National University of Engineering (UNI)
School of Artificial Intelligence
Syllabus 2027-I

1. COURSE

CS281. Computing in Society (Elective)

2. GENERAL INFORMATION

2.1 Course	:	CS281. Computing in Society
2.2 Semester	:	10th Semester.
2.3 Credits	:	2
2.4 Hours	:	2 HT;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Elective
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

This course explores the multifaceted relationship between computing technologies and society. It provides a historical perspective on the evolution of the field while equipping students with ethical analysis frameworks to navigate contemporary challenges. Topics include intellectual property, privacy, professional responsibility, sustainability, and the socio-economic impact of automation. Students will develop the communication skills and ethical sensitivity required for professional practice in a diverse and globalized environment.

5. GOALS

- Apply ethical analysis to professional dilemmas in computing.
- Understand the legal frameworks for Intellectual Property and Privacy.
- Evaluate the environmental sustainability and social impact of IT.
- Communicate effectively regarding professional and ethical issues.

6. COMPETENCES

AG-C01) The Professional and the World: Analyzes and evaluates the impact of solutions to complex computing problems on the sustainable development of society. (Usage)

AG-C02) Ethics: Applies ethical principles and commits to professional ethics and the standards of professional computing practice. (Usage)

7. TOPICS

Unit 1: Foundations and Early History of Computing (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• The history of computing: hardware, software, and human/organizational. • The role of history in the present including within different social contexts, and the relevance of this history on the future. • Age I (Pre-digital): Ancient analog computing (Stonehenge, Antikythera mechanism, Salisbury Cathedral clock, etc.), human-calculated number tables, Euclid, Lovelace, Babbage, Gödel, Church, Turing, pre-electronic (electro-mechanical and mechanical) hardware. • Age II (Early modern computing): ENIAC, UNIVAC, Bombes (Bletchley Park and codebreakers), computer companies (e.g., IBM), mainframes, etc.	• Understand the relevance and impact of computing history on recent events, present context, and possible future outcomes, from more than one cultural perspective [Assess] • Discuss how perspectives held today have been shaped by history, and that alternative perspectives exist (e.g., fears of AI replacing human workers vs AI augmenting human work, various views on Moore's Law) [Debate] • Identify formative and consequential trends in the history of the computing field [Analyze] • Identify the contributions of pioneering individuals or organizations (research labs, computer companies, government offices) in the computing field [Analyze]
Readings : [**Quinn2019**], [**Baase2017**]	

Unit 2: Social Impact and AI (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Social implications (e.g., political and cultural ideologies) in a hyper-networked world where the capabilities and impact of social media, artificial intelligence, and computing in general are rapidly evolving. • Impact of computing applications (e.g., social media, artificial intelligence applications) on individual well-being, and safety of all kinds (e.g., physical, emotional, economic). • Consequences of involving computing technologies, particularly artificial intelligence, biometric technologies, and algorithmic decision-making systems, in civic life (e.g., facial recognition technology, biometric tags, resource distribution algorithms, policing software) and how human agency and oversight is crucial. • Growth and control of the internet, data, computing, and artificial intelligence.	• Describe the different ways that computer technology (networks, mobile computing, artificial intelligence) mediates social interaction at the personal and collective levels [Describe] • Interpret the social context of a given design and its implementation [Interpret] • Analyze the efficacy of a given design and implementation using empirical data [Analyze] • Understand the implications of technology use (e.g., social media) for different identities, cultures, and communities [Explain] • Describe the internet's role in facilitating communication between citizens, governments, and each other [Describe] • Analyze the effects of reliance on computing in the implementation of democracy (e.g., delivery of social services, electronic voting) [Analyze] • Describe the impact of a lack of appropriate representation of people from historically minoritized populations in the computing profession (e.g., industry culture, product diversity) [Describe]
Readings : [**Quinn2019**]	

