



Lab Manual

for

Computing Fundamentals

1008

Diploma In Computer Engineering

Ist Semester

By

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GENERAL INSTRUCTIONS

Rough record and Fair record are needed to record the experiments conducted in the laboratory. Rough records are needed to be certified immediately on completion of the experiment. Fair records are due at the beginning of the next lab period. Fair records must be submitted as neat, legible, and complete.

INSTRUCTIONS TO STUDENTS FOR WRITING THE FAIR RECORD

In the fair record, the index page should be filled properly by writing the corresponding experiment number, experiment name, date on which it was done and the page number.

On the **right side** page of the record following has to be written:

1. **Title:** The title of the experiment should be written in the page in capital letters.
2. In the left top margin, experiment number and date should be written.
3. **Aim:** The purpose of the experiment should be written clearly.
4. **Apparatus/Tools/Equipments/Components used:** A list of the Apparatus/Tools /Equipments /Components used for doing the experiment should be entered.
5. **Principle:** Simple working of the circuit/experimental set up/algorithm should be written.
6. **Procedure:** steps for doing the experiment and recording the readings should be briefly described (flow chart/programs in the case of computer/processor related experiments)
7. **Results:** The results of the experiment must be summarized in writing and should be fulfilling the aim.
8. **Inference :** Inference from the results is to be mentioned.

On the **Left side** page of the record following has to be recorded:

1. **Circuit/Program:** Neatly drawn circuit diagrams/experimental set up.
2. **Design:** The design of the circuit/experimental set up for selecting the components should be clearly shown if necessary.
3. **Observations:** i) Data should be clearly recorded using Tabular Columns.
ii) Unit of the observed data should be clearly mentioned
iii) Relevant calculations should be shown. If repetitive calculations are needed, only show a sample calculation and summarize the others in a table.
4. **Graphs :** Graphs can be used to present data in a form that shows the results obtained, as one or more of the parameters are varied. A graph has the advantage of presenting large



mounts of data in a concise visual form. Graph should be in a square format

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GENERAL RULES FOR PERSONAL SAFETY

1. Always wear tight shirt/lab coat , pants and shoes inside workshops.
2. REMOVE ALL METAL JEWELLERY since rings, wrist watches or bands, necklaces, etc. make excellent electrodes in the event of accidental contact with electric power sources.
3. DO NOT MAKE CIRCUIT CHANGES without turning off the power.
4. Make sure that equipment working on electrical power are grounded properly.
5. Avoid standing on metal surfaces or wet concrete. Keep your shoes dry.
6. Never handle electrical equipment with wet skin.
7. Hot soldering irons should be rested in its holder. Never leave a hot iron unattended.
8. Avoid use of loose clothing and hair near machines and avoid running around inside lab .

TO PROTECT EQUIPMENT AND MINIMIZE MAINTENANCE:

DO: 1. SET MULTIRANGE METERS to highest range before connecting to an unknown source.

2. INFORM YOUR INSTRUCTOR about faulty equipment so that it can be sent for repair.

DO NOT: 1. Do not MOVE EQUIPMENT around the room except under the supervision of an instructor.



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Experiment No. 1

Name of experiment: Familiarising with computer hardware and peripherals

Aim : To identify the internal and external hardware/peripheral components

Objectives: To identify about the internal and external components of PC and networking devices, connections, ports

Components: PC, printer, scanner, and other available devices and parts

Internal hardware components are motherboard, processor (with heat sink and fan), chipset, harddisk, CMOS, RAM, SMPS, LAN card and other cards etc

External devices are speakers, USB HDD, USB DVD R/W, pen drive, printer, scanner, projector, network devices etc.

Tools: Star screw driver, Dust Blower

Theory:

Processor: It is the main execution component.

System on Chip (SoC) type processors contains control unit, ALU and Cache memory.

Intel is the largest processor manufacturer for Desktops and Servers, but not for smartphones. Qualcomm is major company for quadcore/octacore **Snapdragon** smartphone processors.

Intel Celeron G 470 is one of the cheapest processor. Intel **core series** is popular one. Core i5 and Core i7 are apt for graphic uses.

Motherboard: is the most important h/w component as all other components are connected to it and communicate through it. Intel makes the best motherboards, suitable for their processors.

Gigabyte and Asus also make low cost motherboard brands compatible for Intel and AMD processors. USB ports, graphics, sound, wifi, BT etc are intertated in motherboard.

Chipset: It is a set of electronic components in an integrated circuit that manages the data flow between the processor, memory and peripherals. It is usually found on the motherboard. Chipsets are usually designed to work with a specific family of microprocessors. Because it controls communications between the processor and external devices, the chipset plays a crucial role in determining system performance.

Harddisk:

It saves data and files permanently. Since it is a magnetic device, it is much slower than processor.

SSD (Solid state drive) is newly used storage for same purpose of HDD. SSD can also be used side by side with HDD. SSD don't need electric motor to rotate disks as it don't have disks or any moving mechanical parts as in HDD.

RAM:

Program and data has to be brought to RAM from HDD for execution.

It is mainly a semi conductor device (flip flops). So it has speed matching to that of Processor.

Size of the RAM decides speed of execution. The more the size, more data and program can placed in RAM and quickly delivered to processor.

Minimum RAM required is 2GB. 4GB is optimum and 8GB is recommended for highend graphics/games applications. Cost doubles or rather increases when size increases.



BIOS: It is a computer chip on the motherboard. This chip contains a special program that helps the computer processor to interact and control the other components like disc drives, video cards, sound cards, network cards, floppy drives, USB ports, hard drives, and others.

CMOS: It stores information about the computer components settings like system time, date and other configuration settings. 3Volt CR2032 is a specification. CMOS battery gives power to CMOS chip.

Procedure:

Dis-assemble a PC and physically demonstrate the internal components, connections, ports. Later re-assemble and confirm the physical connections. Its optional to demonstrate networking devices

Result:

Above parts are identified either directly or through web sources.



