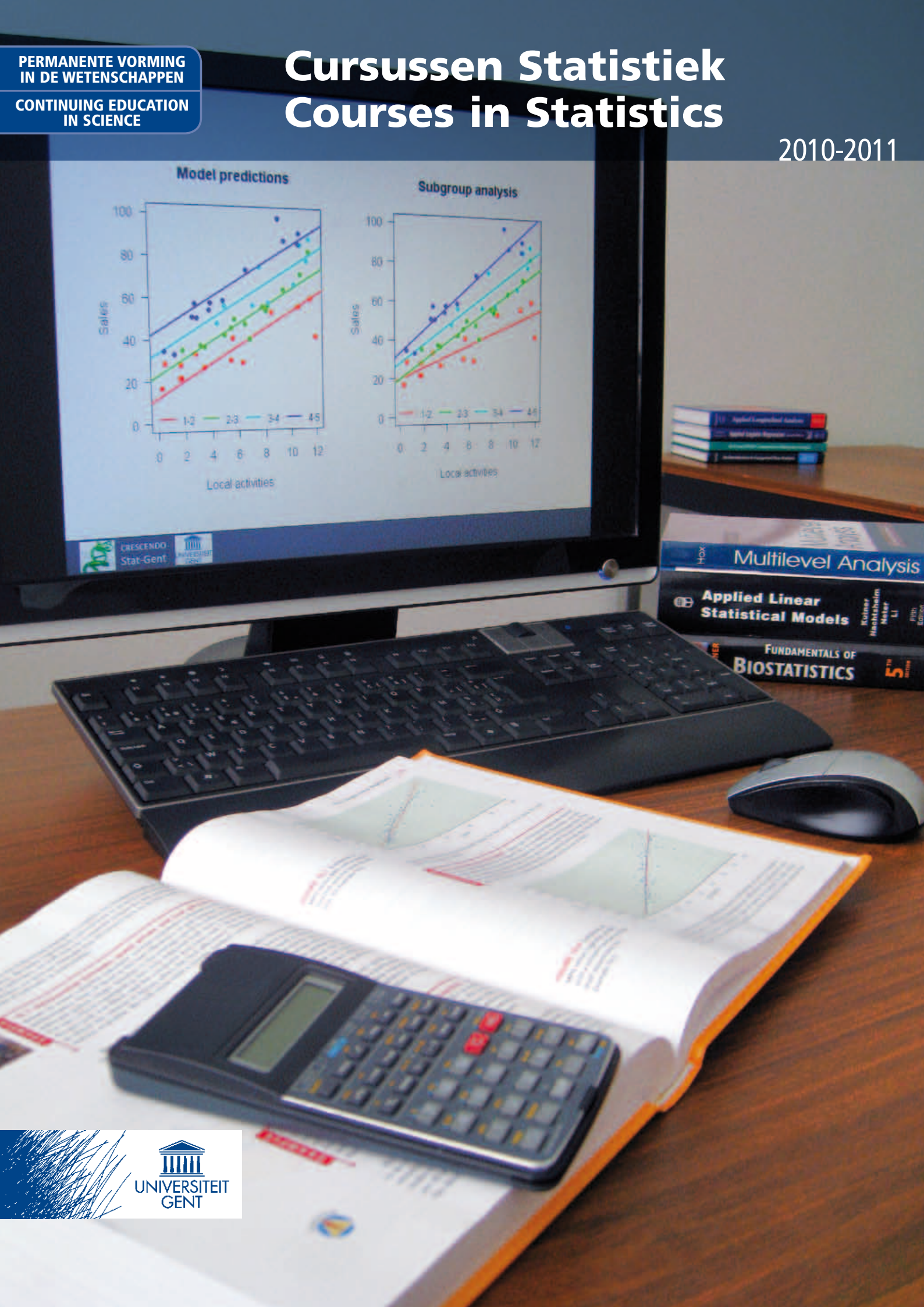
PERMANENTE VORMING IN DE WETENSCHAPPEN

CONTINUING EDUCATION IN SCIENCE

Cursussen Statistiek
Courses in Statistics

2010-2011



UNIVERSITEIT GENT

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Address

Faculty of Sciences

Center for Statistics
ADDRESS Krijgslaan 281 - S9, 9000 Gent
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Institute for Continuing Education in Science
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CS Center for Statistics
Centrum voor Statistiek

ices Institute for Continuing Education in Science

ipvw Instituut voor Permanente Vorming in de Wetenschappen

Onze dienst aanvaardt de opleidingscheques van de Vlaamse Gemeenschap.

Our service accepts the training vouchers of the Flemish Community.

