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FOSSEE News

http://fossee.in

EDITOR OF THIS ISSUE
Prof. Prabhu Ramachandran
IIT Bombay

The focus of this issue is on

Python

CONTENTS

Funded by the National Mission on Education through ICT, MHRD, Govt. of India.

The FOSSEE (Free and Open Source Software for Education) project (*http://fossee.in*) based at IIT Bombay is funded by the Ministry of Human Resource Development (MHRD *http://mhrd.gov.in*). The main objective of this project is to promote the use of Free and Open Source Software (FOSS) in educational institutions and encourage them to start using FOSS in academics. It may be noted that the Government of India (GoI) has also been recommending the use of open source software technologies in the e Governance domain within the country. [1]

Most colleges in India unnecessarily purchase proprietary software and their licenses when the same functionality is available for free through open source software. Furthermore, these proprietary tools are often expensive and do not allow free usage outside academia. Most importantly, users do not have the liberty to customize the code. One of the reasons why institutions do not use FOSS is the lack of awareness about the existence of FOSS tools and the lack of knowledge of how these tools work.

The FOSSEE project focuses on training students as well as teachers to use FOSS and also works towards development and promotion of open source software. The major aim of this project is to help academic institutions to replace commercial/proprietary tools with inexpensive open source alternatives which will allow colleges to invest more in other avenues such as infrastructure and research. To this end, FOSSEE promotes several different FOSS packages such as Python, Scilab, DWSIM, OpenFOAM, Osdag, OpenModelica, Xcos and eSim.

The FOSSEE Python group aims to spread the adoption of the Python programming language in education. Python is a free and versatile programming language. It has an extensive library of packages that allow users to solve a variety of problems. In particular, Python has a rich ecosystem of libraries and tools for scientific computing and data science. There are libraries that provide a powerful interactive computing environment both on the console as well as on a web browser. It is relatively easy to interface Python with other well established languages like FORTRAN and C/C++. There are libraries that make it possible to utilize modern general purpose Graphics Processing Unit (GPGPU) devices as well. These features make it an excellent alternative to numerical languages like Matlab. In addition to this, Python also has libraries to build user interfaces, web applications, interface to hardware and a whole host of other domains. This makes Python an excellent language to learn, opening up a world of possibilities to users who desire to use their computers more effectively.

In addition to this enormous power, Python is easily readable and relatively easy to learn. This has made most top universities in the United States [2] and other countries switch to Python as the first language taught to students [3][4].

Outside the academic domain, most companies use Python extensively. It is therefore important that more students and teachers in India learn to use Python effectively.

Learning Python with FOSSEE

FOSSEE has made available several resources that make it simple to learn Python. For this purpose, the team carries out many interesting activities such as:

- Remote assisted Python workshops
- Over 35 spoken tutorials on Python for introductory scientific computing
- Creation of Python based Textbook Companions (TBC)
- Development of an online testing tool called Yaksh
- FOSSEE forums to answer users' queries

Remote assisted Python Workshops

The FOSSEE team offers remote assisted, interactive Python workshops for students and teachers of various science and engineering colleges. These workshops are designed, developed and presented by Prof. Prabhu Ramachandran and his team at IIT Bombay. A series of quizzes and practice sessions integrated with these workshops allow participants to gain hands on experience in Python programming. Apart from providing a solid foundation in basic Python, these workshops also provide the following features:

- Hands on workshop, well suited for all engineering branches
- Flexible workshop schedule
- Live video/chat assistance from FOSSEE's Python experts
- Integrated online programming evaluation interface (Yaksh) this platform provides interactive feedback, making it fun to program

On clearing the assignments, participants are awarded with graded certificates. Coordinators from the institutes organizing the workshop also receive a certificate of appreciation. Currently, FOSSEE offers remote assisted workshops in two formats.