Experiment No. 2

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Name of experiment: Operating systems

Aim : To familiarise with Ubuntu Operating System

Objective: Learn haddisk partitioning, installation of OS, drivers, applications, shell commands

Equipments: PC, external DVD drive, flash drive

Theory :

An operating system is an intermediary between user and computer h/w.

OS has two parts, shell and kernel. Different types of OS are required for different systems viz desktop, real time, embedded, server, smartphone, workstations, mainframe, super computer systems

Procedure:

Demonstrate following steps.

Steps to Install Ubuntu OS:

Step 1: Download ubuntu iso image from <http://www.ubuntu.com/download/desktop>. Select 32 bit flavour if RAM size is less than 2GB or else select 64 bit

Step 2: Create a start up flash (pen) drive

Step 3: To make pen drive as startup disk, type “Startup disk creator” application by clicking on search icon on top and create startup disk (format if required)

Step 4: Insert the startup pen drive into a new computer to install Ubuntu

Step 3: Switch on the computer, after long beep, press the bios key (eg: F10 for HP) to enter setup

Step 4: Select Storage->boot order and set boot source priority to USB devices by pressing enter key on “USB Harddrive” boot option and bring it to upwards by “up arrow” key , then save it and then exit

Step 5: On exit, system will take us to installation

Step 6: Set time zone, admin name as “administrator” and type a password.

Step 7: click continue and wait for few minutes for installation to complete.

Steps for DVD as startup disk.

Step 1: Right click on the iso file and write it directly to a DVD

Step 2: Insert DVD into DVD drive

Step 3: Enter setup as above and set boot priority to optical disc and repeat steps from 6 to 7 as above

After installation, demonstrate shell commands like ls, cp, cat, mv, cd, pwd, man etc at Terminal

Using Ubuntu Software Center(app store), install applications like Chrome, okular, LaTeX etc.

Result: Familiarised with OS commands and installation



Experiment No. 3

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Name of experiment: CD writing

Aim : To write files to optical discs

Objective: To learn selecting files and write them to CD or DVD in various formats

Tools: Brasero disc burner

Components: Computer with CD-RW or DVD-RW. If not, external USB CD-RW or DVD-RW

Theory:

By default Brasero disc burner application comes with Ubuntu OS. Also search for other appropriate disc writing tool from Ubuntu Software center icon provided in desktop

Procedure:

Step 1: Select files that is to be written and group them in a folder

Step 2: Insert blank CD or DVD to the drive with writer

Step 3: Invoke Brasero disc burner or appropriate tool

Step 4: Select appropriate option (audio, video, data or disc copy) to make iso image

Step 5: Burn the iso image

Result: Burned the files to optical discs

Note:

1. iso images can be directly burned by right clicking on the image and select “write to disc” option

2. Its optional to freely download Ubuntu OS's iso image (desktop or server version) from URL <http://www.ubuntu.com> and burn it to a DVD (size>1.1GB, hence DVD)



Experiment No. 4

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Name of experiment : e-mail

Aim : To create an email id

Objective: To learn how to create an email id, send with attachment, reply, forward, cc, bcc, managing folders like inbox, sent, trash etc

Tools: Computer with internet connection, web browsers

Theory:

Email is the electronic version of the interoffice inter-organizational mail system that offers ability to manage mail electronically liker paper-based mail system. It is a method of exchanging digital messages from an author to one or more recipients. Email operates across the internet or other computer networks.

Procedure:

Step 1: Select an email provider (gmail, outlook, zoho, Mail, AOL, iCloud etc)

Step 2: Click sign-up as a new user

Step 3: Enter our details, password and verify the account

Step 4: Familiarize with options like **compose** to send a mail, inbox, sent mail, drafts etc

Step 5: Learn to attach files in our email

Step 6: Also create personalised folders in email

Step 7: Also try to save files in clouds like google drive

Result: Created a new email id and learned basic functions

Note:

1. Firefox web browser is available by default in Ubuntu. Google Chromium and Chrome web browser can be installed freely from Ubuntu Software center.
2. Google Drive is a file storage and synchronization service created by Google. It allows users to store files in the cloud, share files, and edit documents, spreadsheets, and presentations with collaborators. Google Drive encompasses Google Docs, Sheets, and Slides, an office suite that permits collaborative editing of documents, spreadsheets, presentations, drawings, forms, and more.



Experiment No. 5

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Name of experiment: word processor

Aim : Familiarisation with word processor by making own biodata with covering letter

Objective: To familiarise with features in menu like file, edit, Tools, format, converting from odt to doc, PDF etc

Tools: Libre Office Writer

Equipments: PC with Ubuntu OS

Theory:

LibreOffice Writer lets us to design and produce text documents that can include graphics, tables, or charts. We can then save the documents in a variety of formats, including the standardized OpenDocument format (ODF), Microsoft Word .doc format, or HTML. And we can easily export our document to the Portable Document Format (PDF)

LibreOffice Writer lets us to create both basic documents, such as memos, faxes, letters , resumes and merge documents, as well as long and complex or multi-part documents, complete with bibliographies, reference tables and indexes.

LibreOffice Writer also includes such useful features as a spellchecker, a thesaurus, AutoCorrect, and hyphenation as well as a variety of templates for almost every purpose. We can also create our own templates using the wizards.

Text documents in LibreOffice have an integrated calculation function that helps we to execute sophisticated calculations or logical links. We can easily create a table in a text document in order to perform calculations.

The drag-and-drop feature enables to work quickly and efficiently with text documents in LibreOffice.

Procedure:

1. Search web to select an appropriate model for biodata and covering letter
2. Prepare own biodata to apply for a position/job w.r.t selected course of study
3. Save the file either in open format(.odt) or Microsoft format(.doc). Normally “odt” isn't supported by paid platforms (eg: Windows). But Ubuntu supports their formats.
(“Format drop down” option is just above the “save” button in save window.)
4. Click on “save with password” check-box option, if needed. It is available on left bottom side in save window
5. Its optional to convert the file to Portable Document Format(File->Export as PDF), so that the file will be seen intact in all OS platforms. Also PDF is apt for printing.
6. Repeat the steps from 1 to 5 for creating a covering letter
7. Send files to the email of trainer (optional)

Result: Prepared biodata with covering letter

Note: Draw the created biodata on left side portion of experiment page. Its optional to have an Ubuntu PC with internet and a Printer compatible with Ubuntu.



