Department of Mathematics (PG)

Value-Added Course

VACMASS22 - LEARNING OPEN-SOURCE SIMULATION SOFTWARE – SCILAB

Code	Title of The Paper	Hours
VACMASS22	Learning Open-Source Simulation Software - SCILAB	30

Course Objectives

1. To introduce *SCILAB* which is a free open-source scientific software package alternative to MATLAB.
2. To know the benefits of SCILAB.
3. To develop the knowledge for solving numerical problems through *SCILAB.*
4. To learn the SCILAB tool XCOS which is a graphical editor to design hybrid dynamical systems models.
5. To acquire knowledge to use *SCILAB* software package in a Signal Processing and Python context.

Course Learning Outcomes

The Learners will be able to

1. Understand and apply SCILAB as computational tool.
2. Perform mathematical Modelling in SCILAB.
3. Develop programs in SCILAB.
4. Evaluate, analyze and plot results using SCILAB.
5. Solve Non-linear, linear equations and ODE using SCILAB.
6. Understand the concepts of DSP and Python with SCILAB programs.
7. Develop SCILAB Toolbox for calling functions.

Course Syllabus

Unit I: Introduction to SCILAB

Introduction to SCILAB and its benefits – Self-learning - The amazing resource of SCILAB Textbook Companion - SCILAB Lab migration, Toolboxes, and Forums - Installing – Expressions - Vector Operations - Matrix Operations - Conditional Branching - Iteration - Scripts and Functions. **(6 Hrs.)**

Unit II: 2D Visualization and Introduction to SCILAB XCOS

Plotting 2D graphs - XCOS Introduction - File handling - User Defined Input and Output - Integration - Solving Non-linear Equations. **(6 Hrs.)**

Unit III: Solving Linear Equations and ODE using SCILAB

Linear equations Gaussian Methods - Linear equations Iterative Methods - Interpolation - ODE Euler methods - ODE Applications - Optimization Using Karmarkar Function. **(6 Hrs.)**

Unit IV: Signal Processing with SCILAB

Digital Signal Processing - Control systems - Discrete systems - Calling User Defined Functions in XCOS - Simulating a PID controller using XCOS - Developing SCILAB Toolbox for calling external C libraries. **(6 Hrs.)**

Unit V: Python Interaction Mechanism in SCILAB

Developing SCILAB Toolbox for calling Python and its functions - Interactive Simulation in XCOS using the slider - User-defined variables in XCOS - Loading and saving data in XCOS - Conditional operations in XCOS - Super Blocks in XCOS**.** **(6 Hrs.)**

Course Content: E-Resources

1. https://spoken-tutorial.org/watch/Scilab/Introduction+to+Scilab+and+its+benefits/English/
2. https://spoken-tutorial.org/watch/Scilab/Self+learning+of+Scilab+through+Spoken+Tutorials/English/
3. https://spoken-tutorial.org/watch/Scilab/The+amazing+resource+of+Scilab+Textbook+Companion/English/
4. https://spoken-tutorial.org/watch/Scilab/Scilab+Lab+migration,+Toolboxes+and+Forums/English/
5. https://spoken-tutorial.org/watch/Scilab/Installing/English/
6. https://spoken-tutorial.org/watch/Scilab/Getting+Started/English/
7. https://spoken-tutorial.org/watch/Scilab/Vector+Operations/English/
8. https://spoken-tutorial.org/watch/Scilab/Matrix+Operations/English/

9. https://spoken-tutorial.org/watch/Scilab/Conditional+Branching/English/
10. https://spoken-tutorial.org/watch/Scilab/Iteration/English/
11. https://spoken-tutorial.org/watch/Scilab/Scripts+and+Functions/English/
12. https://spoken-tutorial.org/watch/Scilab/Plotting+2D+graphs/English/
13. https://spoken-tutorial.org/watch/Scilab/Xcos+Introduction/English/
14. https://spoken-tutorial.org/watch/Scilab/File+handling/English/
15. https://spoken-tutorial.org/watch/Scilab/User+Defined+Input+and+Output/English/
16. https://spoken-tutorial.org/watch/Scilab/Integration/English/
17. https://spoken-tutorial.org/watch/Scilab/Solving+Non+linear+Equations/English/
18. https://spoken-tutorial.org/watch/Scilab/Linear+equations+Gaussian+Methods/English/
19. https://spoken-tutorial.org/watch/Scilab/Linear+equations+Iterative+Methods/English/
20. https://spoken-tutorial.org/watch/Scilab/Interpolation/English/
21. https://spoken-tutorial.org/watch/Scilab/ODE+Euler+methods/English/
22. https://spoken-tutorial.org/watch/Scilab/ODE+Applications/English/
23. https://spoken-tutorial.org/watch/Scilab/Optimization+Using+Karmarkar+Function/English/
24. https://spoken-tutorial.org/watch/Scilab/Digital+Signal+Processing/English/
25. https://spoken-tutorial.org/watch/Scilab/Control+systems/English/
26. https://spoken-tutorial.org/watch/Scilab/Discrete+systems/English/
27. https://spoken-tutorial.org/watch/Scilab/Calling+User+Defined+Functions+in+XCOS/English/
28. https://spoken-tutorial.org/watch/Scilab/Simulating+a+PID+controller+using+XCOS/English/
29. https://spoken-tutorial.org/watch/Scilab/Developing+Scilab+Toolbox+for+calling+external+C+libraries/English/

30. https://spoken-tutorial.org/watch/Scilab/Developing+Scilab+Toolbox+for+calling+Python+and+its+functions/English/

31. https://spoken-tutorial.org/watch/Scilab/Interactive+Simulation+in+Xcos+using+slider/English/

32. https://spoken-tutorial.org/watch/Scilab/User-defined+variables+in+Xcos/English/

33. https://spoken-tutorial.org/watch/Scilab/Loading+and+saving+data+in+Xcos/English/

34. https://spoken-tutorial.org/watch/Scilab/Conditional+operations+in+Xcos/English/

35. https://spoken-tutorial.org/watch/Scilab/Super+Blocks+in+Xcos/English/

Learning Methodology:

- Audio-Video tutorial of STP-IIT Bombay.
- Self-paced, E-learning method.

Assessment Method:

The Value-added course certificate of Auxilium College will be given to the students who receive the Certificate for Completion of Training from Spoken Tutorial-IIT Bombay (Spoken Tutorial Project (STP) is a project of the National Mission on Education through Information and Communication Technology (NMEICT) funded by the Ministry of Education (MoE), Govt. of India. It is endorsed by AICTE and UGC, and also comes under Pandit Madan Mohan Malviya National Mission on Teachers and Teaching (PMMMNMTT) and the Swayam Platform).

The pass percentage for the Online test conducted by Spoken Tutorial is 40%.