COMPUTER SYSTEM

WHAT IS A COMPUTER? – *It is an electronic device designed to manipulate data so that the useful information can be stored and retrieved.*

A **COMPUTER** is a machine that manipulates data according to a set of instructions called a computer program. (Wikipedia Encyclopedia)

A **COMPUTER** is an electronic device that performs certain arithmetic and logical operations without any errors. (Wikipedia)

Businesses – defines computer as "*only a tool to make their work easier*."

Computing is usually defined as the activity of using and developing computer technology, computer hardware and software. It is the computer-specific part of information technology. (Wikipedia)

Computing Curricula 2005: also recognizes that the meaning of *computing* depends on the context:-
***Computing** also has other meanings that are more specific, based on the context in which the term is used. For example, an information systems specialist will view computing somewhat differently from a software engineer. Regardless of the context, doing computing well can be complicated and difficult. Because society needs people to do computing well, we must think of computing not only as a profession but also as a discipline.*

The term ***COMPUTING*** is also synonymous with counting and calculating. In earlier times it was used in reference to mechanical computing machines.

Computer science (or computing science) is the study and the science of the theoretical foundations of information and computation and their implementation and application in computer systems. (Wikipedia)

Characteristics of a Computer:
1. It is a machine. – it runs through electricity.
2. It is electronic. – it is made up of millions of transistors/ electronic parts. (e.g. CPU, RAM, ROM)
3. It is automatic. – continuously run once started.
4. It can manipulate data. – process / organized data
5. It has memory. – capable of remembering or memory recall
6. It has logic function. – it can produced logical results based on alternative course of action. Can produce results after instructions were fed into it.

Computer Capabilities:
1. Speed – can process data faster than any other machine designed to perform a similar task. Speed can reach up to million per second.
2. Repetitiveness – can tirelessly perform the same function or operations millions of times.
3. Accuracy – no other system can produce as such accuracy as the computer system.
4. Logical Operations – can make decisions based on alternative courses of action.
5. Store and recall information – data storage capability is unique because it cannot forget stored data or facts. It stores vast amounts of information at high speed.
6. Self-checking – verifies the accuracy of its own by parity check. It counts the number of characters it has stored to make sure there is no loss of data during processing.
7. Self-operating – capable of executing instruction on its own, though even without man's control on it.

Computer Limitations:
1. Dependence on prepared instructions.
2. Inability to derive meanings from objects.
3. Inability to generate information on its own.
4. It cannot correct wrong instructions.

CLASSIFICATION OF COMPUTERS

A. ACCORDING TO PURPOSE
1. General-Purposed Computers – Designed to handle a variety of different problems and to meet different needs. These are strong in versatility but are normally weak in speed and efficiency.
2. Special-Purpose Computers – Designed to handle a specific problem or to perform a specific task. Example of use are for collecting highway tools, airline reservations, satellite tracking, air traffic control, and industrial process control.

B. ACCORDING TO TYPES OF DATA HANDLED
1. Analog Computers – Commonly used for scientific and engineering problems, particularly in chemical industries, electric power plants, and petroleum refineries. These deal with continuously changing

physical data (such as pressure, temperature, and current). Example: Speedometer-analog device that shows the changes in the speed of the automobile as analogous to the changes in the speed of the camshaft's rotation.
2. Digital Computers – Specializes in counting. It handles values that are in a separate or distinct form (discrete).
3. Hybrid Computers – Incorporate both analog and digital features of a single computer. Used in working out special types of problems in science and various areas of engineering.

C. FOUR TYPES OF COMPUTERS ACCORDING TO CAPACITY
1. Microcomputers
2. Mini Computers
3. Mainframe Computers
4. Supercomputers

1. **Microcomputer** – generally a synonym for the more common term, personal computer or PC, a computer designed for an individual. It uses microprocessor technology to input, manipulate, store and output data.

Two Classifications of Microcomputers
1. Personal Computer or PC – widely popular with people of all lifestyles because they are powerful, affordable and easy to use. Ex. (Desktop, Mini-tower, Midi-tower, Full-tower.)
2. Portable Computer – include, laptops or notebooks, sub-notebook, tablet computer and personal digital assistants. They are small enough to move easily from one place to another and they can operate on batteries.