Experiment No. 6

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Name of experiment: Presentation

Aim : To familiarise with presentation tool by making minimum 5 slides about own institution

Objective: To learn about presentation with transition and animations, insertion of scanned images and internet contents.

Theory:

Impress has a comprehensive range of easy-to-use drawing and diagramming Tools to add style and sophistication to your presentation. We can save even more time by downloading templates from the LibreOffice template repository.

Impress supports multiple monitors, and the standardly-incorporated Presenter Console Extension gives you yet more control over your slide show presentation, such as the ability to see the upcoming slide, view your slide notes, and control the presentation timer while the audience is looking at the current slide.

Create custom slide shows to meet the needs of our audience using slides within the current presentation.

Procedure:

1. Collect data and prepare slides
2. Save the file either in open format(.odp) or Microsoft format(.ppt). Normally “odp” isn't supported by paid platforms (eg: Windows). But Ubuntu supports their formats. (“Format drop down” option is just above the “save” button in save window.)
3. Click on “save with password” check-box option, if needed. It is available on left bottom side in save window
4. Its optional to convert the file to Portable Document Format (File->Export as PDF), so that the file will be seen intact in all OS platforms. Also PDF is apt for printing.
5. Also try saving the file in various other formats like XML or autoplay (“.pps”)
(Eg: File --> Save As Microsoft Powerpoint 97/2000/XP/2003 Autoplay and open it to get familiarize with the format)
6. Send files to the email of trainer (optional)

We can change the order of the slides in our custom slide show, by dragging and dropping the slides under Selected Slides.To start a custom slide show:

1. Choose Slide Show → Custom Slide Show.
2. Select the show we want to start from the list.
3. Click Start.

Result: Prepared a presentation about computing fundamentals lab and exported it to pdf using LibreOffice Impress

Exercises: Prepare presentation with minimum 5 slides about own institution, branch, subjects, scope of course, job options etc.

Browse internet about a topic and prepare presentation

Additional exercises may numbered 5-b, 5-c and so on



Experiment No. 7

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Name of experiment: Spreadsheet

Aim : To familiarise with spreadsheet by totaling marks of 3 or more subjects, then calculate percentage and hence find grade based on boundary conditions of few students

Grades S \geq 90%, A \geq 80%, B \geq 70%, C \geq 60%, D \geq 50%, E \geq 40%, F $<$ 40%

Objective: To familiarise with features in menu like file, edit, Tools, format, converting from ods to xls, PDF formats

Tools: Libre Office Calc

Equipments: PC with Ubuntu OS

Theory :

LibreOffice Calc is a spreadsheet application used to calculate, analyze, and manage our data. We can also import and modify Microsoft Excel spreadsheets. It provides functions, including statistical and banking functions, that we can use to create formulas to perform complex calculations on our data. Function Wizard to help we create our formulas. It let us to drag-and-drop tables from databases, form letters in LibreOffice Writer, Convert Excel files, or to open and save in a variety of other formats (eg: MS office).

Procedure:

1. Collect data and prepare sheets
2. Save the file either in open format(.ods) or Microsoft format(.xls). Normally “ods” isn't supported by paid platforms (eg: Windows). But Ubuntu supports almost all formats.
(“Format drop down” option is just above the “save” button in save window.)
3. Click on “save with password” check-box option, if needed. It is available on left bottom side in save window
4. Its optional to convert the file to Portable Document Format (File->Export as PDF), so that the file will be seen intact in all OS platforms. Also PDF is apt for printing.
5. Send files to the email of trainer (optional)

Result : Prepared spreadsheet and exported it to pdf

Note: Draw the created spreadsheet on left side portion of experiment page

Exercises:

4-b: Calculate net salary of few employees (manager, engineer, clerk) from gross pay and deductions (optional)

NS = GP – deductions

GP = BP+DA+HRA

deductions = PF + insurance + tax



Experiment No. 8

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Name of experiment: Average of three numbers

Aim : To learn basic python programing by finding average of 3 numbers

Objective: To learn simple python programming by finding average of 3 numbers

Algorithm:

```
a = 6
b = 7
c = 8
avg = (a+b+c)/3
print avg
```

Procedure:

Step 1: Click on search icon (topmost icon on leftside of Ubuntu desktop)

Step 2: Search “terminal” (type ter and click terminal icon)

Step 3: Type “python” in terminal

Step 4: Then type the program in the prompt >>> one by one and press enter

Step 5: press enter

Result:

Other Exercises:

8 – b: Area of triangle

8 – c: Volume of cylinder

8 – d: Temperature conversion, F to C

8 – e: Other known formulas like displacement, final velocity etc

Note:

Python is an interpreted, interactive, object-oriented programming language. It incorporates modules, exceptions, dynamic typing, very high level dynamic data types, and classes. It has interfaces to many system calls and libraries, as well as to various window systems, and is extensible in C or C++. It is also usable as an extension language for applications that need a programmable interface. Finally, Python is portable: it runs on many Unix variants, on the Mac, and on PCs under MS-DOS, Windows, Windows NT, and OS/2.



Experiment No. 9

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Name of experiment: Programs using selection

Aim: To learn selection structure by finding largest among two numbers

Objective: To learn about various if structures, (if-else, if-else if-else ladder, nested if, case) by implementing programs with selection

Algorithm:

```
Case 1: a>b
>>>a = 8
>>>b = 6
>>>if (a>b):
... print 'a is greater than b'
... else:
... print 'b is greater than a'
...
Case 2: a<b
Case 3: a=b
```

Procedure:

Step 1: Click on search icon

Step 2: Search “terminal” (type ter and click terminal icon)

Step 3: Type “python” in terminal

Step 4: Then type the program in the prompt >>> one by one and press enter

Step 5: Press enter

Result:

Other Exercises:

9 – b: Program to check whether a given number is odd or even

9 – c: Program to find roots of quadratic equation.

