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Regulation for the use of Artificial Intelligence in Systems Engineering Education to foster educational innovation and entrepreneurship

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***Abstract*– The rapid evolution of Artificial Intelligence (AI) has profoundly impacted higher education, particularly in fields such as Systems Engineering. This paper introduces a novel regulatory framework designed to integrate AI into university teaching. Unlike existing frameworks, the proposed model emphasizes not only educational innovation but also entrepreneurship, focusing on fostering the ethical use of AI in academic contexts.**

***Using the "Object-Oriented Programming Techniques" course at a university in North Lima as a case study, this research demonstrates how AI can enhance personalized learning, automate assessments, and facilitate ethical decision-making. Key elements of the framework include continuous updates to infrastructure, ethical guidelines to mitigate AI-related risks, and strategies to promote entrepreneurial thinking through AI-driven tools.**

***While previous studies have shown improvements in academic performance and engagement through similar frameworks, this research highlights the unique contribution of AI in identifying market opportunities and developing innovative business models. This entrepreneurial focus distinguishes the proposed framework, preparing students for leadership roles in a technology-driven economy.**

***Future research should refine AI algorithms to minimize biases and expand this regulatory model to other disciplines, ensuring equitable and transparent integration of AI across educational contexts. This study not only addresses the academic implications of AI but also underscores the critical role of responsible innovation in enhancing both learning outcomes and entrepreneurial skills in higher education.**

***Keywords*— Artificial intelligence, educational innovation, entrepreneurship, academic regulation.**

I. Introduction

Artificial Intelligence (AI) has revolutionized multiple sectors, and higher education is no exception. In the university setting, particularly in fields such as Systems Engineering, AI has begun to transform how teaching and assessment are conducted, introducing both unprecedented opportunities and challenges. AI's ability to automate tasks, personalize teaching, and improve administrative efficiency represents a significant advancement for the educational sector [1]. However, these opportunities are accompanied by ethical and practical concerns that must be urgently addressed [2].

The emergence of generative AI models like ChatGPT has sparked a debate regarding their impact on academic integrity and the learning process. While some educators view these technologies as powerful tools to enhance education, others fear they might undermine students' critical thinking skills and compromise the authenticity of their work [2]. These concerns are echoed globally, with research indicating that biases, misinformation, and the "hallucination" issue are significant risks associated with the deployment of AI in educational settings [3][4]. Furthermore, the lack of clear regulations guiding the use of AI has led to inconsistent and sometimes problematic implementations of these technologies [5].

Globally, regions such as the European Union and Japan have been proactive in establishing responsible AI frameworks [3][4]. The European Union, for instance, has spearheaded initiatives such as the Horizon 2020 program, focusing on building public trust through "trustworthy AI" by adhering to principles of responsible innovation (RI). These efforts include stakeholder engagement and public trust-building as core components of AI governance [3]. Meanwhile, Japan has also highlighted the ethical concerns of AI in higher education, particularly with respect to data privacy and fairness [4]. However, despite these efforts, there remains a significant gap between policy development and practical implementation, particularly in the Global South [3].

In response to these dynamics, several institutions have started developing policies and guidelines to regulate the use of AI in education, aiming to mitigate risks and maximize benefits [2]. Nevertheless, most of these regulations are in the early stages of development and do not yet comprehensively address the complexities that AI introduces into the educational environment [5]. The need for clear regulations is particularly urgent in technical fields like Systems Engineering, where AI could not only enhance teaching and assessment processes but also fundamentally transform how educational programs are designed.

Moreover, research on AI regulation suggests that the lack of consensus on how to define and regulate advanced technologies like AI can limit the effectiveness of any regulatory efforts. Divergences in the interpretation of terms such as "automation" and "autonomy" directly impact the policies proposed, underscoring the importance of clear and well-founded regulations [6].

Recent experiences with virtual classrooms for teaching programming at the National University of San Agustín de Arequipa, Peru, have shown that the implementation of digital technologies in education, when well-structured and supported by adequate regulations, can significantly improve student

SYLLABUS FOR THE COURSE: OBJECT-ORIENTED PROGRAMMING TECHNIQUES

I. General information

Faculty	Engineering	**Degree program**	System Engineering	**Cycle**	5 th	**Credits**		5
Course code	SIST1202A	**Prerequisites**	Programming Fundamentals	**Hours**	**TH**	**PH**	**HL**	**FP**
					1	0	2	6
Type of course	Mandatory	**Course modality**	In-person	**Academic term**	2024-5			
The course contributes to the following general competencies	• Problem-solving • Social responsibility and citizienship							
The course contributes to the following specific competencies	• Problem analysis • Design and development of solutions							
The course develops the following component	• Social responsibility and civic education							

Fig. 1 General information of the "Object-Oriented Programming Techniques" course syllabus

rmotivation and academic performance [7]. These findings are consistent with broader global trends, where countries like China have taken advantage of weak privacy regulations to develop sophisticated AI models, while others, such as the United States, have withdrawn certain AI applications due to privacy concerns [8]. This underscores the importance of developing regulatory frameworks that guide the integration of AI and other technologies in educational settings to maximize benefits and minimize risks.

