

**Basic Course on R**

**14 -18 May, 2018**

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The Erasmus Postgraduate School Molecular Medicine has two main activities: the organization of education for postgraduate students; and the stimulation of cooperation between several departments with regards to translational research.

The school organizes this four-day course on the open-source statistical software program R. **R (**[**http://www.r-project.org/**](http://www.r-project.org/)**)** has become the 'lingua franca' of data analysis and statistical computing. Its great success is attributed to its free availability and the capability for a wide range of analysis and graphics.

This course is meant for PhD-students and other researchers who are just starting to program in R. This course will feature both practical sessions behind a computer and presentations. The course will begin with building the foundation of R as a programming language and move into the use of R as a statistical tool for analyzing data.

The course is given for the 10th time by **Elizabeth Ribble,** Ph.D., Associate Professor of Statistics and Associate Chair of the Department of Mathematical and Computer Sciences, Metropolitan State University of Denver, Colorado. She will be assisted by David Nieuwenhuijse from the Dept. of Viroscience, Erasmus MC and Karl Brand from Bayer, ?.

This course will be held in computer room **C00-5** at the Medical Faculty of the Erasmus MC. See the MolMed website for maps and travel directions: [www.molmed.nl](http://www.molmed.nl). Full participation in this five-day course is **1,8** ECTS. Course registration fee is **€600**. See at the end of this program for more information on the discount options.

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| **DAY 1: Monday 14 May 2018**  **Location: C00-5** | | | |
| Time | Title | **Keywords** | Teachers, *assistants* |
| 10.00 – 10.15 | *Registration and Coffee* | | |
| 10.15 – 11.15 | Introduction, R history | R history, getting familiar with R console, RStudio | Karl Brand |
| 11.15 – 11.30 | *Coffee Break* | | |
| 11.30 – 12.30 | Objects and functions | Objects, data structures, classes, using functions, arguments | Karl Brand |
| 12.30 – 13.15 | *Lunch, location* | | |
| 13.15 – 14.30 | PRACTICAL'Objects and functions' |  | Karl Brand, David Niewenhuijse, *Job van Riet, Harmen van de Werken?* |
| 14.30 – 14.45 | *Coffee Break* | | |
| 14.45 – 15.45 | Manipulating/selecting data | Containers, names, selection rules, accessing data.frame elements, lists | David Niewenhuijse |
| 15.45 – 16.45 | **PRACTICAL**  'Manipulating/selecting data' |  | David Niewenhuijse*,* Karl Brand, *Job van Riet, Harmen van de Werken?* |
| **DAY 2: Tuesday 15 May 2018**  **Location: C00-5** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 9.30 – 10.00 | *Registration and Coffee* | | |
| 10.00 – 10.45 | Entering and importing data | c, cbind, rbind; View; dim; importing from a file; working directory | Karl Brand |
| 10.45 – 11.00 | *Coffee Break* | | |
| 11.00 – 12.15 | **PRACTICAL**  'Entering and importing data' |  | Karl Brand, David Niewenhuijse, Elizabeth McClellan Ribble, *Job van Riet, Harmen van de Werken?* |
| 12.15 – 13.00 | *Lunch* | | |
| 13.00 – 13.45 | Basic plotting | Boxplots, bar graphs, scatterplots, line graphs | David Niewenhuijse |
| 13.45 – 14.45 | **PRACTICAL**  'Basic plotting' |  | David Niewenhuijse,  Elizabeth McClellan Ribble, Karl Brand, *Job van Riet, Harmen van de Werken?* |
| 14.45 – 15.00 | *Coffee Break* | | |
| 15.00 – 15.45 | More on plotting in R: ggplot2 | ggplot2 package for visualizations | David Nieuwenhuijse |
| 15.45 – 16.45 | **PRACTICAL**  'ggplot2' |  | David Nieuwenhuijse*,*  Elizabeth McClellan Ribble, Karl Brand, *Job van Riet, Harmen van de Werken?* |