Unit 3: Ethical Foundations and Frameworks (4 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Avoiding fallacies and misrepresentation in argumentation. • Ethical theories and decision-making (philosophical and social frameworks, e.g. [1]). • Recognition of the role culture plays in our understanding, adoption, design, and use of computing technology. • Why ethics is important in computing, and how ethics is similar to, and different from, laws and social norms. • Introduction to ethical frameworks (e.g., consequentialism such as utilitarianism, non-consequentialism such as duty, rights, or justice, agent-centered such as virtue or feminism, contractarianism, ethics of care) and their use for analyzing an ethical dilemma.	• Describe how a given cultural context impacts decision making [Describe] • Express the use of example and analogy in ethical argument [Analyze] • Analyze (and avoid) basic logical fallacies in an argument [Analyze] • Analyze an argument to identify premises and conclusion [Analyze] • Evaluate how and why ethics is so important in computing and how it relates to cultural norms, values, and law [Evaluate] • Justify a decision made on ethical grounds [Justify] • Discuss the advantages and disadvantages of traditional ethical frameworks [Debate] • Analyze ethical dilemmas related to the creation and use of technology from multiple perspectives using ethical frameworks [Analyze]
Readings : [**Quinn2019**], [**Baase2017**]	

Unit 4: Professional Values, Nature and Continuing Development (4 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Community values and the laws by which we live. • The nature of being a professional including care, attention, discipline, fiduciary responsibility, and mentoring. • Keeping up to date as a computing professional in terms of familiarity, tools, skills, legal and professional frameworks as well as the ability and responsibility to self-assess and progress in the computing field.	• Identify ethical issues that arise in software design, development practices, and software deployment [Analyze] • Discuss how to address ethical issues in specific situations [Debate] • Describe the mechanisms that typically exist for a professional to keep up to date in ethical matters [Describe]
Readings : [**Baase2017**]	

Unit 5: Intellectual Property Foundations (4 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Intellectual property rights. • Legal foundations for intellectual property protection. • Philosophical foundations of intellectual property. • Forms of intellectual property (e.g., copyrights, patents, trade secrets, trademarks) and the rights they protect.	• Defend legal and ethical uses of copyrighted materials [Defend] • Discuss the philosophical bases of intellectual property in an appropriate context (e.g., country) [Debate] • Contrast the protections and obligations of copyright, patent, trade secret, and trademarks [Contrast] • Describe the rationale for the legal protection of intellectual property in the appropriate context (e.g., country) [Describe]
Readings : [**Quinn2019**]	

Unit 6: Digital IP Rights and Copyright (6 hours)	
Competences Expected:	
Topics	**Learning Outcomes**
• Intangible digital intellectual property (IDIP). • Limitations on copyright protections, including fair use and the first sale doctrine. • Intellectual property laws and treaties that impact the enforcement of copyrights.	• Describe and critique legislation and precedent aimed at digital copyright infringements [Describe] • Identify contemporary examples of intangible digital intellectual property [Analyze] • Discuss whether a use of copyrighted material is likely to be fair use [Debate] • Analyze the use of copyrighted work under the concepts of fair use and the first sale doctrine [Analyze] • Discuss the nature of anti-circumvention laws in the context of copyright protection [Debate]
Readings : [**Tavani2013**]	

Unit 7: Data, Surveillance and Privacy Technology (4 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Privacy implications of widespread data collection including but not limited to transactional databases, data warehouses, surveillance systems, cloud computing, and artificial intelligence. • Conceptions of anonymity, pseudonymity, and identity. • Technology-based solutions for privacy protection (e.g., end-to-end encryption and differential privacy).	• Evaluate solutions to privacy threats in transactional databases and data warehouses [Evaluate] • Describe the role of data collection in the implementation of pervasive surveillance systems (e.g., RFID, face recognition, toll collection, mobile computing) [Describe] • Distinguish the concepts and goals of anonymity and pseudonymity [Distinguish] • Describe the ramifications of technology-based privacy protections, including differential privacy and end-to-end encryption [Describe]
Readings : [**Baase2017**]	