Case 1: Roots are different, case 2: Roots are equal, case: Roots are imaginary

9 – d: Program to print Character name of the day.



Experiment No. 10

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Name of experiment: Programs using loops

Aim: To learn repetition structure by printing natural numbers upto a limit

Objective: To learn about various loops like while, do-while, for.

Algorithm:

```
a=1
limit = 15
while(a<limit):
    print a
    a = a+1
```

Procedure:

Step 1: Click on search icon

Step 2: Search “terminal” (type ter and click terminal icon)

Step 3: Type “python” in terminal

Step 4: Then type the program in the prompt >>> one by one and press enter

Step 5: Press enter

Result:

Other Exercises:

10 – b: Program to find factorial of a number

Algorithm:

```
i =1
f = 1
while(i<=n):
    f = f * i
    i = i + 1
print f
```

10 – c: Program to find sum of digits of a number

Algorithm:

```
x=9847094465
sum=0
while(x>0):
    y = x % 10
    x = x / 10
    sum = sum + y

print sum
```

10 – d: Program to print multiplication table

10 – e: Program to find sum of a set of numbers

10 – f: Program to calculate of grade based on boundary conditions



Its optional to draw functional block diagram of computer and components. Also can learn about basic network components and converters. Network components are RJ45 jacks, router, switch(10/100/1000), BB modem, BB modem cum router, USB wifi adapter. Convertors are USB to ethernet adapter, USB to HDMI, USB to serial port, USB to parallel port etc

Processor: Itanium is a high-end processor jointly developed by **Intel and HP**, which is apt for servers , multiprocessor computers (super computers) and mainframes.

Apple's devices are expensive but efficient. Their h/w is made mainly to run in their own **Mac OS** as well as for Apple certified programs, whereas Intel and AMD can run any OS and s/w.

Apple Ax series SoC processors are A4, A5, A6, A7, A8, A9 etc.

Apple Sx series is used in Apple watch. It is SiP (Systems in Package), ie processor contains memory(RAM, ROM etc), storage (for purpose of HDD) and support processors for Wifi, sensors (GPS), I/O. All these in a single chip, so it is called SiP.

SSD is semiconductor device, so it has high speed compared to HDD, but are 6/7 times costlier than HDD. But 100GB storage space is enough for a desktop PC in this age of cloud computing(eg: Google drive) where data and files are stored in remote servers to escape from hacking, virus and hardware failure. An unexpected lightning will cause high voltage(KV) surge and computer will be down or HDD failure losing all datum. Also nowadays h/w parts won't last for years due to low cost manufacturing techniques followed due to heavy competition in sales.

Well, just 6.6GB is only required to install Ubuntu 14.04.5 LTS 64 bit and 6.5GB for 14.04.3 LTS 64bit.

Prepare following tables with recent specifications and prices on left side portion of experiment page.

Note: Approximate Prices as per year 2015

Processor

	Specification	Approx price
	Intel	
1	Celeron 470	2000
2	Dual Core 2030	3500
3	Core i3 3220	7000
4	Core i5 4440	12000
5	Core i7 4770	20000
	AMD (Advanced Micro Devices)	
1	AMD APU 4000	2000
2	AMD FX 6300	8000

Motherboard

	Specification	Approx price
	Motherboards supporting Intel processors	
1	Gigabyte H61 MS	2775
2	Asus H61 MCS	2900
3	Gigabyte H81 MS	2990
4	Asus H81 MCS	3300
	Motherboards supporting Intel i5/i7 processors	



1	Gigabyte H85 MD3H	5250
2	Gigabyte H97 MD3H	6700
3	Asus B 85 MK	5025
4	Asus H97 plus	8700
Motherboards supporting AMD processors		
1	Gigabyte AM1M	2000
2	Gigabyte F2A 58 MS1	2900
3	Asus M5 A97 LER2	4000
4	Gigabyte 990 XAUD3	10000

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RAM			HDD			SSD		
	SPECIFICATION	Approx Price		SPECIFICATION	Approx Price		SPECIFICATION	Approx Price
1	2GB	1000	1	500GB	3000	1	128GB	4400
2	4GB	1850	2	1 TB (1024GB)	3300	2	240 GB	6500
3	8GB	3650	3	2 TB	5250			

Other items:

	Specification	Approx price		Specification	Approx price
Keyboard + Mouse			LED Monitors		
1	USB	700	1	15.6" Acer	4150
2	Wireless	1200	2	18.5" Acer	5100
ATX cabinet + SMPS			3	18.5" Dell	5200
1	Zebronics	935	4	18.5" Samsung	5500
2	Mercury	990	5	20" Acer	5450
3	iBall	1425	6	20" Samsung	6000
4	Coolermaster	2000 - 3000	UPS 600VA 1500 to 3000		



Appendix B

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Its optional to Prepare tables with prices of various OS and important softwares with latest price and specification updates

Item	Approx cost (2015)
1 Windows 7 or 8.1 professional	Rs. 10000/-
2 Windows 7 Ultimate SP1 32bit	Rs. 16500/-
2 Windows 10 (64bit professional)	Rs. 12000/-
3 MS Office home&student	Rs. 6000/-
4.MS Office professional	Rs. 30,000/-
4 Ubuntu	Payment is optional
5 Libre Office	N A
6. Android OS	Free with device

Note:

Ubuntu Software Center from Ubuntu and canonical partners is a utility for installing, purchasing, and removing software in Ubuntu, a major part of Ubuntu's overall software handling. This document describes designers, developers, testers, and potential contributors how USC is supposed to work. The project is open source

Apple Macintosh is the first GUI based OS and MS Windows is the popular OS, but both are not FOSS(free and open source s/w) type. Linux OS is FOSS and famous for its server versions due to its security. Linux doesnot require antivirus s/w. Linux needs supervisor (admin) password for every s/w changes and hence malicious programs wont get installed easily.

