**University of Juba**

**School of Computer Science and Information Technology**

**Department of Computer Science, Information Technology & Cyber Security**

**Philosophy of Computer Science**

**Syllabus**

**Course Title:** *Philosophy of Computer Science*

**Course Description:**

This course will briefly explore topics related to the philosophy of computer science. It will start by defining core concepts like philosophy, computing, computer, algorithm, program, science, and AI to in-depth explanations how a computer works and why?

 Knowing the ***discipline*** of computer science is the combination of two words, ***computer***, and ***science***; we will define what a computer and science are in isolation. In computer science, our focus is not only the studying of the computer as a ***machine*** that consists of hardware and software but mainly ***the study of computing as a scientific process of problem-solving utilizing various programs or algorithms.*** Throughout your computer science Or IT study, you will be empowered with ***technical & soft computing knowledge*** to solve ***real-world problems***. Being a computer scientist Or an IT professional, ***you are obligated to come up with innovative solutions to solve today and future problems.***

Computer Science as a discipline has been making positive impacts almost in any field such as in ***technology, telecommunication, transportation, healthcare, engineering, energy and gas, national security, scientific research and development (R&D), banking & finance, commerce***, and many other domains.

We will explore the development of the field of computing in conjunction with the evolution of computers. Learners in this course will be pushed to develop critical thinking skills around the process of computing. Students in this course will be taught **how to think like computer scientists**. Utilizing ***theoretical and practical approaches***, students will be instructed to be detail-oriented and develop a passion for ***computational intelligence which is the ability of a computer to learn a specific task from data or experimental observation.***

Remember we are living in the “***information age”*** era where almost everything is driven by technology letting us wonder if we are the ones using technology or if technology is the one using us. Technology is one of the faster-growing fields so as a scientist; you are required to keep up with it through continued learning.

In computer science & IT study programs, having a ***suitable personal computer*** (laptop/desktop) is required to all CS & IT students because we believe that ***the more you practice the better you get***. Like basketball players or soccer players, the more they practices the better they perform in their games. So having regular hands-on will help you succeeds in your career as a computer scientist or an IT professional.

Like any other scientific discipline, computer science also has many main branches that require constant study due to their ***rapid growth*** such as ***software engineering, database systems, data communication and networking, computer architecture & design, operating systems, artificial Intelligence (AI), Computer Graphics, Gaming & Animations, Web Design & Development, Cybersecurity, Data Structures & Algorithm Designs,***and others. Therefore, specialized instructors of those topics will be invited as guest speakers to give us ideas about their specializations or ***interests***. The invited instructors will give students road maps of their ***specializations*** helping students to understand their ***career perspectives***.

To extend students’ understanding of philosophy as a discipline, an ***art instructor/philosopher*** will be invited to help us explain in-depth the primary terminologies such as ***metaphysical, epistemological, and ethical.****In addition, answers to the main*questions that are confronting computer and information scientists will be addressed.

Upon completing this course successfully, students are expected to come up with innovative computing solutions to solve our existing contemporary issues such as energy crisis, food shortages, global warming, financial corruptions, clean water shortage, and other related issues.

The questions should be asked, **what is the best or optimal solution for the given problem?** How can technology help in mitigating or eliminating the impacts of the given problem? Or how can technology prevent the specific problem from occurring in first place? Remember prevention is better than care.

This course will empower students to ***become technological inventors/leaders instead of just being followers or regular technology users.***

Students in this course will be pushed to question current solutions and propose their new **unique** optimal or best solutions to any given problem.

Throughout the study of the history of computing, the ***relationships*** between computer science and other ***STEM field (Science, Technology, Engineering, and Mathematics)***will be highlighted.

***Activities: Hand-On***

1. **Fundamentals of Programming using Java or *Python 🡺*** *Build simple back-end applications using either of the languages.*
2. Introduction to Web Design & Development with
3. Computer Science, IT, & Cybersecurity Career Lookups: focus on ***software engineering*** career path: required qualifications [educations, formal/informal training, skills, responsibilities, salaries, potential employers in South Sudan, Africa, & US/UK ]

* ***Computing Careers Roadmaps:*** titles, required qualifications [education, training, skills (technical & soft)] Ex. Software Engineer/full-stack developer for CS students, network Engineer/Technical Support for IT students, & cyber security engineering for the Cybersecurity students.

**Course Objectives:**

* Helps students to deeply understand the reasoning behind computer science's main operations.
* Explains metaphysical, epistemological, and ethical questions that confront computer and information scientists.
* Empowers students with the required technical knowledge to come up with innovative solutions to solve today and future problems.
* Provides computer science, IT, & cybersecurity career path in-depth so they can decide their focus early in their study.
* Help students think like computer scientists by providing them with required computing tactics, techniques, and procedures, & best practices.

**Course Learning Outcomes:**

***Upon completing this course successfully, students should be able to:***

* Able to apply computing methodologies to solve real-world problems by translating any given business problem into technical requirements.
* Familiar with the field of computing and its main branches.
* Able to develop dynamic web applications using HTML, CSS, JavaScript, and SQL.
* Able to plan, design, analyze, implement, test, and deploy simple applications.
* Understand programming languages’ levels, types, and generations
* Understanding the history of computer and the 5 generations of computer
* Know the main differences & similarities between CS, IT & cybersecurity and their career pathways.

**Required or Recommended References:**

1. Luciano Floridi's ***Philosophy and Computing*** (1999)
2. Timothy Colburn's ***Philosophy and Computer Science*** (2000)
3. Floridi's Blackwell ***Guide to the Philosophy of Computing and Information*** (2004)
4. ***A special issue of the philosophy journal The Monist*** (82:1 [1999])

**Computer Science Career Outlook**

***Career Road Maps in-depth:***

**List of Computer Science majors potential roles:**

1. Software Developer
2. Web Developer
3. UX Designer
4. Mobile Applications Developer
5. IT Project Manager
6. Information Security Analyst
7. System Architect
8. AI Engineer (AI/ML/DL)
9. Computer Hardware Engineer
10. Video Game Developer
11. Computer and information Research Scientists
12. Network Engineer
13. Computer support Specialist
14. Database Administrator
15. System Administrator/System Analyst/System Designer/ system Engineer
16. DevOps Engineer
17. DevSecOps Engineer
18. Emebbed system engineer
19. Security Engineer
20. Automation Engineer
21. Academician
22. Bioinformatics scientist

***Essential Skills for Computer Science, IT, & Cybersecurity:***

1. **Programming:** C/C++, JavaScript, **Python**, HTML, CSS, **Java**, SQL, NoSQL, C#, Rust, Perl, or Go
2. **Mathematics:** at least college **algebra** or any high-level college mathematics
3. **Data Analysis**: ability to collect, analyze, & share data following best data science practices – how to you can tell stories using data or make data driven decisions 🡺 data visualization
4. **Systems thinking**: knowing how system works 🡺 by taking system programming, computer organization & Architecture, system designs/Distributed systems. Being able to follow software engineering best practices to plan, analyze, build, test, and deploy an application. 🡺 Building full-stack applications.
5. **Algorithms**: able to map any given problems with learned algorithms 🡺 Algorithm Design and Analysis with respect to computing limitations & trade-offs.
6. **Cloud Computing Related Skills:** since most businesses are moving toward cloud to utilize cloud resources like data, storage, computing power (CPU/GPU), & Security (Security as a services) – knowing Web Services solutions it become also essential ex. Amazon Web Services (AWS), Alibaba Cloud, or Azure by MS.