2. **Minicomputer** – is a multi-processing system capable of supporting from 4 to about 200 users simultaneously. Ex. IBM AS/400e
3. **Mainframe Computer** – a very large and expensive computer capable of supporting hundreds, or even thousands of users simultaneously. Ex. IBM 3090, Amdahl 5890.
4. **Supercomputer** – the fastest type of computer, very expensive and are employed for specialized applications that require immense amounts of mathematical calculations. Ex. Weather forecasting, animated graphics, fluid dynamic calculations, nuclear energy research, and petroleum exploration.

Top 5 Super Computers.
1. NEC EARTH SIMULATOR, area: 4 tennis courts, 3 floors, 35.86 bc/s.
2. IBM ASCI WHITE, area: 2 basketball courts, 7.22 bc/s.
3. TERASCALE COMPUTING SYSTEM, 4.46 bc/s.
4. TERA SUPERCOMPUTER, 3.98 bc/s.
5. NERSC IBM SP RS/600, 3.05 bc/s.

FIVE ELEMENTS OF COMPUTING PROCESS (ELEMENTS OF DATA PROCESSING)
1. Hardware
2. Software
3. Data
4. People
5. Procedures

1. **Hardware** – refers to the physical components that make up a computer system.
2. **Software** – also called a "Program" is the instruction that tells the hardware what to do.
3. **Data** – is the raw facts that the computer can change into useful information.
4. **People** – are also called "end users". Most computers need people to operate them.
5. **Procedures** – are the steps or directions that the end users needs to follow in order to complete a certain task. For example, in order to save a letter in a computer's memory, you need to know the procedure for saving that document.

1. HARDWARE:

3 FUNDAMENTAL ELEMENTS OF A COMPUTER

1. System Unit		2. Input Devices	3. Output Devices
Basic Parts of the System Unit:			
1. Power Supply 2. CD-Rom Drive 3. 3 ½ Floppy Drive 4. Hard Drive 5. MotherBoard consist of the ff: a. Central Processing Unit (CPU) b. Fan c. ROM d. RAM e. Expansion slot	6. System Case – composed of: a. Power On/Off switch b. Reset switch c. LEDs d. CD & Disk drive bays.	1. keyboard 2. mouse 3. joystick 4. graphics pad (tablet) 5. Magnetic character recognition 6. scanner 7. digital video camera 8. Modem	1. CRT – Cathode Ray Tube – Monitor 2. Printer 3. Plotter 4. Speaker 5. Modem

System Unit – the core of a computer is responsible for processing and storing data and controls all computer functions.

CPU – Central Processing Unit – the device that interprets and executes instructions, it is the brain of a computer.

2 Fundamental Types of Memory

a. Main Memory – very closely connected to the processor, the contents are quickly and easily changed, interacts with the processor millions of times per second.
   a.1 RAM – Random Access Memory – is like our normal memory which means the computer can store, retrieve, alter or delete any items held in the RAM – can be access in any order.
   a.2 ROM – Read Only Memory – the information stored can only be read but cannot be added or rubbed out.

b. Secondary Memory – use for long storage of programs and data, the contents can be erased and can be used to store new information.
   Ex. Tape Backup, Diskettes, Hard disk, Compact Disk

Monitor – Main output device that receives signals from a video card inside of the computer and gives the use a graphical or textual display.

Printer – an output device use to produce or print hard copy/s. ex. Laser printer, inkjet or bubble jet printer, dot matrix printer.

Microphone – allows the computer to receive and record sound.

Scanner – an input device that takes in an optical image and digitizes it into an electronic image represented as binary data.

Digital camera – takes picture without film, and stores your snapshots as digital files in its memory or on a diskette.

Graphic tablet – objects are drawn using a pen.

Joy stick – device consisting of handheld stick that pivots about one end and transmit its angle in two dimensions to a computer.

Peripheral devices – devices connected to a computer, serve specific purposes, add a new service or an additional resource. Include both input and output devices.

Keyboard – main input device that enable you to enter data/command into a computer.

Keyboard consists of the following parts:

1. Alphanumeric keys – letters and numbers
2. Punctuation keys – comma, period, semicolon, question mark and so on.
3. Special keys – function keys, control keys, arrow keys, Caps lock key, etc.