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

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

Voorwoord

Statistiek is de laatste decennia onmisbaar geworden in heel wat takken van de wetenschap. Denk maar aan sociologen die oorzaken van gedrag natrekken, artsen en biowetenschappers die DNA analyseren of de effectiviteit van nieuwe interventies evalueren, bio-ingenieurs die de kwaliteit van het milieu bewaken, industriëlen die de productiekwaliteit bijsturen, economen die financiële tijdreeksen bestuderen, … Met de komst van gebruiksvriendelijke software wordt het opslaan en manipuleren van data haast kinderspel. Veel minder evident is het om relevante en kwaliteitsvolle gegevens te verzamelen, om efficiënt informatie te onttrekken en niet misleid te worden door naïeve conclusies. Een techniek en de interpretatie van haar resultaten hangen immers fundamenteel samen met het design en de implementatie van de studie, vaak ook met bijkomende onderstellingen over een complexe datastructuur.

Het Centrum voor Statistiek van de Universiteit Gent, i.s.m. het Instituut voor Permanente Vorming van de Faculteit Wetenschappen (IPVW), organiseert daarom elk jaar cursussen die inspelen op de noden van gebruikers van statistische methoden. Het aanbod richt zich vooral op het verwerven van inzicht in de basis van het statistisch onderzoek. Practica op pc stellen de kandidaat in staat om ook al doende te leren. Het doelpubliek bestaat uit professionelen en onderzoekers met een academische vorming. Of u nu kennis wil opfrissen, op de hoogte wil blijven van recente ontwikkelingen of belangstelling heeft voor een nieuw onderzoeksdomein, deze formule wil u in staat stellen om gericht kennis en vaardigheden op te doen. De nieuwe inzichten zullen uw bedrijf en uw onderzoek de extra voorsprong geven die het verdient. Ook de Vlaamse regering ziet zo'n training als een troef voor haar economisch beleid. Werkgevers kunnen genieten van financiële steun onder de vorm van de KMO-portefeuille. Werknemers kunnen gebruik maken van de opleidingscheques. Meer informatie over deze 'stimulerende middelen' vindt u op de websites www.kmo-portefeuille.be en www.vdab.be/opleidingscheques.

Tussen november 2010 en april 2011 wordt het pakket basismodules aangeboden, waarin statistische kennis gradueel wordt opgebouwd. Vooraf, in oktober 2010, geeft de eerste module een introductie tot het gebruik van de statistische software SPSS, waarvoor de Universiteit Gent een licentie heeft. Naar jaarlijkse gewoonte wordt dit programma aangevuld met een aantal meer gespecialiseerde cursussen: 'Causal Mediation Analysis' in januari, 'Design and Analysis of Clinical Trials' in maart, 'Multilevel Analysis for Grouped and Longitudinal Analysis' in april, en 'Multiple Testing for Genomic Analysis' in april-mei 2011. Nog te verwachten zijn een short course omtrent 'Numerical Literacy' en een over 'Meta-Analysis'. Blijf op de hoogte van deze bijkomende korte cursussen via onze website of het formulier op pagina 18 van deze brochure. Alle cursussen (m.u.v. Module 1) worden in het Engels gedoceerd. Het geheel verloopt in een gemoedelijke sfeer met ruime mogelijkheid tot interactie met de docenten. De IPVW-activiteiten waaraan een examen is verbonden kunnen ook worden opgenomen in het programma van de 'Doctoral Schools' die de UGent-doctoraatstudent ondersteunen bij zijn/haar onderzoek en opleiding (zie pagina 15).

Verder brengen we graag de volgende initiatieven onder uw aandacht: In 2008 is aan de Universiteit Gent het IOF[1] valorisatieconsortium Stat-Gent CRESCENDO gestart, i.s.m. het Centrum voor Statistiek. Stat-Gent heeft tot doel de UGent statistiekexpertise te valoriseren via toepassingen voor overheid en industrie. Meer informatie hierover, ook over onze aanbieding van short courses in de statistiek en over een meer doorgedreven Master opleiding in Statistische Data-Analyse, die wetenschappers uit diverse disciplines een grondige vorming aanbiedt in de methodes van de toegepaste statistiek, vindt u op de websites www.cvstat.UGent.be en www.statgent.be.

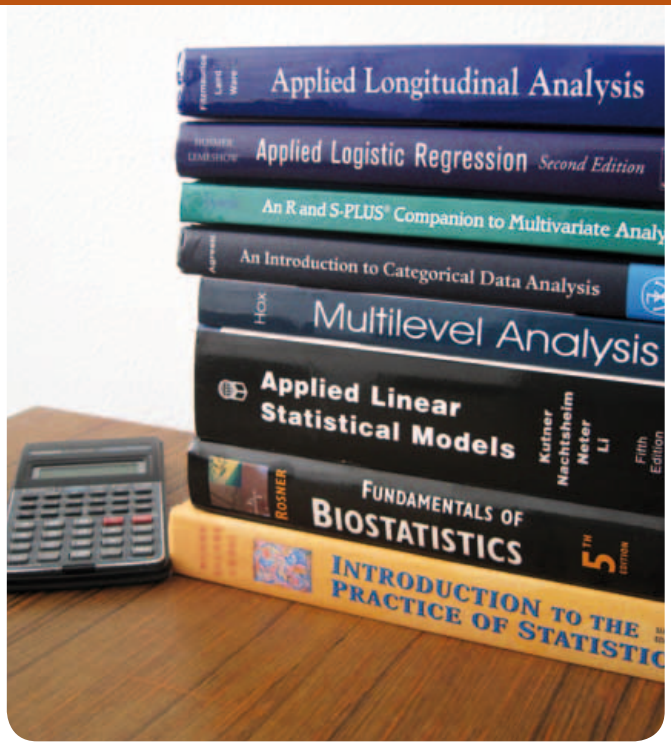
Ook de Associatie Universiteit Gent (AUGent) organiseert jaarlijks een navormingscyclus ten behoeve van onderzoekers van de partnerinstellingen. In praktijkgerichte en interactieve sessies (waaronder een cursus SPSS voor beginners) worden essentiële onderzoekscompetenties toegelicht. Meer informatie hierover vindt u via http://navorming.augent.be.