Major Linux versions are Debian, Suse, redhat, mint etc. Ubuntu is an user friendly version of Debian. It comes with LibreOffice and Mozilla Firefox browser free by default. Through its S/w center, we can install a number of canonically approved s/w which are free from bugs and viruses. New Ubuntu versions are launched twice every year, in April and October. (Eg: Ubuntu 15.04 was launched in April 2015 and Ubuntu 15.10 was launched in October 2015). Ubuntu's last LTS version (long term support) was Ubuntu 14.04 and 12.04 was previous one. LTS versions will get support for few more years whereas other versions will give support only for few months after the launch next version. More info about ubuntu versions is at <https://wiki.ubuntu.com/Releases>

Popular touch device OS "Android" is with Linux kernel. It was result of an initiative to make an OS for digital cameras by Andy Rubin's Android Incorporation. Later Google bought Android Inc in 2005. At Google, a team led by **ANDy RubIn** developed ANDROID mobile device platform with Linux kernel for Open Handset Alliance (OHA).

On 5th Nov,2007, the Open Handset Alliance, a consortium of technology companies including Google, device manufacturers such as HTC, Sony and Samsung, wireless carriers such as Sprint Nextel and T-Mobile, and chipset makers such as Qualcomm and Texas Instruments, unveiled itself, with a goal to develop open standards for mobile devices. That day, Android was unveiled as its first product, a mobile device platform built on the Linux kernel. The first commercially available smart-phone running Android was the HTC Dream, released on 22nd Oct, 2008.

Since April 2009, Android versions have been developed under a confectionery-themed code name and released in alphabetical order, beginning with Android 1.5 "Cupcake"; the earlier versions 1.0 and 1.1 were not released under specific code names:

- Cupcake(1.5), Donut(1.6)
- Eclair(2.0–2.1), Froyo(2.2–2.2.3), Gingerbread(2.3–2.3.7)
- Honeycomb(3.0–3.2.6)
- Ice Cream Sandwich(4.0–4.0.4), Jelly Bean(4.1–4.3.1)
- KitKat(4.4–4.4.4, 4.4W–4.4W.2)
- Lollipop(5.0–5.1.1)
- Marshmallow(6.0–6.0.1)



Python Programming in Ubuntu Linux

Introduction

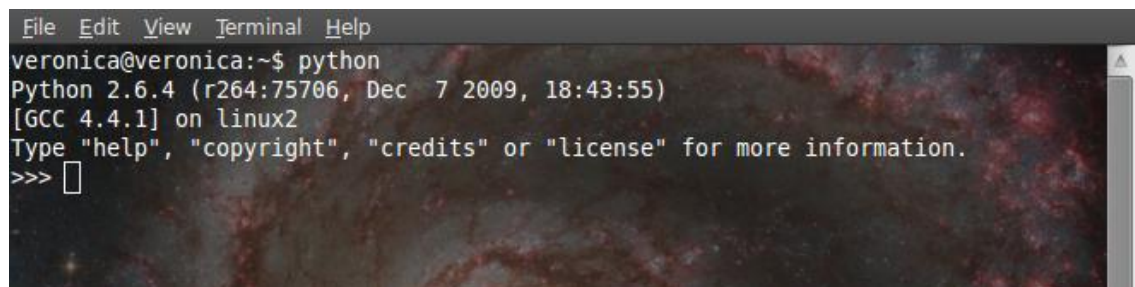
Python is one of the modern programming languages gaining importance in the development community. Python is a dynamic object-oriented programming (**OOP**) language that can be used for many kinds of software development. It was created by Guido von Rossum in 1990. Like Java, once written, programs can be run on any operating system..

Python Installation

Ubuntu makes starting easy, as it comes with a command line version pre-installed. In fact, the Ubuntu community develops many of its scripts and Tools under Python. We can begin the process with either the command line version or the graphical Interactive Development Environment (IDLE).

Python Programming From the Command Line

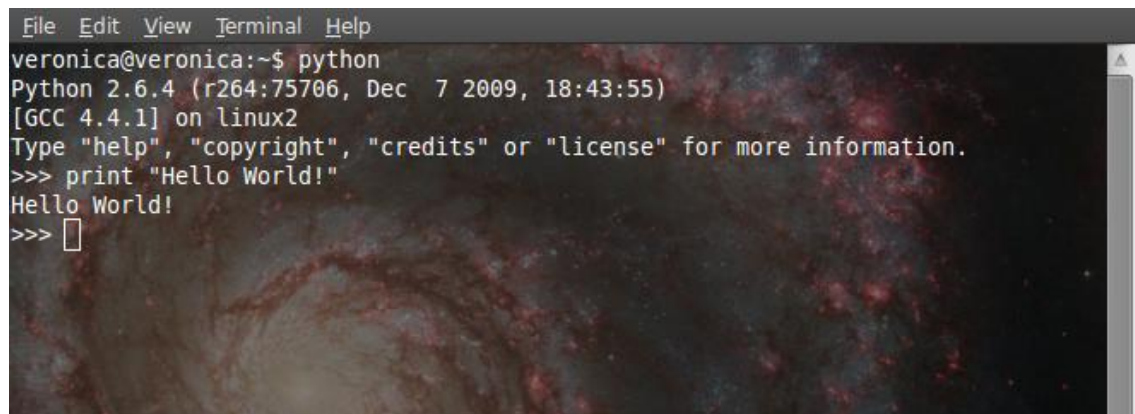
Open a terminal window and type 'python' (without the quotes). This opens python in interactive mode.



```
File Edit View Terminal Help
veronica@veronica:~$ python
Python 2.6.4 (r264:75706, Dec 7 2009, 18:43:55)
[GCC 4.4.1] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>> 
```

While this mode is good for initial learning, we can prefer to use a text editor (like Gedit, Vim or Emacs) to write our code. As long as we save it with the .py extension, it can be executed in the terminal window.

