

Semester	Course Code	Title of the Course
Odd	VACMASS24	Learning Open-Source Simulation Software - SCILAB

ODD SEMESTER

Value-Added Course on “Learning Open-Source Simulation Software – SCILAB” (Course Code: VACMASS24)

Course Objectives

1. To introduce SCILAB, 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, a graphical editor, to design hybrid dynamical systems models.
5. To acquire knowledge to use the SCILAB software package in a Signal Processing and Python context.

Course Outcomes (CO)

The Learners will be able to

1. Understand and apply SCILAB as a 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

(6 hours)

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.

Unit II: 2D Visualization and Introduction to SCILAB XCOS

(6 hours)

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

Unit III: Solving Linear Equations and ODE using SCILAB (6 hours)

Linear equations Gaussian Methods - Linear equations Iterative Methods - Interpolation - ODE Euler methods - ODE Applications - Optimization Using Karmarkar Function.

Unit IV: Signal Processing with SCILAB (6 hours)

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.

Unit V: Python Interaction Mechanism in SCILAB (6 hours)

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.

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/>

Teaching Methodology:

- Audio-Video tutorial of STP-IIT Bombay.
- Experiential Learning.
- Hands-on Training.

Assessment Methods

- 35 Quizzes conducted through Google form. Marks converted to 25 marks
- Online test conducted by Spoken Tutorial, IIT Bombay. The pass percentage is 40%. Marks converted to 25 marks.
- Finally, 50 marks are converted to 100 marks.

Duration: 30 Hours