

**Basic Course on R**

**25 – 28 May 2020**

*Draft vs.20200520*

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 five-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 will be given by *Karl Brand* from Bayer (Berlin); *David Nieuwenhuijse* from the Dept. of Viroscience; *Sara Baart* from the Dept of Biostatistics, Erasmus MC; and *Elizabeth McClellan Ribble* from the Dept of Mathematical and Computer Sciences, Metropolitan State University of Denver. Also thanks to our practical helpers!

This course will be held online via Microsoft Teams.

Full participation in this four-day course is **1,8** ECTS. Course registration fee is **€750**. See at the end of this program for more information on the discount options.

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| **DAY 1: Monday 25 May 2020** | | | |
| Time | Title | **Keywords** | Teachers, *assistants* |
| 09.45 – 10.00 | *Log onto Teams* | | |
| 10.00 – 10.45 | Introduction | getting familiar with R console, RStudio | Karl Brand  *(moderator: Sara Baart)* |
| 10.45 – 11.00 | *Break* | | |
| 11.00 – 11.45 | Objects | Objects, data structures, classes | Karl Brand  *(moderator: Sara Baart)* |
| 11.45 – 12.15 | Functions | Functions, arguments | Karl Brand  *(moderator: Sara Baart)* |
| 12.15 – 13.30 | *Lunch Break* | | |
| 13.30 – 14.30 | PRACTICAL'Objects and functions' |  | Sara Baart, Karl Brand, *Boris Beudeker, Nathan Whitney, Youri Hoogstrate* |
| 14.30 – 14.45 | *Break* | | |
| 14.45 – 15.45 | Manipulating/selecting data | Containers, names, selection rules, accessing data frame elements, lists | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 15.45 – 16.00 | *Break* | | |
| 16.00 – 16:45 | **PRACTICAL**  'Manipulating/selecting data' |  | Sara Baart, Karl Brand, Elizabeth Ribble, *Nathan Whitney, Brian Kelly* |
| 16.45 – 17.00 | *Break* | | |
| 17.00 – 18.00 | Entering and importing data | c, cbind, rbind; View; dim; importing from a file; working directory | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| **DAY 2: Tuesday 26 May 2020** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 09.45 – 10.00 | *Log onto Teams* | | |
| 10.00 – 11.00 | **PRACTICAL**  'Entering and importing data' |  | Karl Brand, Sara Baart, *Boris Beudeker* |
| 11.00 – 11.15 | *Break* | | |
| 11.15 – 12.00 | Basic plotting | Boxplots, bar graphs, scatterplots, line graphs | Sara Baart  *(moderator: Karl Brand)* |
| 12.00 – 13.00 | **PRACTICAL**  'Basic plotting' |  | Karl Brand, Sara Baart, *Boris Beudeker, Youri Hoogstrate* |
| 13.00 – 13.45 | *Lunch Break* | | |
| 13.45 – 14.45 | Hypothesis Testing and Confidence Intervals 1 | Summary statistics, t-test, Mann-Whitney U test in R | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 14.45 – 15.00 | *Break* | | |
| 15.00 – 16.00 | **PRACTICAL**  'Hypothesis Testing and Confidence Intervals 1' |  | Sara Baart, Karl Brand, Elizabeth Ribble, *Lance Barto, Nathan Whitney, Brian Kelly* |
| 16.00 – 16.15 | *Break* | | |
| 16.15 – 17.15 | Hypothesis Testing and Confidence Intervals 2 | Correlations, ANOVA, Tukey’s method, chi-squared test in R | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 17.15 – 18.00 | **PRACTICAL**  'Hypothesis Testing and Confidence Intervals 2' |  | Sara Baart, Karl Brand, Elizabeth Ribble*, Nathan Whitney, Brian Kelly* |

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| **DAY 3: Wednesday 27 May 2020** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 09.45 – 10.00 | *Log onto Teams* | | |
| 10.00 – 10.45 | More on plotting in R: ggplot2 | ggplot2 package for visualizations | David Nieuwenhuijse *(moderator: Karl Brand)* |
| 10.45 – 11.00 | *Break* | | |
| 11.00 – 12.00 | **PRACTICAL**  'ggplot2' |  | Karl Brand, David Nieuwenhuijse, *Job van Riet* |
| 12.00 – 12.45 | *Lunch Break* | | |
| 12.45 – 13.15 | Distribution-free ANOVA | Kruskal-Wallis test, Friedman’s test | Sara Baart  *(moderator: Karl Brand)* |
| 13.15 – 14.00 | **PRACTICAL**  'Distribution-free ANOVA' |  | Sara Baart, Karl Brand, *Job van Riet* |
| 14.00 – 14.15 | *Break* | | |
| 14.15 – 15.15 | Linear Regression | building linear models in R, diagnostics | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 15.15 – 16.00 | **PRACTICAL**  'Linear Regression' |  | Sara Baart, Karl Brand, Elizabeth Ribble, *Lance Barto, Nathan Whitney, Brian Kelly* |
| 16.00 – 16.15 | *Break* | | |
| 16.15 – 17.00 | Logistic Regression | building logistic models in R | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 17.00 – 18.00 | **PRACTICAL**  'Logistic Regression' |  | Sara Baart, Karl Brand, Elizabeth Ribble*, Nathan Whitney, Brian Kelly* |

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| **DAY 4: Thursday 28 May 2020** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 09.45 – 10.00 | *Log onto Teams* | | |
| 10.00 – 11.00 | Programming structures 1 | writing your own functions, if/else functions, loops | Karl Brand  *(moderator: Sara Baart)* |
| 11.00 – 11.15 | *Break* | | |
| 11.15 – 12:15 | **PRACTICAL**  'Programming structures 1' |  | Sara Baart, Karl Brand, *Job van Riet, Youri Hoogstrate* |
| 12.15 – 13.00 | *Lunch Break* | | |
| 13.00 – 13.45 | Programming structures 2 | scope, recursion, replacement, search path | Karl Brand  *(moderator: Sara Baart)* |
| 13.45 – 14.30 | **PRACTICAL**  'Programming structures 2' |  | Karl Brand, Elizabeth Ribble, *Lance Barto, Nathan Whitney, Job van Riet, Brian Kelly* |
| 14.30 – 14.45 | *Break* | | |
| 14.45 – 15.30 | Object-oriented programming and performance enhancement | generic functions and methods, writing faster code, vector preallocation, bytecode compilation | Elizabeth Ribble  *(moderator: Nathan Whitney)* |
| 15.30 – 16.30 | **PRACTICAL**  'Object-oriented programming and performance enhancement' |  | Karl Brand, Elizabeth Ribble, *Lance Barto, Nathan Whitney, Brian Kelly* |

## Attendance fees

The subscription fee of non-commercial participants for the Course is **€ 750**. Discounts are handled as followed:

* All MSc students and PhD students get a discount of **50 % and pay € 375.**
* 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 € 187,50**.

*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.