Unit 8: Environmental Footprint of Computing Systems (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Environmental, social, and cultural impacts of implementation decisions (e.g., sustainability goals, algorithmic bias/outcomes, economic viability, and resource consumption). • Local/regional/global social and environmental impacts of computing systems and their use (e.g., carbon footprints, resource usage, e-waste) due to hardware (e.g., e-waste, data centers, rare element and resource utilization, recycling) and software (e.g., cloud-based services, blockchain, AI model training and use). This includes everyday use of hardware (cheap hardware replaced frequently) and software (web-browsing, email, and other services with hidden/remote computational demands).	• Assess the environmental impacts of a given project's deployment (e.g., energy consumption, contribution to e-waste, impact of manufacturing) [Assess] • Describe global social and environmental impacts of computer use and disposal [Describe] • Describe the environmental impacts of design choices within the field of computing that relate to algorithm design, operating system design, networking design, database design, etc [Describe] • Assess computing applications in respect to environmental issues (e.g., energy, pollution, resource usage, recycling and reuse, food management and production) [Assess]
Readings : [**Quinn2019**]	

Unit 9: Economic Models and Strategies (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Economic models: regulated and unregulated, monopolies, network effects, and open market; knowledge and attention economies. • Pricing and deployment strategies: planned obsolescence, subscriptions, freemium, software licensing, open-source, free software, adware. • Impacts of differences in access to computing resources, and the effect of skilled labor supply and demand on the quality of computing products.	• Summarize the social effects of economic models (e.g., the knowledge and attention economies) [Summarize] • Describe the differences and similarities of competing strategies (e.g., subscription vs freemium vs free) [Describe] • Discuss examples of digital divides [Debate]
Readings : [**Baase2017**]	

Unit 10: Computer Crimes and Attacks (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Computer crimes, legal redress for computer criminals and impact on victims and society. • Social engineering, computing-enabled fraud, identity theft and recovery from these. • Cyber terrorism, criminal hacking, and hacktivism. • Malware, viruses, worms. • Attacks on critical infrastructure such as electrical grids and pipelines.	• List classic examples of computer crimes and social engineering incidents with societal impact [List] • Identify issues with laws that apply to computer crimes [Analyze] • Describe the motivation and ramifications of cyber terrorism, data theft, hacktivism, ransomware, and other attacks [Describe] • Examine the ethical and legal issues surrounding the misuse of access and various breaches of security [Examine]
Readings : [**Baase2017**]	

Unit 11: Identity and Diversity in Computing (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• How identity impacts and is impacted by computing technologies and environments (academic and professional). • The benefits of diverse development teams and the impacts of teams that are not diverse.	• Define and distinguish equity, equality, diversity, inclusion, and accessibility [Define] • Identify examples of the benefits that diverse teams can bring to software products, and how a lack of diversity has costs [Analyze] • Assess the impact of power and privilege in the computing profession as it relates to culture, industry, products, and society [Assess]
Readings : [**Quinn2019**]	

Unit 12: Technical and Professional Communication (2 hours)	
Competences Expected: AG-C01,AG-C02	
Topics	**Learning Outcomes**
• Oral, written, and electronic team and group communication. • Technical communication materials (e.g., source code, and documentation, tutorials, reference materials, API documentation). • Communicating with different stakeholders such as customers, leadership, or the public. • Tradeoffs in competing factors that affect communication channels and choices.	• Understand the importance of writing concise and accurate technical documents following well-defined standards for format and for including appropriate tables, figures, and references [Produce] • Analyze written technical documentation for technical accuracy, concision, lack of ambiguity, and awareness of audience [Analyze] • Compose and deliver an audience-aware, accessible, and organized formal presentation [Compose] • Identify and describe qualities of effective communication (e.g., virtual, face-to-face, intragroup, shared documents) [Analyze] • Choose an appropriate way to communicate delicate ethical concerns [Assess]
Readings : [**Quinn2019**]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY