

Fundamentals of Programming and Data Structure (IT403N)

Alternate name: *Computer skills before and beyond programming*

Synopsis: This course aims at developing/ recapitulating essential computer-related skills which serve the following goals

1. As a primer to those planning to learn programming but have no background of computers
2. As a companion for those who intend to run, manage and administer their computing resources such as PC, workstation or a server.
3. As a supplement to those who program in one language but need support on overall administration of software and understand inter-operability, scheduling and related tasks.
4. As a higher level analysis of programming languages highlighting how they compare in terms of resource management, compilation, running and inter-connecting with each other.
5. As a guide to recent development in computing practices such as cloud computing so as to enable users to take right decisions on their programming and development practices.

Syllabus (except part 1 and 2, all tasks will assume a Linux Operating system):

1. Basics of Operating systems. Windows. Unix, Linux operating systems and their inter-operability
2. Command line operations in windows. Basic commands in windows OS. Creating command scripts in windows.
3. Text editors in windows and Linux environment. WYSIWIG and WYSWYM editors. Notepad, textedit, vi, emacs, gedit. Other GNU tools.
4. Linux programming. UNIX shells. C shell, bash and bash scripting. Awk scripting.
5. Linux systems administration. Job scheduling, process management. Network configuration, user privileges.
6. Basics of C programs, GCC: compilation and debugging. Installation and sharing software, special reference to C programs.
7. Integrated Development Environments (IDEs). Eclipse and other IDEs with special applications.
8. Understanding Web based systems. Client-server models and web servers. Essentials ideas of HTML, XML, CSS and higher level web based contents.
9. Essential ideas of parallel programming. Multithreading and multi-tasking. Message passing interface (MPI) concept. Shared and distributed memory. Cloud computing with reference to Google cloud.
10. Job queues and job management systems. Portable batch system (PBS) and torque.
11. Remote access essentials. SSH, Teamviewer and Anydesk
12. Programming languages. Low and high level languages. Scripting, compilation and running programs. Configuring and porting programs. Objects oriented, functional and structured languages. Best programming practices and common elements across programming languages. Code optimization. Makefile and related software management.

Selected Web References:

1. <https://www.guru99.com/operating-system-tutorial.html>
2. <https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/>
3. Microsoft official documentation for windows commands.

<https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/cmd>

4. GNU and Open source foundation tools: www.gnu.org
5. Bash scripting: <https://linuxconfig.org/bash-scripting-tutorial-for-beginners>
6. Linux system administration: <https://tldp.org/LDP/sag/html/index.html>
7. C-programing: <https://www.freecodecamp.org/news/the-c-beginners-handbook/>
8. IDEs: https://en.wikipedia.org/wiki/Comparison_of_integrated_development_environments
9. Eclipse IDE: <https://help.eclipse.org/2020-12/index.jsp>
10. Web design and programming: <https://www.w3schools.com/>
11. Parallel programming (basics): <https://hpc.llnl.gov/training/tutorials/introduction-parallel-computing-tutorial>
12. Parallel programming (advanced): <https://www.mpi-forum.org/docs/>
13. Programming languages: <https://www.computerscience.org/resources/computer-programming-languages/>
14. Secure Shell (SSH): <https://www.ssh.com/ssh/protocol/>
15. Teamviewer: <https://www.teamviewer.com/en-us/documents/>
16. AnyDesk: <https://download.anydesk.com/docs/AnyDesk-UserManual.pdf>
17. Job queuing and management: <https://developer.nvidia.com/adaptive-computing-torque-resource-manager>
18. https://en.wikipedia.org/wiki/Programming_language
19. Makefiles: <http://www.gnu.org/software/make/manual/make.html>