We hopen dat het nieuwe aanbod u kan smaken en wensen u alvast een leerrijk en productief jaar toe!

1 Industrieel OnderzoekFonds

Introduction

Statistics has become indispensable in many branches of science. Sociologists and psychologists searching to explain behaviour, biologists analyzing DNA, clinicians evaluating new interventions, bio-engineers monitoring the environment, managers performing quality control, economists studying time series, … they all rely on statistical methods. Today's user-friendly software allows anyone to store and manipulate data quite easily. It remains a challenge, however, to gather relevant, high-quality data and retrieve information efficiently to draw accurate inference. Without training and due professionalism one runs a high risk of arriving at misleading conclusions. One must recognise how the appropriate statistical technique and justified interpretation depend fundamentally on the design and conduct of a study in combination with any assumptions about the data structure.



To meet the needs of users of statistical methods, the Centre for Statistics of Ghent University in co-operation with the Institute for Continuing Education of the Faculty of Sciences (ICES) organizes a yearly series of courses. The goal is to train users of statistical software, providing them with insight in the basics of statistical research. Practical sessions on PC's allow participants to obtain this through hands-on experience. Our courses are aimed at 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 is designed to offer specific knowledge and skills through separate modules. The new insights will give your company or research the extra edge it needs. The Flemish Community regards continuing training as an important element of its economic policy. Employers are granted financial support through the government's introduction of the KMO-portfolio and employees can use training vouchers. More information about this stimulating initiative can be found on the websites: www.kmo-portefeuille.be and www.vdab.be/opleidingscheques (both in Dutch).

From November 2010 to April 2011, the program offers a classic series of basic modules which gradually build up statistical knowledge and techniques. Leading into these basic modules, in October 2010 a course introduces the statistical software SPSS, for which Ghent University has a campus license. Every year, the program offers an additional number of more specialized courses: 'Causal Mediation Analysis' in January, 'Design and Analysis of Clinical Trials' in March, 'Multilevel Analysis for Grouped and Longitudinal Analysis' in April and 'Multiple Testing for Genomic Analysis' in April-May 2011. Also scheduled is a short course on 'Numerical Literacy' and one on 'Meta-Analysis'. More information about these 2 courses will be posted on our website or can be requested through use of the form on page 18 of this brochure. With exception of the first module, 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.
ICES-activities that include an exam will also be incorporated in the program of the Doctoral Schools, which support UGent doctoral students with their research and training.

Also, we would like to bring the following initiatives to your attention: In 2008, the IOF[2] valorisation consortium Stat-Gent CRESCENDO was launched at Ghent University, in collaboration with the Center for Statistics. Stat-Gent's mission is to valorize UGent statistical expertise through applications in government and industry. For more information about this consortium, about short courses in statistics organized by the Center for Statistics and on the Masters program in Statistical Data-Analysis, which offers a more thorough training in the methods of practical statistics to scientists in diverse areas, visit www.cvstat.UGent.be and www.statgent.be.

The Ghent University Association (AUGent) organizes its own more basic training aimed at the researchers of the partner institutes. More information about this initiative can be found on http://navorming.augent.be.

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

[2] Industrial Research Fund

MODULE 1 – 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

4, 5, 7 en 8 oktober 2010 telkens van 17u tot 20u.

Plaats

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

Doelpubliek

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

Toelatingsvoorwaarden

Geen

Lesmateriaal

Documentatie- en oefeningenbundel.

Prijs

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

MODULE 2 – Introductory Statistics Basics of Statistical Inference

Maria Ysebaert (Center for Statistics)

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 9, 16, 23 and 30, December 7, 14 and 21, 2010 from 5:30 p.m. till 9:30 p.m. (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. No extensive background in mathematics is required.

Exam

Participants can, if they wish, take part in an exam at a date which will be specified later. 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.

Course material

Copies of lecture notes.
Recommended handbooks are:
Book 1: "Fundamentals of Biostatistics", Bernard Rosner, 6th ed. (2005), Thomson Learning.
Book 2: "Introduction to the Practice of Statistics", David S. Moore and George P. McCabe, 6th ed. (2009), Palgrave.