I. Introduction to Scientific Computing using Python (ISCP)

ISCP is a 1 day workshop designed for students and faculty from any branch of Engineering/Sciences. The topics covered during an ISCP workshop include the use of Python for basic numerical computing, plotting and writing simple Python programs. The workshop content also emphasises the usage of IPython console and Jupyter notebooks. This format has witnessed an overwhelming response from participants from various educational institutes across India [Testimonials]. Owing to this success, the FOSSEE team has recently started detailed 3 day workshop titled "Basic Programming using Python".

II. Basic Programming using Python

This is a 3 day workshop on basic Python programming, which covers all the topics required by a beginner to explore and step into the world of Python. In addition to the topics covered in 1 Day ISCP, this workshop largely includes the following topics:

- Basic Data Types
- Control Flow
- Core Data Structures
- Functions
- Files
- Modules
- Exceptions

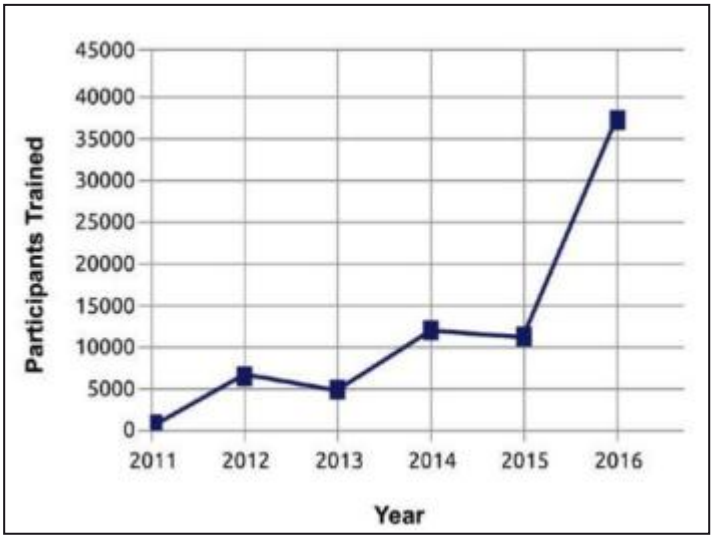
Many institutes have conveyed their interest in taking up advanced workshops for Python with FOSSEE due to the practical exposure that is provided to participants. Institutes have also expressed their wish to utilize the workshop content in their curriculum. For more details regarding the workshops, visit: *http://python.fossee.in/python workshops/*

Learning Python through Spoken Tutorials

A Spoken Tutorial (ST) is a 10 minute audio video tutorial created through a screencast methodology. The FOSSEE Python team has created Python Spoken tutorials for self learning and these tutorials are available at: *http://spoken tutorial.org*

While practising a particular spoken tutorial, a learner can clarify his/her doubts with regard to a spoken tutorial by posting the query on the Spoken Tutorial Forum *http://forums.spoken tutorial.org.* These queries are clarified by Python experts from FOSSEE. In case there are general queries on Python, but not related to Spoken Tutorials, one can post them on the FOSSEE Forum, at: *http://forums.fossee.in*

More than 1 lakh students and teachers have been trained using the Python Spoken Tutorials since 2011, as shown below:



Python Workshop Statistics

Textbook Companions (TBCs)

A significant issue with the acceptance of open source software on a large scale by academia is the lack of documentation. We have proposed and implemented a novel approach to solve this problem through the use of Textbook Companions (TBC).

We have a substantial number of students in India who are in college. If we can encourage them to create documentation, we can surely enhance the accessibility of all open source software. Unfortunately, not many students realize the importance of documentation and do not contribute to this important task. Contributing good quality documentation requires patience and maturity. We addressed both these by asking students to write code for the solved problems of standard engineering and science textbooks. This documentation is termed as TBC, which is a collection of various FOSS code of solved examples from standard engineering and science textbooks. These codes have been contributed by students and faculty from all over India. There is no violation of copyright as nothing from the book is reproduced. Here, the need for the textbook is always felt as one has to view the underlying example to understand the code available in the TBC.