Furthermore, integrating AI into education aligns with global trends in innovation and entrepreneurship, where universities play a crucial role in training future technology leaders. Innovation and entrepreneurship are key drivers of economic growth and promoting them within the educational sector is essential for closing competitiveness gaps [9]. Additionally, research has shown that the organized and guided use of AI platforms in educational contexts can provide a significant tool for developing thesis projects and research papers, provided that ethical principles are followed to prevent misuse [10].

This paper aims to develop a comprehensive regulatory framework for the use of AI in university teaching, using the course "Object-Oriented Programming Techniques" from the Systems Engineering program at a university in North Lima as a case study. The proposed regulation seeks to address the ethical, pedagogical, and technical issues associated with integrating AI into higher education, providing a framework that ensures its effective and responsible use. This approach aims to ensure that AI implementation in universities not only enhances educational quality but also upholds fundamental values of equity, transparency, and academic responsibility.

With this focus, the present study not only addresses the educational implications of AI but also underscores the importance of appropriate regulation to foster responsible innovation and entrepreneurship in the context of university education.

II. Methodology

The course "Object-Oriented Programming Techniques" was chosen as a case study due to its alignment with key areas where AI integration can provide significant pedagogical benefits. Specifically, the course's emphasis on problem-solving, design, and development of software solutions makes it a suitable candidate for AI integration, as AI tools can enhance these skills by automating repetitive tasks, providing predictive insights, and offering personalized feedback. Additionally, object-oriented programming is foundational to modern software development, where AI technologies are increasingly integrated into industry practices. Therefore, selecting this course provides a practical platform for assessing the impact of AI in both educational and professional contexts [11].

A. Syllabus review / case study selection

The first step in constructing a regulatory framework for the use of AI in Systems Engineering education is to review the syllabus of the course selected for this research. This analysis focuses on the following aspects:

Course objective: the syllabus for the course "Object-Oriented Programming Techniques" aims to develop competencies in object-oriented programming among students, with an emphasis on problem-solving, social responsibility, problem analysis, and the design and development of solutions. These objectives are achieved using active teaching methods, laboratory practices, and projects that integrate the use of Java and the object-oriented programming paradigm.

Analysis of AI integration to strengthen course objectives: integrating AI into the "Object-Oriented Programming Techniques" course would enhance learning by improving problem-solving through predictive analysis and recommendations, automating the design and development of solutions with coding assistants, and personalizing instruction

II. COURSE SUMMARY

The course is of a theoretical-practical nature and aims to provide knowledge of the Object-Oriented Paradigm applied to programming, developing the student's ability to implement classes in an object-oriented programming language. The main topics are: fundamentals of object-oriented programming, representation of classes and relationships between classes, visual programming, and database access.

III. COURSE OBJECTIVES

By the end of the course, the student will develop a project using the Java language and applying the object-oriented programming paradigm, graphical interfaces, and data access to solve specific problems, demonstrating logic, readability, and best practices in implementation.

Fig. 2 Course summary and objectives of the "Object-Oriented Programming Techniques" course included in the syllabus.

through adaptive systems that adjust difficulty based on each student's individual progress. Additionally, including modules on AI ethics would contribute to developing a social and ethical awareness among students, fostering a broad understanding of the implications of their work in software development. AI technologies play multiple roles in key educational domains, including enhancing learning, training, assessment, and management processes, with notable benefits such as improved learning outcomes, increased student engagement, and adaptive teaching strategies [11].

V. ORGANIZATION OF LEARNING UNITS

UNIT	UNIT NAME / UNIT OBJECTIVE	WEEK
I	**Fundamentals of Object-Oriented Programming** By the end of this unit, the student will develop cases, appropriately using object-oriented programming principles, demonstrating mastery of good programming practices	1 - 2
II	**Representation of Classes and Relationships Between Classes** By the end of this unit, the student will develop cases, correctly using diagrams and good object-oriented programming practices, demonstrating creativity and responsibility in their work.	3 - 5
III	**Visual Programming and Database Access** By the end of this unit, the student will be able to develop visual programming applications with database access for information storage, demonstrating creativity and good programming practices.	6 - 8