Fees

Reduced prices apply to students and participants of non-profit, social 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.
Both books are optional and can be bought at the additional cost of 65 EUR per book. Both books discuss the same topics, so it suffises to buy only one. Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 3 – Analysis of Variance

Maria Ysebaert (Center for Statistics)

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 one or more characteristics (factors), 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 random 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 11, 18 and 25, February 1, 15 and 22, March 1, 2011 from 5:30 p.m. to 9:30 p.m. (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 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 11, 2011, these principles will be briefly reviewed. This review session is open to interested participants of subsequent modules of this year's program. Participants who have recently followed the introductory course are exempt from that first session.

Course material

Copies of lecture notes.
Recommended handbook: "Applied Linear Statistical Models", Michael H. Kutner, Christopher J. Nachtsheim, John Neter & William Li, 5th ed. (2004), McGraw-Hill.

Fees

Reduced prices apply to students and participants of non-profit, social 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 60 EUR. Please indicate this clearly on the registration form. The examination fee is 30 EUR.

MODULE 4 – Causal Mediation Analysis

Stijn Vansteelandt (UGent)

Course description

In observational epidemiology, psychology and sociology, there is substantive interest in separating direct exposure effects from indirect effects that are mediated through given intermediate variables. The use of mediation analysis has thus become quite common, especially in the social and psychological sciences, where an approach based on regression analysis advocated by Baron and Kenny is now utilized routinely. More recently, an approach to mediation arising from the causal inference literature and based on the notion of counterfactuals has been proposed. This approach has lead to an improved understanding of the conditions under which the standard regression approach to mediation analysis is valid and to novel techniques that enable effect decomposition of a total effect into a direct and indirect effect in much more general settings than those commonly considered (e.g. the newer techniques can handle nonlinear models, interactions, ...). The purpose of this course is to give an introduction to these developments and will at the same time bring new insights into methods for confounder control through the use of so-called causal diagrams. Emphasis will be on concrete methods as well as an up-to-date survey of current status in the area. Computer demonstrations in the freeware statistical software package R will be included, without assuming prior familiarity with the software.

Dates and venue

Thursday February 10 and Friday February 11, 2011, from 9 a.m. to 12 p.m. and from 1 p.m. to 4 p.m. at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit medical investigators, sociologists, psychologists, research scientists, clinical research associates, … who need to use statistical methods for mediation analysis or wish to develop a better understanding of techniques for confounder control.

Exam

Participants can, if they wish, take part in an exam at a date which will be specified later. 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

Participants are expected to be familiar with the basic principles of statistical inference and linear regression. Basic knowledge of logistic regression is an advantage.

Course material

A full set of slides will be provided. The course will be based on current, accessible papers, and a full reading list will be available ahead of the course.

Fees

Reduced prices apply to students and participants of non-profit, social 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.

MODULE 5 – Applied Linear Regression

Tom Loeys (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) 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 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).

Session 5 covers design of experiments (DoE) as a case example of multiple linear regression. DoE is a popular process improvement methodology used for practical problem solving in science and industry. The last session will briefly touch on problems where the linear regression model is not appropriate and needs to be replaced by related approaches such as nonlinear 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.

Dates and venue

March 8, 15, 22 and 29, April 5, 2011 from 5:30 p.m. to 9:30 p.m. (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

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 of module 3, 'Analysis of Variance', on January 11, 2011, 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", Michael H. Kutner, Christopher J. Nachtsheim, John Neter & William Li, 5th ed. (2004), McGraw-Hill.

Fees

Reduced prices apply to students and participants of non-profit, social 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 60 EUR. Please indicate this clearly on the registration form. The examination fee is 30 EUR.

MODULE 6 – Design and Analysis of Clinical Trials

David Harrington (Harvard School of Public Health, US)

Course description

Experiments involving the health of human beings carry serious challenges and risks, but form one of the richest sources of information on causal effects of interventions. They have been responsible for progress in medicine, leading to lives saved and improved quality of life. To obtain relevant information in an efficient and ethical manner, such experiments must be carefully designed and executed, correctly analyzed and reported.

In this course we will stress concepts and practical examples. We will start by discussing various designs for clinical trials used for instance during drug development. These include placebo-controlled simple, stratified, cross-over, factorial and sequential designs. We will discuss ways of randomizing patients and will stress the importance of a sufficient sample size to obtain reliable results. We will discuss the value of data monitoring including rules for early stopping due to futility or efficacy. Concepts will be illustrated by discussing published clinical trials from cancer, HIV and other diseases.

Dates and venue

March 14, 16 and 17, 2011 from 5.30 pm till 9 pm at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course is designed for biomedical researchers who wish to critically evaluate results from clinical trials or are engaged in the design, execution, analysis and reporting of a clinical trial.

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 assumed to have a working knowledge of the basic statistical concepts: sampling, population, hypothesis testing, confidence intervals, means, survival probabilities.