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| **DAY 3: Wednesday 16 May 2018**  **Location: C00-5** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 9.30 – 10.00 | *Registration and Coffee* | | |
| 10.00 – 11.00 | Hypothesis Testing and Confidence Intervals 2 | Correlations, ANOVA, Tukey’s method, chi-squared test in R | Elizabeth McClellan Ribble |
| 11.00 – 11.15 | *Coffee break* | | |
| 11.15 – 12.15 | **PRACTICAL**  'Hypothesis Testing and Confidence Intervals 2' |  | Elizabeth McClellan Ribble,  David Nieuwenhuijse, Karl Brand |
| 12.15 – 13.00 | *Lunch* | | |
| 13.00 – 13.45 | 'Distribution-free ANOVA' | Kruskal-Wallis test, Friedman’s test | Elizabeth McClellan Ribble |
| 13.45 – 14.45 | **PRACTICAL**  'Distribution-free ANOVA' |  | Elizabeth McClellan Ribble,  David Nieuwenhuijse, Karl Brand |
| 14.45 – 15.00 | *Coffee break* | | |
| 15.00 – 16.00 | **Hypothesis Testing and Confidence Intervals 1** | Summary statistics, t-test, Mann-Whitney U test in R | Elizabeth McClellan Ribble |
| 16.00 – 17.00 | **PRACTICAL**  **'Hypothesis Testing and Confidence Intervals 1'** |  | Elizabeth McClellan Ribble, David Niewenhuijse, Karl Brand |

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| **DAY 4: Thursday 17 May 2018**  **Locations: C00-5** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 08.30 – 09.00 | *Registration and Coffee* | | |
| 09.00 – 10.00 | Linear Regression | building linear models in R, diagnostics | Elizabeth McClellan Ribble |
| 10.00 – 10.15 | *Coffee break* | | |
| 10.15 – 11.15 | **PRACTICAL**  'Linear Regression' |  | Elizabeth McClellan Ribble*,*  David Nieuwenhuijse, Karl Brand |
| 11.15 – 12.00 | *Lunch* | | |
| 12.00 – 12.45 | Logistic Regression | building logistic models in R | Elizabeth McClellan Ribble |
| 12.45 – 13.45 | **PRACTICAL**  'Logistic Regression' |  | Elizabeth McClellan Ribble*,* David Nieuwenhuijse, Karl Brand |
| 13.45 – 14.00 | *Coffee break* | | |
| 14.00 – 15.00 | Programming structures 1 | writing your own functions, if/else functions, loops | Elizabeth McClellan Ribble (or Karl?!) |
| 15.00 – 16.00 | **PRACTICAL**  'Programming structures 1' |  | Elizabeth McClellan Ribble,  David Nieuwenhuijse, Karl Brand |

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| **DAY 5: Friday 18 May 2018**  **Location: C00-5** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 9.30 – 10.00 | *Registration and Coffee* | | |
| 10.00 – 11.00 | Programming structures 2 | scope, recursion, replacement, search path | Elizabeth McClellan Ribble |
| 11.00 – 11.15 | *Coffee break* | | |
| 11.15 – 12.15 | **PRACTICAL**  'Programming structures 2' |  | Elizabeth McClellan Ribble*,*  David Nieuwenhuijse,  *Job van Riet* |
| 12.15 – 13.00 | *Lunch* | | |
| 13.00 – 14.00 | Object-oriented programming and performance enhancement | generic functions and methods, writing faster code, vector preallocation, bytecode compliation | Elizabeth McClellan Ribble |
| 14.00 – 14.15 | *Coffee break* | | |
| 14.15 – 15.15 | **PRACTICAL**  'Object-oriented programming and performance enhancement' |  | Elizabeth McClellan Ribble*,*  David Nieuwenhuijse,  *Job van Riet* |

## Attendance fees

The subscription fee of non-commercial participants for the Course is **€ 600**. Discounts are handled as followed:

* All MSc students and PhD students get a discount of **50 % and pay € 300.**
* All participants from the MolMed school get a discount of **100 % and pay € 0**.
* Master students from elsewhere who pay the fee from their personal budget get a discount of **75 % and pay € 150**.

*If these financial requirements pose a problem but you wish to attend the Course and Workshops, please contact Frank van Vliet, managing director of the Erasmus Postgraduate School Mol Med, at: f.vanvliet@erasmusmc.nl*

# Invoice

Fees can be paid upon an INVOICE. After your registration you will receive an INVOICE per postal mail. The payment can then be done per bank transfer. All the information necessary will be on the invoice, including the unique INVOICE number.

Late participants can also pay cash upon signing in for the Course.

# Cancellations

The fees are for all the days of the course. There is no discount for participating in only a part of the course. Our cancellation policy is that **cancellation is possible up to one week before the start** of the Course. Later cancellation will not be accepted, but you are allowed to send a substitute.

### Commercial participants & sponsors

Companies are invited to inquire for participation and sponsoring.