At the prompt, type in print "Hello World!" (with the quotes) and hit enter. We'll see the command printed on the next line.



```
File Edit View Terminal Help
veronica@veronica:~$ python
Python 2.6.4 (r264:75706, Dec 7 2009, 18:43:55)
[GCC 4.4.1] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>> print "Hello World!"
Hello World!
>>> 
```

To run a script(saved using text editor like Gedit, Vim or Emacs) from the command line, type: `python my_script.py` #if the python script name is my_script.py
To exit the command line, type `exit()` or hit `ctrl+d`



Python Programming with IDLE

It is difficult to write lengthy programs in terminal. So we can try **IDLE**. Open a terminal window and type: 'idle'. (without the quotes). We'll see the python graphical shell loaded.

```
Python 2.6.4 (r264:75706, Dec 7 2009, 18:43:55)
[GCC 4.4.1] on linux2
Type "copyright", "credits" or "license()" for more information.

*****
Personal firewall software may warn about the connection IDLE
makes to its subprocess using this computer's internal loopback
interface. This connection is not visible on any external
interface and no data is sent to or received from the Internet.
*****

IDLE 2.6.4
>>> print "I Love Linux!"
I Love Linux!
>>>
```

To write a Python script, click on File > New Window. This will open a sort of Notepad type editor. Type in the following code:

```
#linuxversion.py
#Have user input version and print response
name = raw_input("What Linux release do you use?")
print "I also like", name, " – Linux rules!"
```

Couple of things going on here. The first 2 lines, preceded by the # sign are just comments. The third statement uses the input gathered from the raw_input function and assigns it to a variable, name. Finally, the print statement will return the result. Save the file, with a .py extension, then click on Run > Run Module from the menu to run the program.



```
File Edit Shell Debug Options Windows Help https://gptcthirurangadi.in
Python 2.6.4 (r264:75706, Dec 7 2009, 18:43:55)
[GCC 4.4.1] on linux2
Type "copyright", "credits" or "license()" for more information.

*****
Personal firewall software may warn about the connection IDLE
makes to its subprocess using this computer's internal loopback
interface. This connection is not visible on any external
interface and no data is sent to or received from the Internet.
*****

IDLE 2.6.4
>>> print "I Love Linux!"
I Love Linux!
>>> ===== RESTART =====
>>>
What Linux release do you use?Ubuntu
I also like Ubuntu - Linux rules!
>>>
```

Note:

Many programming languages typically ignore whitespace – that is the spacing in code. But in Python, improper use of spacing can generate syntax errors.

Python Programming Resources

One of the best resources is the main [Python website](http://www.python.org)-<http://www.python.org>.

. Here are a few additional recommendations:

- The Python Tutorial - <http://docs.python.org/tutorial/>
- The Python Wiki Beginner's Guide - <http://wiki.python.org/moin/BeginnersGuide>



Integrated Development Environment

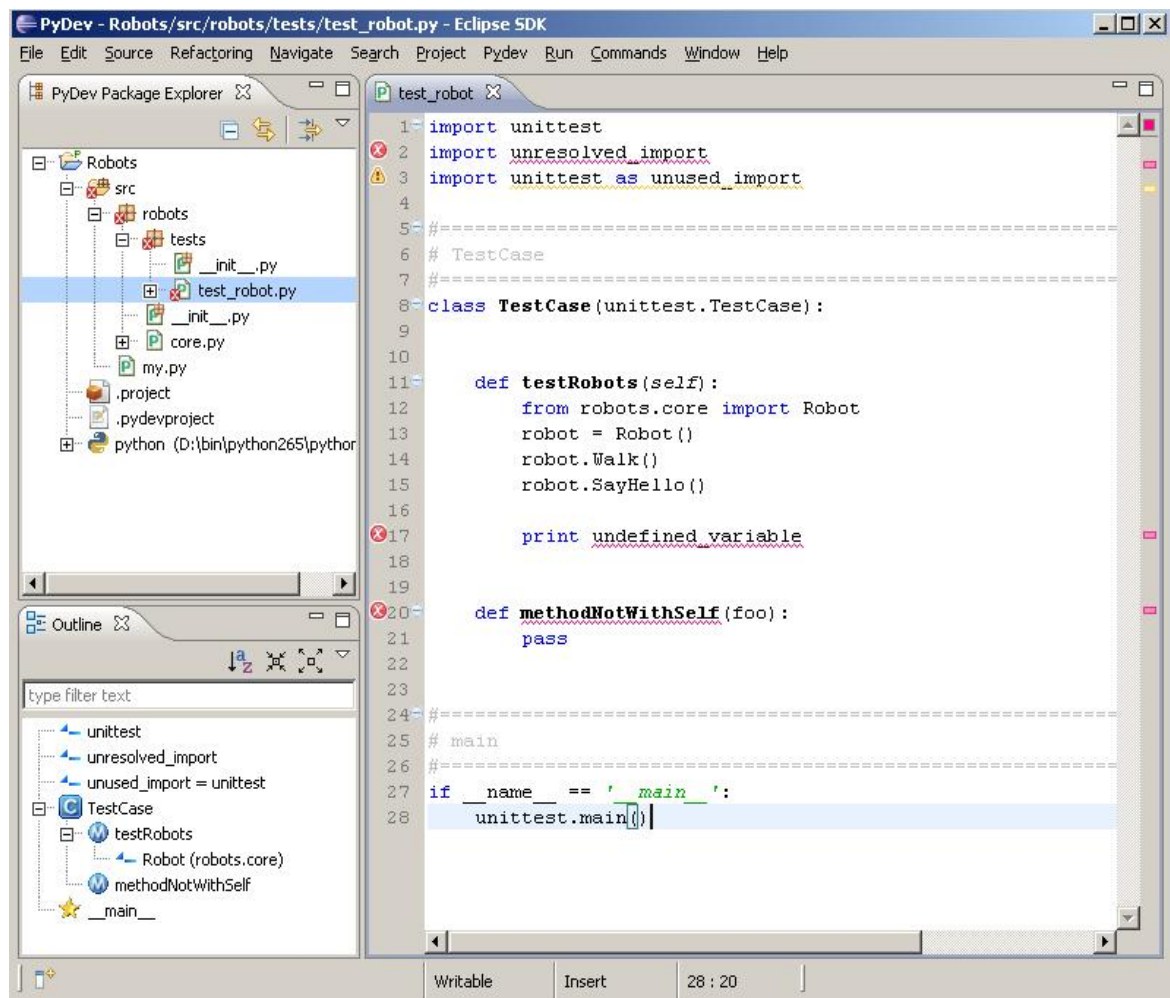
An IDE (*Integrated Development Environment*) allows developers to work efficiently when we are working on a very big project consisting of many files. An IDE will have features that will make a developer work much easier.