Course material

Copies of lecture notes and published articles.
Recommended text book: 'Fundamentals of Clinical Trials', L. Friedman, C. Furberg, D. De Mets, 4rd ed., 2010, Springer.

Fees

Reduced prices apply to students and participants of non-profit, social 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 book is optional and can be bought at the additional cost of 55 EUR. Please indicate this clearly on the registration form. The examination fee is 30 EUR.

MODULE 7 – 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). Multilevel logistic models to analyze data where the outcome variable is dichotomous or a proportion, and multilevel multivariate modeling to analyze where there are multiple outcome variables will be shortly introduced.

Dates and venue

April 13, 14 and 15, 2011 from 9 a.m. till 4 p.m. at the Faculty of Social and Behavioural Sciences, Dunantlaan 1, pc-klas 1, Ghent. The course includes three computer labs, where multigroup and longitudinal data are analysed. 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.

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: J.J. Hox (2010), "Multilevel Analysis. Techniques and Applications" (second edition), New York: Routledge.

Fees

Reduced prices apply to students and participants of non-profit, social 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 40 EUR. Please indicate this clearly on the registration form. The examination fee is 30 EUR.

MODULE 8 – Multiple Testing for Genomic Analysis

Lieven Clement (UGent), Beatrijs Moerkerke (UGent), Olivier Thas (UGent), Marnik Vuylsteke (UGent – VIB)

Course description

Recent advances in technology are coming with the production of enormous amounts of data. The dimension of today's datasets has led to a multiplicity of analyses and tests that are posing new and fundamental challenges to hypothesis testing. If no adjustments are made to account for this multiplicity, the number of false positive results can grow unacceptably large. This is at the heart of the multiple testing problem. The multiple testing problem has received particular attention in the field of genomics data analysis where thousands of genes are tested for differential expression or for association with a target phenotype, often based on relatively small sample sizes.

This course will start with an introduction in genomic analyses, focusing on microarray-based differential gene expression studies and genome-wide association studies. Next, we will present different error measures through which repeated tests are being evaluated. This course will review popular procedures that are designed to control the Familywise Error Rate and the False Discovery Rate. All methods will be illustrated with practical examples using demonstrations in R and GenStat.

In the final lecture, we will also briefly discuss specialized topics such as sample size calculations and measures for power and false negative rates.

This course consists of 3 lectures in which each lecture is followed by a hands-on computer session. The last part of the course in an entire computer session designed to help practice the procedures covered in this course.

In these sessions, we will illustrate the use of R and the R procedures that are available in the Bioconductor open source software project. In addition, we will demonstrate the use of GenStat menus for FDR control.

Dates and venue

April 28, May 5, 12 and 19, 2011, from 5:30 p.m. to 20:15 p.m. 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 targets researchers who are dealing with the analysis of high dimensional genomics data and facing possibly different sources of multiplicity.

Exam

Participants can, if they wish, take part in an exam. A certificate from the University will be issued to participants with a 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 basic principles of statistical inference and the linear model framework. Some experience with the R software package would be helpful but is not required; all necessary code will be provided in the hands-on computer sessions.

Course material

Copies of lecture notes.

Fees

Reduced prices apply to students and participants of non-profit, social 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. Lieven Clement is a postdoctoral fellow at Ghent University, Department of Applied Mathematics, Biometrics and Process Control, Faculty of Bioscience Engineering. He did a PhD in Environmental Statistics. He is currently active in the field of statistical genomics and develops methods for the analysis of microarray, tiling array, qPCR and next generation sequencing experiments.

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.

Prof. dr. David Harrington is Professor of Biostatistics in the Department of Biostatistics at the Harvard School of Public Health and former Head of the Department of Biostatistical Science at the Dana-Farber Cancer Institute. He conducts statistical research in survival analysis and in longitudinal data and collaborative research in cancer. He conducts statistical research in survival analysis and collaborative research in cancer. He served as the Group Statistician for the Eastern Cooperative Oncology Group from 1990 to 2000, an organization of approximately 300 treatment sites conducting clinical and basic research in all adult malignancies. He has also served as the Director of the Biostatistics Core Facility for the Dana-Farber/Harvard Cancer Center, a consortium of Harvard Medical School teaching affiliates, academic departments and laboratories with more than 750 investigators directly involved in cancer research. He is currently the principal statistician for the Cancer Consortium for Outcomes Research, a network of cancer registries and cancer centers organized to study patterns of cancer care among US physicians and access to care for subpopulations.

Dr. Tom Loeys received the M.S. degree in mathematics (1992) from Ghent University, the M.S. in biostatistics (2001) from the Limburgs Universitair Centrum, and earned a PhD in biostatistics (2002) from Ghent University. He worked as a biometrician at Merck, Sharp and Dohme (Brussels) till 2009 where he was involved in the design, analysis and reporting of phase-2 and phase-3 clinical trials in a wide range of therapeutic areas. Since June 2009 he is working at the department of data analysis of the faculty of psychology and educational sciences at Ghent University.

