## 1. Introduction

IIT Bombay has conducted many large-scale teacher training workshops under the Train 10,000 Teachers (T10KT) programme, sponsored by the National Mission on Education through ICT (NMEICT), MHRD, Govt. of India, and trained over 2,00,000 teachers.

Another successful technology developed at IIT Bombay is Spoken Tutorial, using which about 50 lakh students have been trained on various ICT topics. The effectiveness of this method can be seen from the testimonials available here: https://spoken-tutorial.org/testimonials/media/?foss=70 and the TEDx talk. This project is funded by NMEICT, MHRD.

It is now proposed to offer the highly effective Spoken Tutorial based ICT training to a large number of teachers, across the country, through the T10KT methodology, with **R Programming language** training being taken up next.

**R** (http://www.r-project.org/) is a Free/Libre and Open Source Software (FLOSS) - a well organized and sophisticated package - that facilitates data analysis, modeling, inferential testing, and forecasting. It is a user-friendly software that allows creating new function commands to solve statistical problems. It runs on a variety of UNIX platforms (and similar systems such as LINUX), Windows and Mac OS X.

R is one of the most preferred open-source languages for analytics and data science. The cross-platform compatibility of R and its capacity to handle large and complex data sets makes it an ideal tool for academicians to analyze data in their labs.

R can be used for simple calculations, matrix calculations, differential equations, optimization, statistical analysis, plotting graphs, etc. Also, it is useful for anybody who wishes to undertake extensive statistical computations and data visualization.

R allows you to develop custom Artificial Intelligence Apps to deploy within your own organization. It has numerous packages that are used in the field of ML.

The FOSSEE project at IIT Bombay (https://fossee.in) has been promoting R, and other FLOSS, such as Scilab, Python, OpenFOAM, eSim, Osdag, OpenModelica, DWSIM, Drupal and Linux, and Open source hardware, such as Arduino and OpenPLC. FOSSEE is also funded by NMEICT, MHRD.

The R workshop is organized by the Teaching Learning Centre (ICT) at IIT Bombay, funded by the *Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT)*, MHRD, Govt. of India. As the Spoken Tutorial method offers hands-on practice, with 100% active learning, those who undergo this training will be able to start using the R language immediately after the workshop. They will also be able to conduct R workshops for their students, using Spoken Tutorials, without requiring any help from anyone else.

The one day R Main workshop will be conducted on **Saturday, 09 November 2019,** through about 200 Remote Centres of IIT Bombay (the details will be shared later). This will be a blended training programme that uses A-VIEW for live interactions and Spoken Tutorials to learn to use R language. Details of the workshop will be announced later. The medium of instruction for this workshop is English.

## 2. Methodology of the Large-scale Workshop

It will be a one day workshop on **Saturday, 09 November 2019**. All participants will have to go to their chosen Remote Centre. They will learn R programming language through Spoken Tutorials, with help from Coordinators, already trained for this purpose by IIT Bombay. As the learning will happen only through carefully designed Spoken Tutorials which are developed at IIT Bombay, the quality of learning will be very high. All the participants, from all the Remote Centres, will be able to interact with the R team at IIT Bombay, ask them questions, etc. through the video conferencing software A-VIEW. There will be about 4 hours available for R language training and 2 hours for interactions.

A timed discussion forum https://forums.spoken-tutorial.org/ will be used to answer the questions that the participants may have in different Remote Centres. One has to select the Spoken Tutorial, and the exact time (minute and second) when the doubt arises. It will be answered immediately by one of the volunteers. Answers can also be provided by other participants in the same Remote Centre or in other Centres. These answers double as additional learning material. Course Coordinators at Remote Centres, already trained for this purpose, ensure that the workshop goes through smoothly.

Using this approach, we have trained 3,500, 4,200, 4,300, 5,300 and 2,600 teachers, respectively, on Koha, Moodle, Scilab, Python, and Linux, in the past 10 months.