As the name suggests, TBC in literal terms is a companion that cannot replace the textbook but will serve as a great supplement.

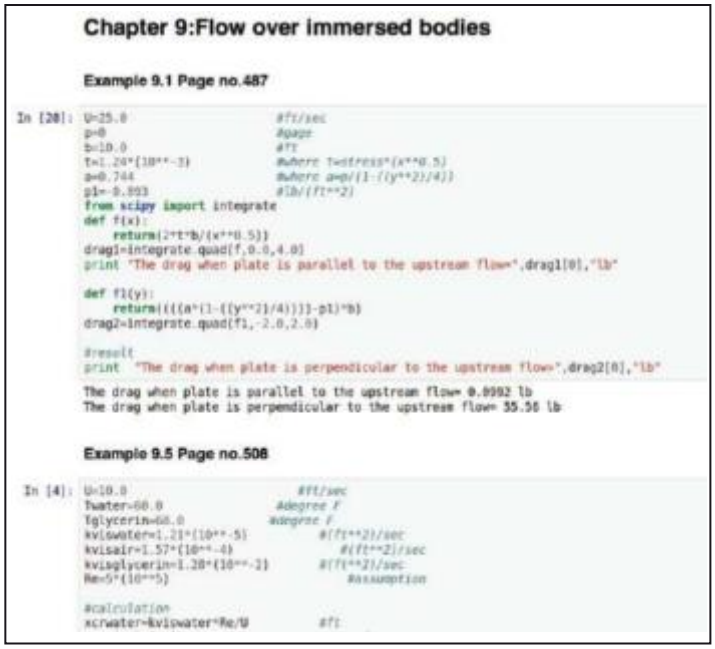
The Textbook Companion is available for free to download, modify and experiment based on the requirement of its users thereby giving maximum freedom to its users. TBCs are available for many of our FOSSEE projects like Scilab, OpenFOAM, DWSIM and Python.

Python Textbook Companions

The Python TBC is a repository of solved examples from standard Engineering and Science textbooks programmed using Python. The following features make Python TBC a very useful learning resource for academics:

- More than 500 standard engineering textbooks now have TBCs available
- The solved examples are available in the form of Jupyter notebooks. There are over 4000 such notebooks available on our TBC site
- These notebooks can be explored online or downloaded for free
- The code available on TBC are categorised based on the textbooks
- These TBCs are mapped to the engineering curriculum in India so as to help students and faculty to enhance their learning/teaching experience

To know more, visit: *http://tbc python.fossee.in* and explore the books coded in Python



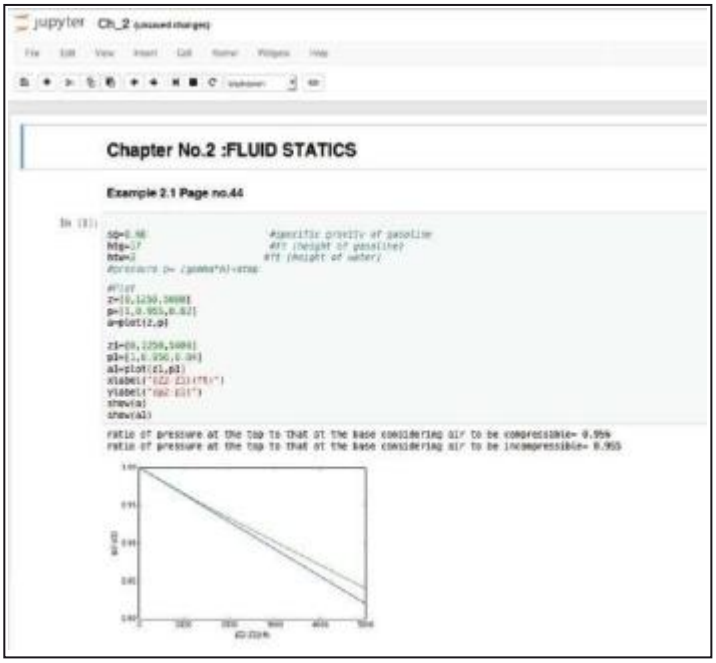
Python TBC Example 1

Benefits of using Python TBCs

- Learn Python through a practical approach
- Access large collection of Python code of solved examples
- Learn numerical and scientific computing
- Improve programming skills by contributing new TBCs