Prof. dr. Beatrijs Moerkerke is professor at Ghent University, Department of Data Analysis, Faculty of Psychology and Educational Sciences. She teaches courses in statistics and methodology to students in psychology and educational sciences. During her PhD, she worked on multiple testing problems motivated by applications in genetics. Her current research also focuses on multiplicity in the analysis of brain imaging data.

Prof. dr. Stijn Vansteelandt is professor at Ghent University, Department of Applied Mathematics and Computer Science. He teaches courses in statistics at the Faculty of Sciences, the Faculty of Pharmaceutical Sciences and in the Master in Statistical Data Analysis program. He performed his postdoctoral research at the Harvard School of Public Health and at Ghent University. His present research focuses on missing data and causal inference in clustered sampling designs and longitudinal studies.

Prof. dr. ir. Olivier Thas is professor at Ghent University, Department of Applied Mathematics, Biometrics and Process Control. He teaches courses in statistics to students in the Faculty of Bioscience Engineering and the Faculty of Sciences (Masters program in Statistical Data-Analysis). His research interests include nonparametric and semiparametric statistics and their applications to high throughput genomics, particularly expression studies and second generation sequencing.

The teachers

Prof. dr. ir. Marnik Vuylsteke is professor at Ghent University, Department of Plant Biotechnology and Genetics, Faculty of Science. He teaches quantitative genomics and biostatistics to Master students in Biochemistry and Biotechnology. His current research focuses on microarray expression data analysis and association mapping, mainly in the model plant Arabidopsis.

Prof. dr. Wijngaards-de Meij is professor in applied statistics at the department of Methodology and Statistics of the Faculty of Social Sciences at Utrecht University. She received a MSc 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, and is member of the organization of the Multilevel Conference 2011. She has been teaching courses on Multi-level 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.

Prof. dr. Maria Ysebaert is an honorary professor of Ghent University. She studied biochemistry at Ghent University, the University of Oregon Medical School and the Nobel Institute in Stockholm. Apart from biochemistry, she also taught biostatistics at undergraduate and postgraduate level at the faculty of Veterinary Science at Ghent University. Currently, her scientific interests concerns statistical analysis in research on molecular structure of proteins.

Practical information

Registration

Please use the registration form in this brochure or on our website: **www.ipvw-ices.UGent.be**.
Your registration is not valid until you receive an e-mail confirmation from ICES. If you have not received this mail within a week, please contact ICES to double check.
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, social profit and public services. These prices are available at 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 only in writing 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: training vouchers and the KMO-portfolio

- **The training vouchers** (opleidingscheques) are an initiative of the Flemish community and can be ordered online (www.vdab.be/opleidingscheques) by any employee living in the Flemish or Brussels Region. Please order them well in advance and send them to our office as soon as you receive them. Please do not write anything on the vouchers.
- **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.

Doctoral schools (UGent)

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

- Arts, Humanities and Law
  (Director: prof. Dominique Willems)
- Social and Behavioural Sciences
  (Director: prof. André Vandierendonck)
- Natural Sciences
  (Director: prof. Guido Vanden Berghe)
- (Bioscience) Engineering
  (Director: prof. Yvan Houbaert)
- 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 one of our courses is eligible for a refund from your UGent doctoral school (DS), please visit the training pages on the website of your DS (www.ugent.be/en/research/doctoralschools). In all cases **initial payment stays with your department**. Your DS will only refund the registration fee (books excluded) after you passed the exam connected to the course. For further information please contact your DS.

Inschrijvingsformulier Statistiek 2010-2011

Dit formulier vindt u ook terug 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 mail naar het IPVW. Plaatsen worden toegekend volgens chronologie van inschrijven.
Adres: IPVW – Krijgslaan 281, S3 – 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.

Naam: Voornaam:

Functie:

Bedrijf of instelling:

Volledig adres:

Tel.: Fax: E-mail:

Geboortedatum[1]: / / 19 Geboorteplaats[1]: Geslacht[1]: ☐ M ☐ V

Ja, ik schrijf me in voor de volgende module(s) van de cursus Statistiek 2010-2011, georganiseerd door het Centrum voor Statistiek i.s.m. het Instituut voor Permanente Vorming in de Wetenschappen:

- ☐ **M1: Inleiding tot SPSS**
- ☐ **M2: Inleidende Statistiek. Basis van Statistische Gevolgtrekking**[2] ◯ *Examen* ◯ *Boek 1 (Rosner)* ◯ *Boek 2 (Moore et al.)*
- ☐ **M3: Variantie-Analyse**[2] ◯ *Examen* ◯ *Boek (Kutner et al.)*
- ☐ **M4: Causale Mediatie-Analyse**[2] ◯ *Examen*
- ☐ **M5: Toegepaste Lineaire Regressie**[2] ◯ *Examen* ◯ *Boek (Kutner et al.)*
- ☐ **M6: Ontwerp en Analyse van Klinische Studies**[2] ◯ *Examen* ◯ *Boek (Friedman et al.)*
- ☐ **M7: Multilevel Analyse voor Gegroepeerde en Longitudinale Data**[2] ◯ *Examen* ◯ *Boek (Hox)*
- ☐ **M8: Multipele Testen voor Genoomanalyse**[2] ◯ *Examen*