Control key – a key on the PC keyboard labeled Ctrl. You can use the Ctrl key in the same way that you use the Shift key – keeping it pressed down while pressing another character. The result is control key combination, which can have different meanings depending on which program is running.

Alt key – short for Alternate key, you can use it in the same way as Ctrl key. The meaning of the Alt key combination depends on which application is running.

Arrow keys – most computer keyboards contain four arrow keys for moving the cursor or insertion point right, left, up, or down. When combined with shift, Function, Control or Alt Keys, the arrow keys can have different meanings.

Shift key – a key on computer keyboards that gives the other keys an alternate meaning. When combined with alphabetic keys, the Shift key causes the system to output a capital letter. The shift key can also be combined with other keys to produce program-dependent results.

Function keys – Special keys on the keyboard that have different meanings depending on which program is running.

2. SOFTWARE:

1. **Application Software** – are programs that people use to get their work done. It may include data entry, update query and report programs, productivity software for spreadsheets, word processing, databases and custom accounting program for payroll, billing and inventory.

Example of Application Software:

a. Word Processor
b. Spreadsheet Software
c. Presentation Software
d. Database Software
e. Web Browser

2. **Operating Systems** – are software which controls the computer and runs applications, it keep all the hardware and software running together smoothly.

Examples of Operating Systems:

a. DOS
b. Windows
c. Mac OS
d. Linux

e. Unix
f.

3. **Programming Languages** – are used to create all other software whether it is Operating system or Application software.

Examples: Visual Basic, C++, Cobol, Turbo Pascal

A. Word Processors – are usually the first application that leads people to using a computer for their work. These normally have the following capabilities built into them.

1. spell checking
2. standard layouts for normal documents
3. ability to have some characters appear in bold print, italics, or underlined.
4. center lines, make text line up on the left side of the paper, or the right side of the paper.
5. save the document so it can be used again,
6. print the document.

Examples of Word Processing Software:

1. Microsoft Word '97, 2000, and XP
2. Word Perfect
3. Lotus WordPro

B. Spreadsheet Software – commonly used for accounting purposes such as:

1. tabulating of complex mathematical equations with a row and column matrix.
2. designed to used number and formulas to do calculations with ease.

Examples of Spreadsheet Software:

1. Microsoft Excel '97, 2000 & XP
2. Lotus 123
3. Quicken

C. Database Software – programs that manage large amounts of data organized as fields, records and files.

Examples of Database Software:

1. Microsoft Access
2. Lotus Approach

D. Presentation Software – designed to showcase information to an audience. Used extensively in business to display graphics, charts, diagrams, photos, and text blocks to highlight information.

Examples of Presentation Software:

1. Microsoft PowerPoint '97, 2000, XP
2. Lotus Freelance Graphics

E. Web Browsers – are programs use to view web pages.

Examples: Internet Explorer, Netscape Navigator

3. DATA:

A. ELECTRONIC DATA PROCESSING – (EDP) the processing of data through the use of a computer

Information – data that have been collected and processed into a meaningful form.

Types of Data Processing

1**. Business Data Processing** – characterize by the need to establish, retain, and process files of data for producing useful information. Generally, it involves a large volume of input data, limited arithmetical operations, and relatively large volume of output.

2. **Scientific Data Processing** – involves a limited volume of input and many logical or arithmetic calculations. Unlike business problems, most of the scientific problems are non-repetitive, requiring a "one-time" solution.

Data Processing Cycle

1. Input – the feeding of raw materials (data) or instructions to the central processing unit (CPU) of the computer in a machine-readable format.
2. Processing – transforming of raw data into meaningful information in the CPU.
3. Output – the outcome of the computations and related activities carried out in the CPU.

B. METHODS OF DATA PROCESSING

1. **Batch Processing** – a technique in which data to be processed are collected into groups to permit convenient, efficient, and serial processing.
2. **On-Line Processing** – a technique that uses devices directly connected to the CPU either for data entry or inquiry purposes.
3. **Real-time Processing** – a method which has the capability of a fast response to obtain data from an activity or a physical process.
4. **Distributed Processing** – it generally consists of remote terminals linked a large central computer system to help the user conduct inquiries about accounts, process jobs, or other data processing operations.