TBC Cloud Interface

The online Python TBC interface allows students to download the solved examples in the form of Jupyter notebooks. In addition, users can also execute and modify the existing examples online through a web browser. The infrastructure for this uses many tools provided by the open source Jupyter (*http://jupyter.org*) project. To access TBC code on Github, visit: *https://github.com/FOSSEE/Python Textbook Companions*



Python TBC Example 2

FOSSEE Forum

An Internet forum is an online discussion site for users to hold conversations in the form of posted messages. FOSSEE maintains a forum, where users can post their queries on various FOSS packages. It allows users to view all the previous questions addressed by our team. In fact, one can select the desired FOSS from the list provided on the forum and then post a query related to it. These queries are actively monitored and answered by our domain experts. To view FOSS related queries and post your own questions, visit: *http://forums.fossee.in/*

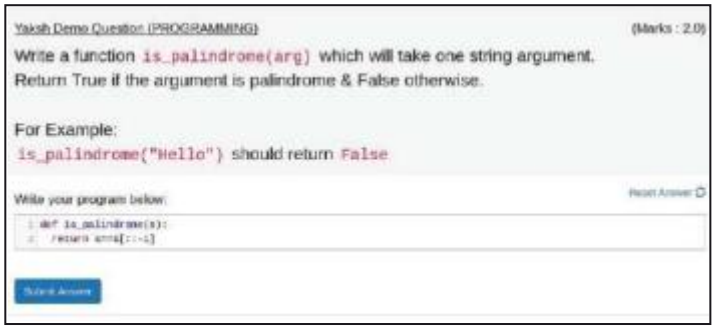
Yaksh Online Evaluation Interface

Yaksh is a real time, online evaluation interface that helps instructors assess the performance of their students. The platform can also be used to provide a practice environment for students to learn programming. Using Yaksh, one can create a question paper with multiple choice questions (MCQ), fill in the blanks and full fledged programming assignments.

Yaksh for instructors:

- Makes it easy to evaluate by allowing automatic grading of a large number of answer papers
- It provides a user friendly interface to monitor student performance. This can be used to help students who are doing poorly
- Tests can be conducted for hundreds of students simultaneously
- Supports major programming languages like Python, C, C++, Java, Bash and Scilab

Besides instructors, this interface is very useful for students as well.

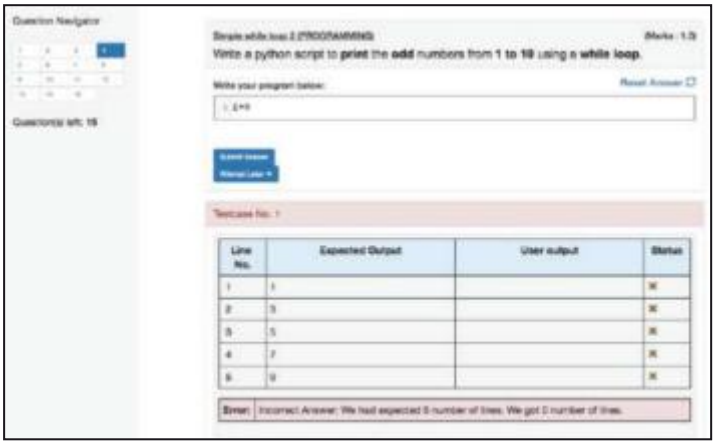


Interface for a programming question on Yaksh

Students get immediate feedback on any programming questions they answer. They can attempt such programming questions until they get it correct. This interactive approach makes it an effective learning tool. This approach of providing instant feedback makes the process lively for the student.