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

Betalingswijze[3]**:**

- ◯ **Ik ben UGent-personeelslid en betaal d.m.v. een SAP interne bestelbon: 4 3 . . . . . .** [4]
- ◯ **Ik betaal als privé-persoon en**
  - ◯ **maak géén gebruik van opleidingscheques**
  - ◯ **heb opleidingscheques aangevraagd voor een bedrag van ..... EUR.**
- ◯ **Mijn bedrijf betaalt en**
  - ◯ **maakt géén gebruik van steunmaatregelen**
  - ◯ **maakt gebruik van de KMO-portefeuille. Hiertoe werd een portefeuille geopend op . . / . . / 20 . . voor een bedrag van ..... EUR, met projectnummer: 20 . . /KMO/ . . . . . .**

FACTURATIEGEGEVENS

Naam: .....

Adres: .....

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

Vereist: ☐ Door me in te schrijven verklaar ik me akkoord met de betalings- en annuleringsvoorwaarden[5].

Datum: ..... Handtekening: .....

1 Deze informatie wordt vermeld op de certificaten.
2 Deze cursussen worden in het Engels gedoceerd.
3 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 van de deelnemer opgemaakt.
KMO-portefeuille: alle informatie over deze steunmaatregel vindt u op www.KMO-portefeuille.be
4 Check de IPVW-website voor de gereduceerde tarieven. Gelieve ook de goedgekeurde bestelbon zelf, met dit formulier mee te sturen.
5 De volledige voorwaarden vindt u op de IPVW-website. Betaling gebeurt binnen 30 dagen na ontvangst van de factuur met vermelding van de gestructureerde mededeling. Deelnemers kunnen hun inschrijving 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 2010-2011

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: ICES – Krijgslaan 281, S3 – 9000 GENT **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.

Last name: First name:

Function:

Company or institute:

Full address:

Phone: Fax: E-mail:

Date of birth[1]: / / 19 Place of birth[1]: Gender[1]: ☐ M ☐ F

Yes, I register for the following module(s) of the course in Statistics 2010-2011, organized by the Center for Statistics, in co-operation with the Institute for Continuing Education in Science:

☐	**M1: Introduction to SPSS** [2]		
☐	**M2: Introductory Statistics. Basics of Statistical Inference**	◯ *Exam*	◯ *Book 1 (Rosner)* ◯ *Book 2 (Moore et al.)*
☐	**M3: Analysis of Variance**	◯ *Exam*	◯ *Book (Kutner et al.)*
☐	**M4: Causal Mediation Analysis**	◯ *Exam*	
☐	**M5: Applied Linear Regression**	◯ *Exam*	◯ *Book (Kutner et al.)*
☐	**M6: Design and Analysis of Clinical Trials**	◯ *Exam*	◯ *Book (Friedman et al.)*
☐	**M7: Multilevel Analysis for Grouped and Longitudinal Analysis**	◯ *Exam*	◯ *Book (Hox)*
☐	**M8: Multiple Testing for Genomic Analysis**	◯ *Exam*	

The total amount for my registration, including books and exam fees, adds up to ..... EUR.
All amounts are free from VAT.

Payment[3]**:**

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

◯ **I am registering as a private person and**
- ◯ **will not make use of training vouchers.**
- ◯ **have requested training vouchers for the amount of ..... EUR.**

◯ **My company will pay and**
- ◯ **will not make use of support measures.**
- ◯ **will make use of the KMO-portfolio. A portfolio was opened on . . / . . / 20 . .**

for an amount of ..... EUR, with project number: 20 . . /KMO/ . . . . .

Invoice address Name: .....

Address: .....

VAT-n°: BE . . . / . . . / . . .

Mandatory: ☐ By registering I agree with the payment and cancellation conditions[5].

Date: ..... Signature:

.....

1 This information is mentioned on the certificates.
2 This course is taught in Dutch.
3 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-portefolio: all information about this support measure is available on www.KMO-portefeuille.be
4 Please check the ICES website for the reduced prices. Please also send along the approved order itself, together with this registration form.
5 Full conditions are available on the ICES website. 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 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 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 organises 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 our mailing list.

I want to ◯ receive more information about the following ICES-activities
◯ make changes to my subscription

PERSONAL INFORMATION

Title: ◯ Mr ◯ Mrs ◯ Miss

Last Name: ..... First name: .....

