**BASH PROGRAMMING:**

**What is a Shell?** (**Shell Programming in Unix, Linux and OS X)**

What Is the Shell?

The Kernel and the Utilities

The Login Shell

Typing Commands to the Shell

The Shell’s Responsibilities

Program Execution

Variable and Filename Substitution

I/O Redirection

Hooking up a Pipeline

Environment Control

Interpreted Programming Language

**Shell Configuration**

Shell initialization files

System-wide configuration files

Individual user configuration files

Changing shell configuration files

Variables

Types of variables

Creating variables

Exporting variables

Reserved variables

Special parameters

Quoting characters

Escape characters

Single quotes

Double quotes

ANSI-C quoting

Locales

Shell expansion

Brace expansion

Tilde expansion

Shell parameter and variable expansion

Command substitution

Arithmetic expansion

Process substitution

Word splitting

File name expansion

Aliases

More Bash options

**Conditional flows:**

Exit Status

The $? Variable

The test Command

String Operators

An Alternative Format for test

Integer Operators

File Operators

The Logical Negation Operator !

The Logical AND Operator -a

Parentheses

The Logical OR Operator -o

The else Construct

The exit Command

The elif Construct

The case Command

Special Pattern-Matching Characters

**Loops:**

for loop  
The for Command   
The $@ Variable

The for Without the List

The while Command

The until Command

More on Loops

Breaking Out of a Loop

Skipping the Remaining Commands in a Loop

Executing a Loop in the Background

I/O Redirection on a Loop

Piping Data into and out of a Loop

Typing a Loop on One Line

The getopts Command

**Functions**

Returning a Value  
Using Variables in Functions  
Array Variables and Functions  
Function Recursion  
Creating a Library  
Using Functions on the Command Line

**Arrays:**

Using an Array   
Two-Dimensional Grids  
Working with Single-String Grids  
Two-Dimensional Grids Using Arrays

**Shell Environment>**

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Subshells   
Exported Variables   
export -p   
PS1 and PS2   
HOME   
PATH   
Your Current Directory   
CDPATH   
More on Subshells   
The .Command   
The exec Command   
The (...) and { ...; } Constructs   
Another Way to Pass Variables to a Subshell   
Your .profile File The TERM Variable   
The TZ Variable

**Text Manipulation**

Text filtering tools   
Head and tail   
The diff command   
The cut command   
The paste command   
The join command   
The uniq commandThe comm command   
The tr command   
IO redirection   
File descriptors   
Redirection   
Brace expansion   
Pattern matching with the vi editor  
Sed  
Awk

**Working with Files (Shell Programming in Unix, Linux and OS X)**

Listing Files: The ls Command   
Displaying the Contents of a File: The cat Command   
Counting the Number of Words in a File: The wc Command   
Command Options   
Making a Copy of a File: The cp Command   
Renaming a File: The mv Command   
Removing a File: The rm Command   
Working with Directories   
The Home Directory and Pathnames   
Displaying Your Working Directory: The pwd Command   
Changing Directories: The cd Command   
More on the ls Command   
Creating a Directory: The mkdir Command   
Copying a File from One Directory to Another   
Moving Files Between Directories   
Linking Files: The ln Command   
Removing a Directory: The rmdir Command   
Filename Substitution   
The Asterisk   
Matching Single Characters   
Filename Nuances   
Spaces in Filenames   
Other Weird Characters

**Shell Arithmetic**

Floating-Point Math and the bc Utility   
Creating Some Shell Scripts Using bc   
Testing for Integers and Floating-Point Numbers   
Building a Math Statement for the bc Command   
Using a Here Document   
Using getopts to Parse the Command Line   
Building a Math Statement String for bc   
Here Document and Presenting the Result   
Parsing the Command Line for Valid Numbers

**Regular Expressions**

What are regular expressions  
metacharacthers  
pattern matching  
regular expressions and grep  
Pattern matching using Bash features

**Job Control commands**

cron service  
Crontab Syntax and Operators  
Linux Crontab Command

**Data Processing**

What Is a Record File?  
Processing the Record Files  
merge, split, filter record files