## 3. Syllabus for the workshop

Depending on the level of the user, one can learn any/all of the topics mentioned below. If one cannot complete all the topics, one can complete them later on, through self-learning, as all required Spoken Tutorials are freely available.
**Basic Tutorials:**
1. Introduction to basics of R
2. Introduction to data frames in R
3. Introduction to RStudio
4. Introduction to R script
5. Working Directories in RStudio
6. Indexing and Slicing Data Frames
7. Creating Matrices using Data Frames
8. Operations on Matrices and Data Frames
9. Merging and Importing Data
10. Data Types and Factors
11. Lists and its Operations
12. Plotting Histograms and Pie Chart
13. Plotting Bar Charts and Scatter Plot
14. Introduction to ggplot2
15. Aesthetic Mapping in ggplot2
16. Data Manipulation using dplyr Package
17. More functions in the dplyr Package
18. Pipe Operator
19. Conditional Statements
20. Functions in R

## 4. Useful content and activities in R:

**Lab Migration Project** The R- team (https://r.fossee.in/) has taken up the effort to promote R language in colleges all over India. We help you migrate your proprietary software based labs to R. If interested, please write to us at contact-r@fossee.in

**Textbook Companion Project:** The Textbook Companion Project (TBC) aims to port solved examples from standard textbooks using R. Any standard textbook can be used for this purpose. The completed TBCs can be accessed here.

## 5. Teaching faculty

- **Prof. Radhendushka Srivastava,** Department of Mathematics, IIT Bombay
- **Prof. Kannan M. Moudgalya**, Department of Chemical Engineering
- FOSSEE and Spoken Tutorial Teams, IIT Bombay

## 6. Course Fee

Every participant has to pay Rs. **100** as the course fee to IIT Bombay at the time of online registration. On the day of the workshop, i.e., **on 09 November 2019**, they have to pay Rs. **400** to the Remote Centre that they would be attending, to defray the cost of organising the workshop, lunch, and coffee/tea. Please note that the registration fee once paid is neither refundable nor adjustable under any circumstances.

## 7. Who should attend?

As this workshop is not subject-specific, teaching faculty from all colleges (engineering, sciences, arts, commerce, management, law, medicine, etc.), polytechnic colleges, ITIs, and schools, can attend. Teachers registered in any Masters programme, and also all Research Scholars can also participate.

## 8. Duration and Venue

The workshop will be conducted on **Saturday, 09 November 2019 from 9.30 AM to 6.00 PM at select Remote Centres of IIT Bombay.** This workshop will be conducted through a blended mode, using both live video conferencing facility (A-VIEW) and hands-on sessions using Spoken Tutorials. A detailed workshop schedule will be available soon.

## 9. Participation Certificates

Participation certificates will be provided to all participants after successful completion of the workshop, in an electronic form.

## 10. Online Test and Certificates (Optional)

About one or two weeks after the workshop on 9 Nov. 2019 (the date to be announced), a free online test will be conducted remotely. Information will be sent through email to registered email addresses, along with required links. All participants can take this test from their own locations - there is NO need to go to Remote Centres to participate in this test. The duration of the test will be less than one hour (about 30 to 45 minutes). It will have MCQ, simple calculations, and simple programming type questions using R. One can do the calculations on R, and answer the questions. There will be NO descriptive questions.

## 11. How to apply?

Enrollment will be strictly online, and no other mode of application will be entertained. **The last date of registration is 08 November 2019, 12.30 pm**. The URL for registration is: http://www.it.iitb.ac.in/nmeict/announcements.html

**Register on the Spoken Tutorial Website:**

1. Before the workshop, participants should register on https://spoken-tutorial.org/
2. Fill up the registration form and submit.
3. An email will be received.
4. The account should be activated by clicking the link in the email.
5. The Username and Password should be noted. This is an extremely important step.
6. One needs the above information to post questions on the forum, which will be explained at the time of the workshop.

**Note**

- Neither IIT Bombay nor the Remote Centre will bear the travel expenses of the participating representatives. There shall also be no accommodation provided to the participants.
- All participants are required to bring **earphones**, as they will have to listen to video tutorials. Without earphones, the workshop will not at all be effective.
- Computers to practise Spoken Tutorials and to learn R language will be available at Remote Centres. But if they wish, participants can bring their own laptops.

## 12. Address for communication

Dr. Kalpana Kannan
Project Coordinator, ESOS Project
Department of CSE, Kanwal Rekhi Building
Indian Institute of Technology Bombay
Mumbai - 400 076
Tel.: +91-22-2576 4989 Email: eoutreach@it.iitb.ac.in

---

**One day Workshop**
**on**

# R

Under the aegis of the
Pandit Madan Mohan Malaviya
National Mission on Teachers and Teaching,
MHRD, Govt. of India

on

## 09 November 2019

Conducted by the
Teaching Learning Centre (ICT),
Supported by FOSSEE & Spoken Tutorials
at
**IIT Bombay**



### R- Course Instructor

**Prof. Radhendushka Srivastava**
Department of Mathematics
**Indian Institute of Technology Bombay**

### Project Coordinator

**Prof. Kannan M. Moudgalya**
Department of Chemical Engineering
**Indian Institute of Technology Bombay**
Powai, Mumbai 400076