

**Basic Course on R**

**28th October – 1st November 2019**

*Final vs.20191018*

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; and *Sara Baart* from the Dept of Biostatistics, Erasmus MC. The course program and materials are also developed by *Elizabeth Ribble McClellan*, to whom we are grateful for developing this course with her colleagues. Also thanks to our practical helpers!

This course will be held in *OWR-22, COO-3 and COO-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 **€750**. See at the end of this program for more information on the discount options.

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| **DAY 1: Monday 28 October 2019**  **Location: COO-5** | | | |
| Time | Title | **Keywords** | Teachers, *assistants* |
| 12.30 – 12.45 | *Registration and Coffee* ***at the entrance of COO-5*** *(room occupied until 12.45!)* | | |
| 12.45 – 13.15 | Introduction | getting familiar with R console, RStudio | Karl Brand |
| 13.15 – 14.00 | Objects | Objects, data structures, classes | Karl Brand |
| 14.00 – 14.15 | *Coffee Break* | | |
| 14.15 – 14.45 | Functions | Functions, arguments | Karl Brand |
| 14.45 – 15.45 | PRACTICAL'Objects and functions' |  | Karl Brand, David Nieuwenhuijse, Sara Baart, Wesley van de Geer |
| 15.45 – 16.00 | *Coffee Break* | | |
| 16.00 – 17.00 | Manipulating/selecting data | Containers, names, selection rules, accessing data frame elements, lists | Karl Brand |

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| **DAY 2: Tuesday 29 October 2019**  **Location: OWR-22** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 08.30 – 09.00 | *Registration and Coffee* | | |
| 09.00 – 09.45 | **PRACTICAL**  'Manipulating/selecting data' |  | Karl Brand, David Nieuwenhuijse, Job van Riet, Wesley van de Geer |
| 09.45 – 10.30 | Entering and importing data | c, cbind, rbind; View; dim; importing from a file; working directory | Karl Brand |
| 10.30 – 10.45 | *Coffee Break* | | |
| 10.45 – 11.45 | **PRACTICAL**  'Entering and importing data' |  | Karl Brand, David Nieuwenhuijse, Wesley van de Geer |
| 11.45 – 12.30 | Basic plotting | Boxplots, bar graphs, scatterplots, line graphs | David Nieuwenhuijse |
| 12.30 – 13.30 | *Lunch in: opposite to DE Coffee Corner* | | |
| 13.30 – 14.30 | **PRACTICAL**  'Basic plotting' |  | Karl Brand, David Nieuwenhuijse, Wesley van de Geer, Job van Riet |
| 14.30 – 14.45 | *Coffee Break* | | |
| 14.45 – 15.30 | More on plotting in R: ggplot2 | ggplot2 package for visualizations | David Nieuwenhuijse |
| 15.30 – 16.30 | **PRACTICAL**  'ggplot2' |  | Karl Brand, David Nieuwenhuijse, Wesley van de Geer |

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| **DAY 3: Wednesday 30 October 2019**  **Location: COO-3** | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 08.30 – 09.00 | *Registration and Coffee* | | |
| 09.00 – 10.00 | Hypothesis Testing and Confidence Intervals 1 | Summary statistics, t-test, Mann-Whitney U test in R | Sara Baart |
| 10.00 – 10.15 | *Coffee break* | | |
| 10.15 – 11.15 | **PRACTICAL**  'Hypothesis Testing and Confidence Intervals 1' |  | Sara Baart, David Nieuwenhuijse, Karl Brand |
| 11.15 – 12.15 | Hypothesis Testing and Confidence Intervals 2 | Correlations, ANOVA, Tukey’s method, chi-squared test in R | Sara Baart |
| 12.15 – 13.00 | *Lunch in: opposite to DE Coffee Corner* | | |
| 13.00 – 14.00 | **PRACTICAL**  'Hypothesis Testing and Confidence Intervals 2' |  | Sara Baart, David Nieuwenhuijse, Karl Brand |
| 14.00 – 14.15 | *Coffee break* | | |
| 14.15 – 14.45 | Distribution-free ANOVA | Kruskal-Wallis test, Friedman’s test | Sara Baart |
| 14.45 – 15.30 | **PRACTICAL**  'Distribution-free ANOVA' |  | Sara Baart, David Nieuwenhuijse, Karl Brand |

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| **DAY 4: Thursday 31 October 2019**  **Location: COO-5** *(room occupied from 16.00)* | | | |
| **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 | Sara Baart |
| 10.00 – 10.15 | *Coffee break* | | |
| 10.15 – 11.00 | **PRACTICAL**  'Linear Regression' |  | Sara Baart, Karl Brand |
| 11.00 – 11.45 | Logistic Regression | building logistic models in R | Sara Baart |
| 11.45-12.15 | **PRACTICAL**  'Logistic Regression' (part 1) |  | Sara Baart, Karl Brand, Job van Riet |
| 12.15 – 13.00 | *Lunch in: opposite to DE Coffee Corner* | | |
| 13.00 – 13.30 | **PRACTICAL**  'Logistic Regression' (cont’d) |  | Sara Baart, Karl Brand, Job van Riet |
| 13:30 – 14:30 | Programming structures 1 | writing your own functions, if/else functions, loops | Karl Brand |
| 14:30 – 14.45 | *Coffee break* | | |
| 14.45 – 15:45 | **PRACTICAL**  'Programming structures 1' |  | Karl Brand, Job van Riet |

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| **DAY 5: Friday 1 November 2019**  **Location: COO-5** *(NB room the whole day available!)* | | | |
| **Time** | **Title** | **Keywords** | **Teachers, *practical assistants*** |
| 08.30 – 09.00 | *Registration and Coffee* | | |
| 09.00 – 09.45 | Programming structures 2 | scope, recursion, replacement, search path | David Nieuwenhuijse |
| 09.45 – 10.30 | **PRACTICAL**  'Programming structures 2' |  | Karl Brand, David Nieuwenhuijse, Sara Baart |
| 10.30 – 10.45 | *Coffee break* | | |
| 10.45 – 11.30 | Object-oriented programming and performance enhancement | generic functions and methods, writing faster code, vector preallocation, bytecode compilation | David Nieuwenhuijse |
| 11.30 – 12.30 | **PRACTICAL**  'Object-oriented programming and performance enhancement' |  | Karl Brand, David Nieuwenhuijse, Sara Baart |

## 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.