C. DATA PROCESSING OPERATION

1. Recording – refers to the transfer of data into some form or document. It relates to the documentation of intermediate figures and facts resulting from calculations.
2. Verifying – refers to the careful checking of the recorded data for any errors.

3. Duplicating – refers to the reproduction of the data into many forms or documents.
4. Classifying – refers to identifying and arranging items with like characteristics into groups or classes.
5. Sorting – refers to arranging or rearranging data in a predetermined sequence to facilitate processing. Sorting is done in alphabetic or a numeric order.
6. Calculating – refers to arithmetic manipulation of the data.
7. Summarizing and Reporting – it is here where a collection of data is condensed and certain conclusions from the data are represented in a meaningful format that is clear, concise and effective.

4. PEOPLE or PEOPLEWARE

CAREERS IN COMPUTING

1. Information System Manager – a manager of a department that focuses on activities such as system analysis / design or program preparation; must perform the functions of planning, organizing, and controlling.
2. System Analyst – primarily responsible for the analysis, design, development and implementation of systems for such applications as payroll, inventory control, accounts receivable, and sales analysis.
3. Database Administrator – designs, creates, and maintains the organization's database.
4. Data Communication Specialist –designs and maintains computer networks that link computers and terminals for data communications.
5. Computer Programmers – write programs or perform programming.
a. **Application Programmers** – Translate specifications given by the system analyst and prepare programs for applications.
b. **System Programmers** – develop and maintain system software.
6. Knowledge Engineer – work closely with human specialists to translate human expertise into the facts and decision rules that can be placed in the knowledge base of an expert system.
7. Operations Personnel
a. **Data Encoder** – responsible for transferring data from the source document into a form which the computer can understand.
b. **Data controllers** – verify and check whether that data prepared are accurate and complete.
c. **Computer Operators** – actually handle the machine; responsible to load and unload the programs, mount the data tapes, disks, or cards.
d. **Librarian** – a person who catalog, monitor, and control the distribution of disks, tapes, system documentation and system computer-related literature.
8. Educator – employed to teach computer concepts.
9. Computer Instructor – conducts the training sessions.

HISTORY OF COMPUTING/COMPUTER

A. PRE-MECHANICAL AGE

1. Writing and Alphabets – communication through speaking and simple drawing known as *petroglyths* (signs or simple figures carved in rock).
   - pictographs – pictures or sketches that visually resemble that which is depicted.
     e.g. cave painting
   - Geometric signs (dots, squares, etc.) with no apparent depicted object.
   - Ideographs – symbols to represent ideas or concepts.
   - First development of signs corresponding to spoken sounds, instead of pictures, to express words.
     3100 B.C. the Sumerians in Mesopotamia (southern Iraq) devised *Cuneiform* – the first true written language and the first real *information system*.
   - 2000 B.C., Phoenicians created symbols that expressed single syllables and consonants (the first true alphabet)
   - The Greeks later adopted the Phoenician alphabet and added vowels; the Romans gave the letters Latin names to create the alphabet we use today.

   Many people think computers are 20th century inventions. Yet, computing began when our ancestors devised the first, rudimentary counting methods.
2. Paper and Pens – input technologies
   - Sumerians` input technology was a **stylus** that could scratch marks in wet clay.
   - About 2600 B.C. the Egyptians wrote on the papyrus plant
   - Around 100 A.D. the Chinese made paper from rags, on which modern-day paper-making is based.
3. Books and Libraries – output technologies (permanent storage devices)
   - Religious leaders in Mesopotamia kept the earliest "books"
   - The Egyptians kept scrolls.
   - Around 600 B.C. the Greeks began to fold sheets of papyrus vertically into leaves and bind them together.
4. The First Numbering Systems.
   - Egyptian system: numbers 1-9 as vertical lines, number 10 as U or circle.
   - The first numbering systems similar to those in use today were invented between 100 and 200 A.D by Hindus in India who created a nine-digit numbering system.

- Around 875 A.D., the concept of zero was developed.

5. The First Calculator: **The Abacus** – was man's first recorded adding machine. It was in 500 B.C. when the abacus was invented in Babylonia, then popularized in China, the abacus is an ancient computing device constructed of sliding beads on a wooden frame. We could call the abacus the first calculator.

B. MECHANICAL AGE

1. The First Information Explosion.
   - **Johann Gutenberg** (Germany 1837-1468) invented the **movable metal-type printing process** in 1450.
2. The First general purpose "computers"
   - Actually people are the one who held the job title **"computer**" one who works with numbers.
   - 1623, **Wilhelm Shickard**, a professor at the University of Tubingen, Germany invents the first mechanical calculator; it can work with six digits, and carries digits across columns. It works, but never makes it beyond the prototype stage.
   - 1642, **Blaise Pascal**, French Mathematician invented a mechanical calculation machine called **PASCALINE**. The Pascaline was made out of clock gears and levers, and could solve basic mathematical problems like addition and subtraction.
   - 1801, **Joseph-Marie Jacquard** developed an automatic loom that was controlled by punched cards. (JACQUARD LOOM)
   - 1821, **Charles Babbage** invented the first, modern computer design: a steam-powered adding machine called "the difference engine." Babbage understood that long math problems were just repetitive operations.
   - 1832, Babbage also invented the "**analytical engine**". The analytical engine was a mechanical adding machine that took information from punched cards to solve and print complex mathematical operations.
     Babbage's **difference engine and the analytical engine** are regarded as the **first "thinking machines**." These machines were made for people who weren't math experts. **The Difference and Analytical Engines** were easy to operate and produced solutions at the turn of a hand crank. Babbage's inventions earned him the title, **"father of computers".**
   - 1842, The first program was written by **Ada Augusta Lovelace Byron** for Babbage's Difference Engine. Thus Ada Byron is credited with being the ***first computer programmer***. The programming language **Ada** is named in her honor.

• THE ELECTROMECHANICAL AGE: 1840 – 1940

3. The Beginnings of Telecommunication.

a. **Voltaic Battery** – the first electric battery known as the voltaic pile, was invented in 1800 by Alessandro Volta.

b. **Telegraph** – Samuel F. B. Morse conceived of his version of an electromagnetic telegraph in 1832 and constructed an experimental version in 1835. He did not construct a truly practical system until 1844, when he built a line from Baltimore to Washington.

c. **Telephone and Radio**. – in 1876, Alexander Graham Bell. Developed the first working telephone

4. Electromechanical Computing

- The punched card was adapted for use in early computers and provided computer programmers with a new way to put information into their machines(Hollerith Punched Card Machine.) Hollerith later went on to found the **Tabulating Machine Company**, which later became the **Computer Tabulating Recording Company**: Hollerith retired in 1921, but his company went on to become the **International Business Machines Corporation**, today it is known as **IBM.**
- 1906, the Vacuum tube was developed by Lee De Forest. This was important because it provided an electrically controlled switch; a necessity for digital electronic computers.

• THE ELECTRONIC AGE: 1941 – PRESENT

- 1941, **Konrad Zuse** built the first programmable computer called the **Z3**. The Z3 was the first computer designed to solved complex engineering equations, rather than basic arithmetic problems.
- 1942, **Howard Aiken**, a Ph.D. student at Harvard University built the **Mark I** "The first stored-Program Computer". 8 feet tall, 51 feet long, 2 feet thick, weighed 5 tons, used about 750,000 parts 500 miles of wires, 3-5 second per calculation.
- 1942, **John Atanasoff and Clifford Berry** completed the first all-electronic computer, called the **ABC (Atanasoff – Berry Computer)**. ***The ABC was the first computer to use electricity in the form of vacuum tubes*** to help make electric computation possible. The ABC as used for solving complex systems of equations.

FOUR GENERATIONS OF DIGITAL COMPUTING

A. The First Generation Computers (1951 – 1958)

1. Vacuum Tubes used as their main logic elements.

A.1. **ENIAC** – (Electronic Numerical Integrator and Calculator) – the first general purpose computer. Use in World War II. 1000 times faster than Mark I and could perform 5000 additions per second.

A. 2. **UNIVAC** – (Universal Automatic Computer) it was used in the U.S. Census Bureau.

A. 3. **IBM 701** – the first electronic business Computer (International Business Machine)

B. The Second Generation Computer (1959 – 1963)

1. Vacuum tubes replaced by transistors as main logic element.
2. Magnetic tape and disks began to replace punched card.

B.1. 1961 – **Grace Hopper** –the woman that found the first computer bug, finishes developing **COBOL** (Common Business-Oriented Language).

B.2. **Thomas Kurtz and John Kemeny** developed **BASIC** (Beginners All Purpose Symbolic Instruction Code) as computer language to help teach people how to program.

C. The Third Generation Computer (1963 – 1974)

1. Individual transistors were replaced by integrated circuits (IC)
2. Magnetic tape and disks completely replace punch cards as external storage devices.
3. Introduction of metal oxide semiconductor (MOS)

C.1. ARPANET is set up, later it becomes the INTERNET.

D. Fourth Generation Computers (1979 – Present)

Intel Corporation – designed the first tiny computer on a chip, it is called a microprocessor. – A microprocessor is an integrated circuit built on a tiny piece of silicon. It contains thousands or even millions of transistors, which are interconnected via superfine traces of aluminum.

D.1. The first Microcomputer, or **Personal Computer** (PC) – **ALTAIR 8080 in 1975**.
D.2. Apple II Personal Computer – the first personal computer to come in a plastic case and include color graphics.
D.3. IBM enters the personal computer market with the PC – in 1981.
D.4. Apple Macintosh - 1984
D.5. Windows 1.0 (operating system) - 1985.
D.6. 1990 – Windows 3 was launched.
D.7. 1993 – Intel Introduced the Pentium Processor, a microprocessor with 3.1 million transistors.
D.8. 1995 – Microsoft finally released Windows ’95 on August 24, 1995.

HISTORY OF INTEL MICROPROCESSOR

YEAR	MICROPROCESSOR	USES/FEATURES
1971	4004	Powered the Busicom Calculator
1972	8008	Use for the Mark-8 the first computer for the home.
1974	8080	Become the brain of the Altair PC.
1978	8086 – 8088	The brain of the IBM PC.
1982	80286	The first Intel processor that could run all the software written for its predecessor.
1985	Intel 386 ™	32 bit chip and was “multi-tasking” or it could run multiple programs at the same time.
1989	Intel 486 ™	The first to offer a built-in math coprocessor, which speed up computing.
1993	Pentium®	Allowed computers to more easily incorporate “real world” data such as speech, sound, handwriting and photographic images.
1997	Pentium II	7.5 million-transistor incorporates Intel MMX technology, designed to process video, audio and graphics data efficiently.
1999	Pentium III	Features 70 new instructions – Internet Streaming SIMD extensions – that dramatically enhance the performance of advance imaging, 3-D, streaming audio, video and speech recognition applications.
2000	Pentium IV Processor 1.4 and 1.5 Ghz	Can create professional-quality movies; deliver TV like video via the Internet; communicate with real-time video and voice; render 3D graphics in real time; quickly encode music for MP3 players; and simultaneously run several multimedia applications while connected to the internet. The processor debuted with 42 million transistors and circuit lines of 0.18 microns. The Pentium 4 processor’s initial speed of 1.5 gigahertz (1.5 billion hertz).
2001	Pentium IV Processor 1.6, 1.7, 1.8, 1.9, 2.0 Ghz	Same details with P4 1.4 and 1.5 Ghz
2002	Pentium IV Processor 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.4 Ghz	• Number of transistors 55 million, 800 MHz system bus (all versions include Hyper Threading) • 6500 to 10000 MIPS
2003	Pentium 4 EE Mobile Processor	• Introduced September 2003 • EE = "Extreme Edition" • Built from the Xeon's "Gallatin" core, but with 2 MB cache-
2004	Pentium 4E, 4F	• Introduced February 2004

		• built on 0.09 µm (90 nm) process technology Prescott (2.4A, 2.8, 2.8A, 3.0, 3.2, 3.4, 3.6, 3.8) 1 MB L2 cache • 533 MHz system bus (2.4A and 2.8A only) • Number of Transistors 125 million on 1 MB Models • Number of Transistors 169 million on 2 MB Models • 800 MHz system bus (all other models)
2005	Pentium D Smithfield - 90 nm process technology (2.66–3.2 GHz)	The **Pentium D** brand refers to two series of desktop dual-core 64-bit x86 processors with the NetBurst microarchitecture manufactured by Intel. Each CPU comprised two dies, each containing a single core residing next to each other on a multi-chip module package. The brand's first processor, codenamed **Smithfield**, was released by Intel on May 25, 2005. • Introduced May 26, 2005 • 2.66–3.2 GHz (model numbers 805-840) • Number of Transistors 230 million
2006	**Presler** - 65 nm process technology (2.8–3.6 GHz)	The last generation of Pentium D branded processors was **Presler** identified by the product code 80553, and made of two 65 nm-process cores found also in Pentium 4 branded Cedar Mill CPUs. • Introduced January 16, 2006 • 2.8–3.6 GHz (model numbers 915-960) • Number of Transistors 376 million
2006 - 2009	Core 2 Dou (Pentium Dual Core) “Allendale” (65nm)	**Allendale** was originally the name for the E4000 processors, which use a low-cost version of the *Conroe* core. They feature a lower front side bus with 200 MHz ("800 MT/s") instead of 266 MHz ("1066 MT/s") and only half the L2 Cache, offering a smaller die size and therefore greater yields. • Number of Transistors 167 Million
2006 - 2009	Core 2 Quad (Pentium Quad-Core) "Kentsfield" (65 nm) Yorkfield (6M, XE, CL) 45 nm process technology	**Kentsfield** is the code name the first Intel desktop quad core CPU branded Core 2 (and Xeon for lower-end servers and workstations **Yorkfield** (codename for the Core 2 Quad Q9x5x series and Xeon X33x0 series) features a dual-die quad core design with two unified 6 MB L2 caches, their product code is 80569. They also feature 1333 MT/s FSB and are compatible with the Bearlake chipset. • Same features as **Wolfdale** • Number of Transistors 820 Million
2006 - 2009	Core 2 Dou (Pentium Dual Core) Wolfdale-3M (45 nm)	**Wolfdale-3M** is the logical successor of Allendale and uses the 82 mm² dies with 3 MB L2 cache similar to Penryn-3M, its product code is 80571. It is used in the Core 2 E7xxx series as well as the E5xxx/E6xxx Pentium Dual-Core and E3xxx Celeron processors. The E5xxx enables only 2 MB of L2 cache, replacing the E2xxx series of Pentium Dual core chips, the E7xxx series uses the full 3 MB of L2 Cache, and a 1066MT/s FSB, replacing the Core 2 Duo E4xxx series and the Celeron E3xxx series with 1 MB L2 cache enabled is the follow-on to the Celeron E1xxx series. • Number of Transistors 410 Million
2008 – 2009	64-bit processors: Intel 64 - Nehalem microarchitecture **Core i5** **Lynnfield** - 45 nm process technology	**Core i5** is a brand name used by Intel for several new processors. It is positioned between the mid-range Core i3 and Core 2 and the high-end Core i7 and Xeon brands. • 4 MB L3 cache • Introduced September 8, 2009 • Variants o 750 - 2.66 GHz
2008 - 2009	**Core i7** **Bloomfield** - 45 nm process technology	**Intel Core i7** is a family of several Intel desktop and laptop 64-bit x86-64 processors, the first processors released using the Intel Nehalem microarchitecture and the successor to the Intel Core 2 family. All three current models and two upcoming models are quad-core processors. The *Core i7* identifier applies to the initial family of processors codenamed ***Bloomfield.*** • Hyper-Threading is again included. This had previously been removed at the introduction of Core line • 781 million transistors • Introduced November 17, 2008 • Variants o 920 - 2.66 GHz

		o 940 - 2.93 GHz o 950 - 3.06 GHz o 965 (extreme edition) - 3.20 GHz o 975 (extreme edition) - 3.33 GHz
2008 – 2009	**Core i7** **Lynnfield** - 45 nm process technology	o 8 MB L3 cache o Introduced September 8, 2009 o Variants ▪ 860 - 2.80 GHz ▪ 870 - 2.93 GHz
2009	**Netbooks** **Microprocessors** **Intel Atom**	**Intel Atom** is the brand name for a line of ultra-low-voltage x86 and x86-64 CPUs (or microprocessors) from Intel, designed in 45 nm CMOS and used mainly in Netbooks, Nettops, and MIDs. The Atom Z series is code-named Silverthorne and the Atom N series is code-named Diamondville. As of June 2009, the most used chips in the Netbook retail market are Z520, Z530, and N270. • Intel Atom can execute up to two instructions per cycle.