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

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 mail ☐ through post

of the following ICES courses:

- ☐ Biological Basis of Our Behaviour*
- ☐ Continuing Education for Surveyors*
- ☐ Crystalline Rocks and Plate Tectonics*
- ☐ Introduction to Bio-informatics
- ☐ Introduction to Biotechnology*
- ☐ Statistics

And/or more specifically about the short courses:

- ☐ Numerical Literacy
- ☐ Meta-Analysis

- ☐ Synthetics: from 'plastic' to high tech materials*

* These courses are taught in Dutch.

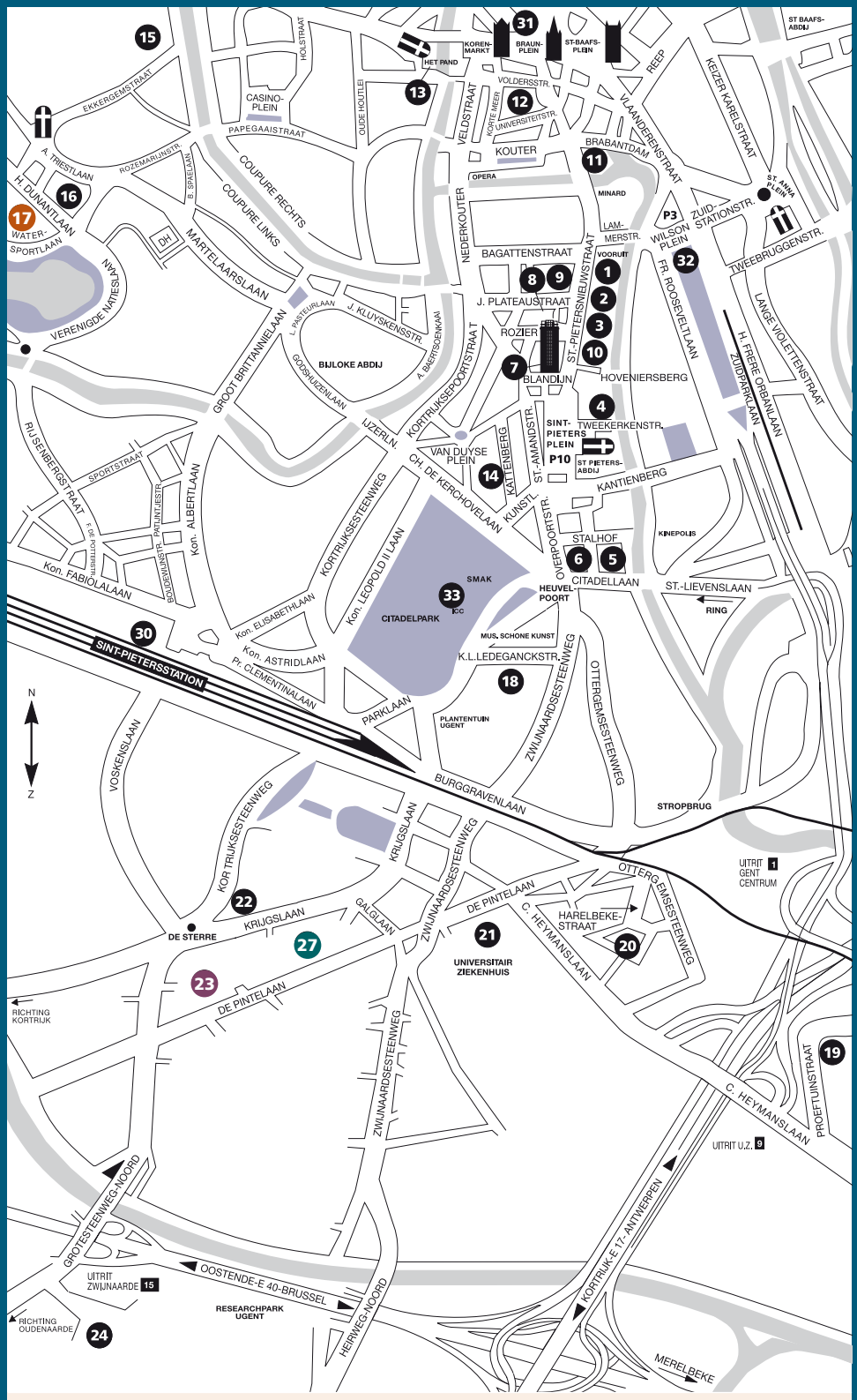
of future ICES courses within these departments:

- ☐ 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

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.

Notities / Notes

Course locations



17 **Fac. of Psychology and Educational Sciences (PP)** H. Dunantlaan 1
23 **Fac. of Sciences (WE)** Campus Sterre, Krijgslaan 281, building S9
27 **Fac. of Sciences (WE)** IPVW-ICES, Campus Sterre, Krijgslaan 281, building S3

2 Adviescentrum voor studenten
30 Station Gent Sint-Pieters

For all further information:

UNIVERSITEIT GENT

Faculty of Sciences

ICES, Krijgslaan 281, building S3, 9000 Ghent
Phone 09 264 44 26 – www.ipvw-ices.UGent.be