Introduction to Computer Science – D684

Section 2

Lesson 1

* 1. **– Computational Thinking**

**Software Development Life Cycle (Polya’s)**

1. **Analysis and specification phase** – (Understand the Problem)
   1. Analyze specification
      1. Understand (define) the problem
      2. Specify the problem that the program is going to solve
2. **Algorithm development phase** – (Devising a Plan)
   1. Plan is called an algorithm
   2. Develop algorithm - develop a logical sequence of steps to be used to solve the problem
   3. Test algorithm - follow the steps as outlined to see if the solution truly solves the problem
3. **Implementation phase** – (Carrying Out the Plan)
   1. **Code** – translate the algorithm (general solution) into a programmable language
   2. **Test** – have the computer follow the instructions. Check the results and make corrections until the answers are correct
4. Maintenance phase – (Looking Back/Reviewing the solution)
   1. Use – Use the program
   2. Maintain – modify the program to meet changing requirements or to correct errors
   3. **– The Software Development Lifecycle**

**Program Development Cycle (Structured Approach) SDLC**

1. Understand the problem
2. Plan the logic
   1. Flowcharts or pseudocode
3. Code the program
4. Use software (compiler or an interpreter) to translate the program into machine language
5. Test the program
6. Put the program into production
7. Maintain the program

**Computational Thinking =** solving problems using logical steps

**End user =** the person who ultimately uses a software application or system

**Documentation =** any supporting paperwork for a program

**Desk-checking =** walking through a program’s logic on paper before writing the program

**Debugging** = process of finding and correcting errors

**High versus Low-Level Programming Language**

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| Feature | **High-Level Language** | **Low-Level Language** |
| Definition | Closer to human language and designed to be easy to read/write | Closer to the machine code and interacts directly with hardware |
| Ease of use | Easier to read, write, and maintain | Harder to write and understand, requires knowledge of computer architecture |
| Examples | Python, Java, C++, JavaScript | Assembly language, Machine Code (Binary) |

Lesson 2

* 1. **– Codes of Ethics and Professional Conduct**

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| Feature | Association for Computing Machinery (ACM) | Institute of Electrical and Electronics Engineers (IEEE) |
| Definition | International organization dedicated to advancing computing as a science and profession | International organization focused on fostering innovation and excellence in electrical, electronics, and computer engineering |
| Primary Focus/ Differences | Software, algorithms, and theoretical computing | Broader, covering electrical engineering, hardware, and standards development |
| Emphasis | Computing ethics, security, and intellectual property | Public safety, sustainability, and fair professional conduct |
| Overlap | Computing, research, and professional development in IT related fields  Collaboration on Computer Science, networking, AI, cybersecurity, and IT education | |

Complete Code of Ethics

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| **ACM** | **IEEE** |
| 1. General Ethical Principles  * Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. * Avoid harm. * Be honest and trustworthy. * Be fair and take action not to discriminate. * Respect the work required to produce new ideas, inventions, creative works and computing artifacts. * Respect privacy. * Honor confidentiality  1. Professional Responsibilities  * Strive to achieve high quality in both the processes and products of professional work * Maintain high standards of professional competence, conduct, and ethical practice * Know and respect existing rules pertaining to professional work * Accept and provide appropriate professional review * Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks * Perform work only in areas of competence * Foster public awareness and understanding of computing, related technologies, and their consequences * Access computing and communication resources only when authorized or when compelled by the public good * Design and implement systems that are robustly and usably secure  1. Professional Leadership  * Ensure that the public good is the central concern during all professional computing work * Articulate, encourage acceptance of, and evaluate fulfillment of social responsibilities by members of the organization or group * Manage personnel and resources to enhance the quality of working life * Articulate, apply, and support policies and processes that reflect the principles of the Code * Create opportunities for members of the organization or group to grow as professionals * Use care when modifying or retiring systems * Recognize and take special care of systems that become integrated into the infrastructure of society  1. Compliance with the Code  * Uphold, promote, and respect the principles of the Code * Treat violations of the Code as inconsistent with membership in the ACM | We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members, and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:   * to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment * to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist * to be honest and realistic in stating claims or estimates based on available data * to reject bribery in all its forms * to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems * to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations * to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others * to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression * to avoid injuring others, their property, reputation, or employment by false or malicious action * to assist colleagues and co-workers in their professional development and to support them in following this code of ethics |

Lesson 3

**3.1– Ethical and Societal Considerations in Computer Science**

**Intellectual property =**creations of the mind, such as inventions, literary and artistic works, designs, symbols, names, and images

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| Type | Definition | Subcategories | Description |
| Copyright  Marked with © | Legal protection for original works of authorship (eg books, music, software)  GNU GPL (General Public License) = software license that grants users freedom to use, modify, and distribute software under certain conditions | Fair use | Allows limited use of copyrighted material without permission for purposes such as education, criticism, or new reporting |
|  | | Public domain | Works that are not protected by copyright and can be used freely by anyone |
| Trademark  Marked with  Registered = ®  Unregistered = ™ | A symbol, word, or phrase legally registered or established by use as representing a company or product | Registered | A trademark officially recognized and protected by law |
|  | | Unregistered | A trademark used in commerce but not officially registered |
| Patent | Grants exclusive rights to an inventor to make, use, or sell an invention for a specific period | N/A | Protects new inventions, processes, or designs from being copied |

**Key Terms**

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| **Term** | **Definition** |
| **Cyberbullying** | **Using digital communication (social media, messaging, etc) to harass, intimidate, or harm others** |
| **Cybercrime** | **Illegal activities conducted online, such as hacking, theft, and fraud** |
| **File sharing** | **The distribution or transmission of digital files over a network** |
| **Malware** | **Malicious software designed to harm or exploit devices, networks, or users (eg viruses, ransomware, spyware)** |
| **Peer-to-peer Networks** | **A decentralized network where computers hare files directly without a central server, often used for file sharing** |
| **Piracy** | **The unauthorized copying, distribution, or use of copyrighted content (eg software, music, movies)** |