Since Yaksh is a free and open source project, under a BSD License, one can obtain the source code from Github and run an instance on one's own server.

One can find Yaksh at: *http://yaksh.fossee.in*



Yaksh Student Interface

SciPy India Conference

Scipy India is an annual conference providing opportunities to spread the use of the Python programming language in the scientific computing community in India. It provides an opportunity for those interested in Python to learn of new developments, talk about how they have used Python, meet other interested users/developers and get involved in the community.

FOSSEE's Python group has been organizing the SciPy India conference since 2009 in the month of December.

This conference witnesses a participation of about 200 250 people each year. A large number of the attendees are new to Python. The conference is typically well received and many people are aware of the SciPy community through these efforts. Each year a leading expert in the community is invited to keynote at the conference. Important members of the extended SciPy community from India and abroad have spoken at the conference.

The conference focuses on high quality tutorials for one or two days and a single day for the conference itself. For more details, visit: *https://scipy.in/2017*

Plans for the Future

The FOSSEE Python team aims to continue the creation of textbook companions and also promote its' use in academic institutions. The team intends to improve and upgrade the Yaksh online test interface in terms of scalability and effectiveness.

For beginners, a new series of Python Spoken Tutorials, covering a wide range of topics will be developed. In addition to this, all the existing tutorials will be updated, considering the latest version of the Software. A new series of tutorials on Django for beginners shall also be developed. The team will continue to conduct remote assisted workshops for institutes and colleges. It is also working closely with the IIT Bombay edX team to launch Python courses for individuals as well. Another important activity that will be undertaken is to assist schools in learning Python through faculty training programs followed by workshops for students.

To increase the acceptability of Python, the team is aiming at schools, in particular, the CBSE board curriculum. It is now evaluating the efforts involved in making a supplementary content for the existing Python syllabus in higher secondary.

Testimonials

"Looking forward towards another workshop from FOSSEE. The speakers were awesome and very helpful, especially Prof. Andreas, Prof. Prabhu Ramachandran. Tutorials were very refreshing and informative. Got a lot to learn & looking forward for more."

Arpit Nandi, DMCE (Mumbai, SciPy India 2015)

"I really liked the kind of content that was available in the workshop. The questions for the quiz were very good. Overall it was a perfect workshop."

Suvigya Agrawal, MIT, Udupi (Karnataka)

"The FOSSEE Textbook Companion Project has been a scintillating point in my career. It has been instrumental in fine tuning my programming and presentation skills. It provided an ideal forum for me to learn Python and contribute to the open source community. I learnt Python through online videos posted on YouTube and through exploration of the language..."

Abhiram Padu, Student, EEE PES University (Bangalore)

"I learnt Python from Spoken Tutorials available on the website. The Python TBC team also helped me a lot in starting my internship. Till now, I have completed 3 TBCs and now ..."

Deepak Shakya, Student, CE, DCRUST (Haryana)

More testimonials can be found at: *http://python.fossee.in/testimonials/1/*

References:

[1] **Policy on Adoption of Open Source Software for Government of India:** *http://meity.gov.in/sites/upload_files/dit/files/policy_on_adotion_of_oss.pdf*

[2] **Python is Now the Most Popular Introductory Teaching Language at Top U.S. Universities:** *https://cacm.acm.org/blogs/blog cacm/176450 python is now the most popular introductory teaching language at top u s universities/fulltext*

[3] **The incredible Growth of Python:** *https://stackoverflow.blog/2017/09/06/incredible growth python/*

[4] **Why is Python growing so quickly:** *https://stackoverflow.blog/2017/09/14/python growing quickly/*

FOSSEE Project, IIT Bombay,
Powai, Mumbai 400076

For any queries or assistance in specific areas contact at:

General queries: **info@fossee.in**
TBC: **textbook@fossee.in**
Workshop: **workshops@fossee.in**
Career: **jobs@fossee.in**

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