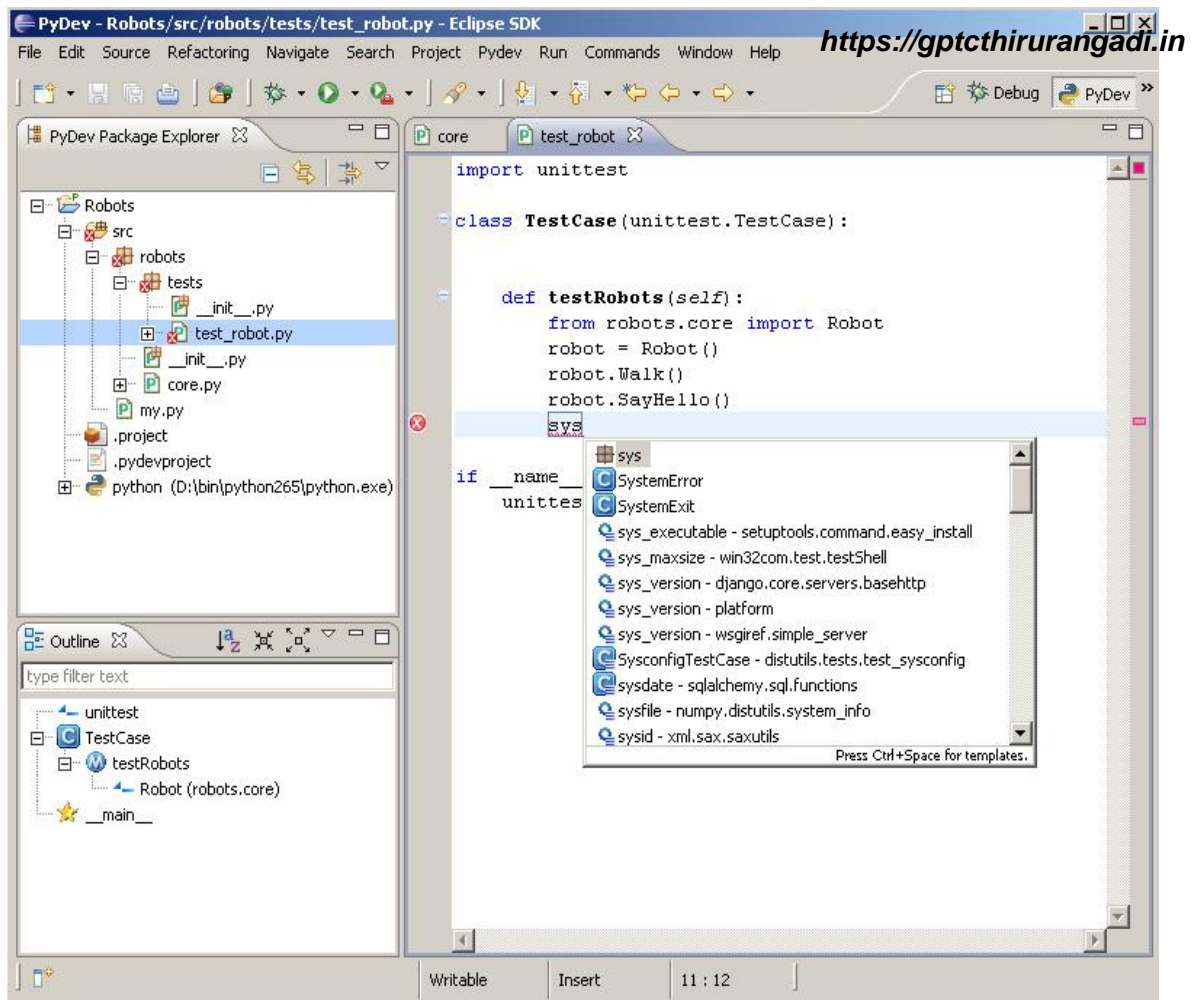
Some features we can expect from a good IDE are: Code completion, Syntax highlighting, Templates for common code, Source Control support (eg. *Subversion*, *Mercurial* or *Git*)

Let's see which Python IDE's are the best and how they stack up against each other.

1. Eclipse with PyDev

Use this when coding in Python on Windows machine, it works with minimal configuration.





Eclipse with PyDev

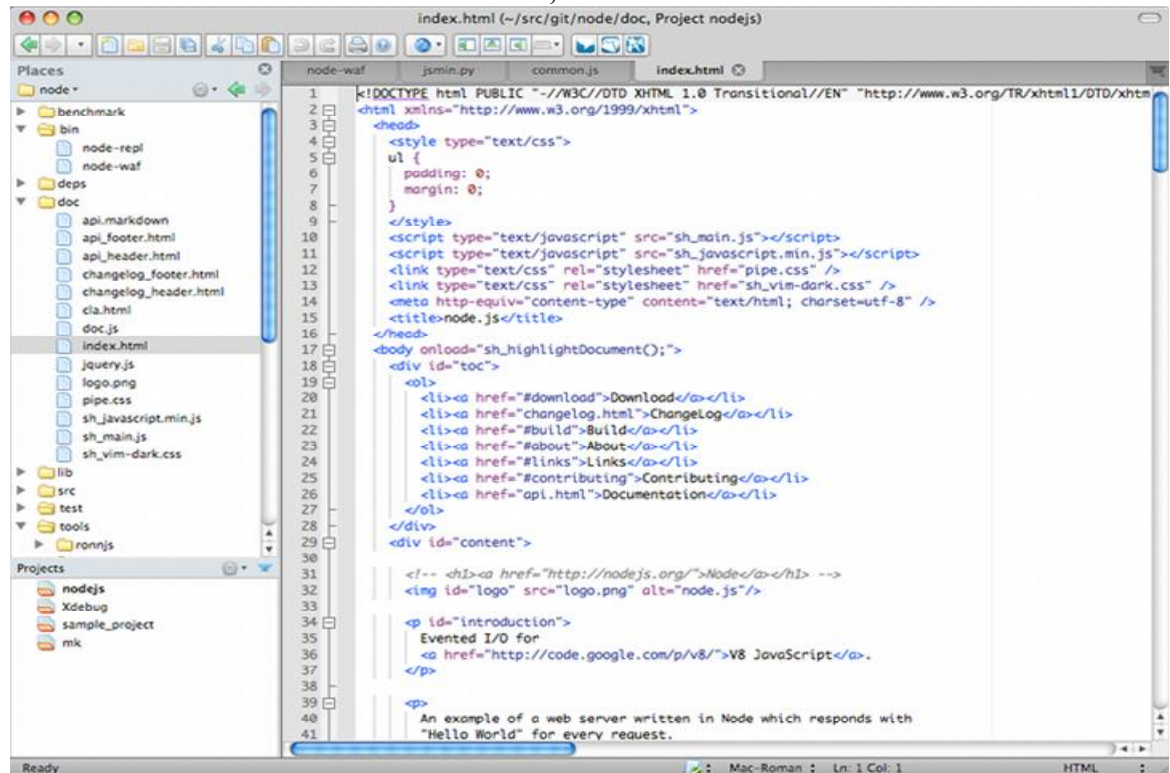
PyDev's Official Site: <http://pydev.org/>

Eclipse is a very versatile IDE that's been around for a very long time. It's a time tested offering and is very solid all around. Eclipse is like a sandbox IDE; it can **support any language** as long as somebody has baked in the support through a package. Such is the case with PyDev, a package that allows you to turn Eclipse into a very useful Python IDE.

It's a **completely free IDE** that offer a wide array of features such as:
Django integration, Code completion, Code completion with auto import
Syntax highlighting, Code analysis, Go to definition, Refactoring, Mark occurrences
Debugger, Remote Debugger, Tokens browser, Interactive browser
Unit test integration, Code coverage

2. Komodo Edit

Komodo Edit - Available on Windows, Linux and Mac.



Komodo Edit's Official site: <http://www.activestate.com/komodo-edit>

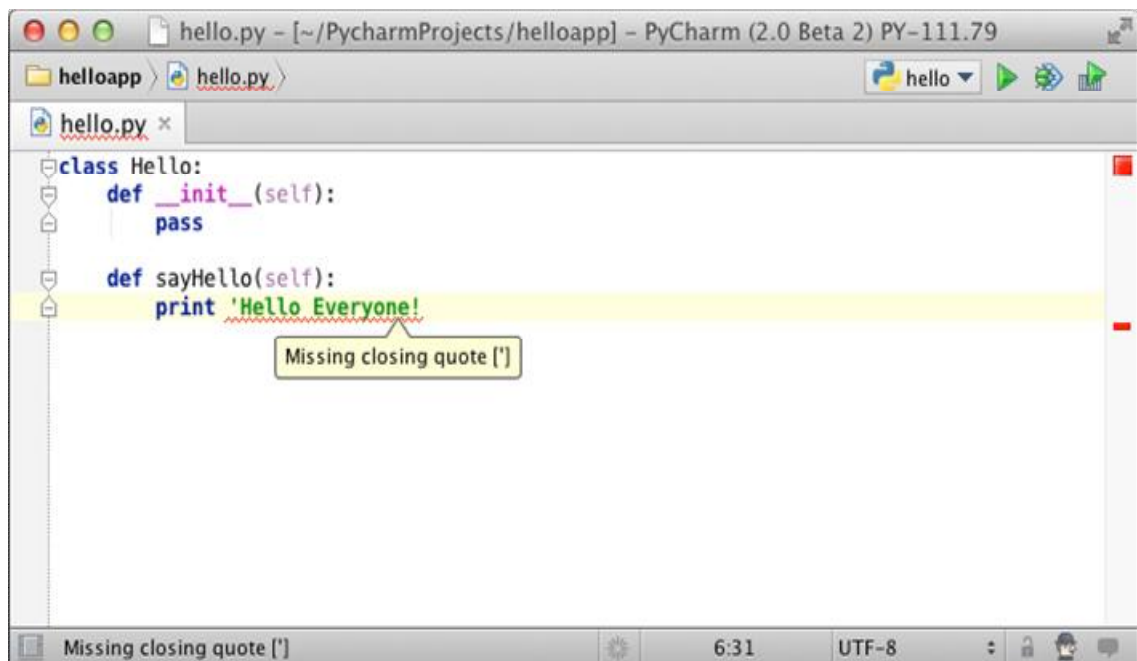
Komodo Edit is a very clean, professional Python IDE. It doesn't have fluff and instead focuses on putting the thing we need right in front of us. No digging through random submenus looking for an option. It's code completion is very good and fast; it pops up as we type with minimal loading time. ActiveState offers a commercial version of their IDE, called Komodo IDE. The differences between the two version are as follows:

Komodo Edit vs. Komodo IDE



Multi-Language Editor »	✓	✓
Project Manager / Places »	✓	✓
Toolbox »	✓	✓
Debugging »	✓	
Source Code Control Integration »	✓	
Database Explorer (MySQL, Oracle, etc.) »	✓	
Publishing »	✓	
Code Browser »	✓	
Sections List »	✓	
Rx (Regular Expression) Toolkit »	✓	
Interactive Shells »	✓	
Unit Testing »	✓	
HTTP Inspector »	✓	
DOM Viewer »	✓	
PDK Integration »	✓	

3. PyCharm



PyCharm by JetBrains

PyCharm's Official Site: <http://www.jetbrains.com/pycharm/>

PyCharm is an IDE created by [JetBrains](http://www.jetbrains.com/). We might remember the authors of [ReSharper](http://www.jetbrains.com/), one of the best investments a .NET developer can make. Features are; Cross Platform, Commercial, Automatic Code-completion, Integrated Python Debugging, Error Markup, Source Control integration, Smart Indent, bracket Matching, Line Numbering, Code Folding, Unit Testing