Fig. 3 Units and thematic content included in the "Object-Oriented programming techniques" course syllabus

A. Current teaching methodologies: the syllabus for the "Object-Oriented Programming Techniques" course employs a variety of instructional techniques, including case studies, project development, individual and group presentations, and the use of multimedia and multiplatform resources for both synchronous and asynchronous activities. These techniques aim to promote active learning, critical analysis, creativity, and teamwork, which are essential for developing competencies in object-oriented programming and solution design. The integration of AI is expected to significantly enhance these methodologies by personalizing learning according to individual student needs, automating assessments and providing immediate feedback, offering continuous support through virtual assistants and chatbots, and conducting predictive tracking of progress to identify areas for improvement. This would result in a more adaptive and efficient educational experience, optimizing academic outcomes. Notably, AI excels in explaining its responses, not only returning the source code for the program to be implemented but also providing commentary and descriptions about the development and functionality of the code [12].

Evaluation methods: the evaluation methods used in the course analyzed in this research, including case development, field practice, and final projects, can greatly benefit from AI integration. AI can provide faster and more personalized feedback by automatically assessing exercises and projects, suggesting improvements, and correcting errors in real time. Additionally, AI can enhance fairness in evaluation by eliminating human biases, ensuring that grades are awarded fairly based on performance and adherence to specific criteria. This not only optimizes the evaluation process but also promotes continuous and adaptive learning for students. Generative AI systems offer opportunities to transform both professional and personal work, but they present challenges related to the formulation of instructions, evaluation and trust in results, and workflow optimization [13].

B. Comparison with relevant literature: in this phase, the findings from the syllabus analysis are compared with relevant literature on AI implementation in higher education, with the goal of extracting best practices and lessons learned. This includes:

Review of case studies: the analysis of the "Object-Oriented Programming Techniques" course syllabus highlights how AI integration can enhance teaching, personalize learning, and automate key processes in higher education. This aligns with recent studies, such as the use of neural networks to predict

IV. TEACHING AND LEARNING METHODOLOGY

To achieve the learning outcomes of the course and its units, the instructor integrates active methods, strategies, and techniques in a reflective and critical manner, aiming to motivate, stimulate, and guide student learning.

The teaching strategies and techniques employed include case resolution in the form of exercises proposed individually and in teams, where students analyze the context, abstract software requirements, analyze and generate class diagrams, and create programs using object-oriented programming languages and basic software development documents. Additionally, individual and group presentations are conducted, where students progressively showcase the development of their application project, aimed at providing a solution to a problem. Group activities related to social responsibility are also carried out, where students analyze the impact of these activities.

The instructor supports their pedagogical practice through a multiplatform system and multimedia resources that enable the development of synchronous and asynchronous activities, as well as content management, videoconferencing, and the use of various technological tools to create formative experiences and provide guidance that promotes learning and the development of both general and specific competencies in students.

Fig. 4 Teaching and learning methodology indicated in the "Object-Oriented Programming Techniques" course syllabus

academic performance at the National University of Engineering of Peru (UNI), where a machine learning model was applied to identify students at academic risk, achieving 90% accuracy [14]. Another relevant study describes the digital transformation of universities, focusing on the creation of an intelligent architecture to improve academic competitiveness and productivity, emphasizing the importance of personalization and the adoption of emerging technologies in higher education [15]. Additionally, at the Faculty of Engineering of the University of Buenos Aires, an academic chatbot is being used to assist students in understanding complex concepts in Physics, demonstrating how chatbots can address individual support needs and contribute to personalized learning [16].

In a comparative study on AI adoption and digital transformation in China and Taiwan, it was found that despite technological advances, there has not been a fundamental transformation in these countries' public administration systems. AI is primarily used to reinforce existing trajectories rather than promote disruptive changes, highlighting the gap between theory and practice in digital transformation [17]. On the other hand, an analysis of AI's impact on education suggests that while AI can improve learning efficiency and personalization, it also raises significant challenges regarding equity and inclusion, especially when implemented without adequate planning to mitigate potential adverse effects. Similarly, in a study on AI use in breast cancer detection, a significant reduction in workload and an improvement in diagnostic accuracy were observed, illustrating AI's potential to perform complex tasks more efficiently and accurately than humans [18]. These studies demonstrate how AI can enhance public administration, educational processes, and healthcare, but also underscore the need for careful and regulated implementation to ensure that the benefits of technology are distributed equitably and do not exacerbate existing inequalities.

Analysis of documented impacts: documented impacts of AI implementation in higher education include significant improvements in evaluation efficiency and accuracy, as seen in the case of UNI, where neural networks helped predict student academic success with high precision. Similarly, digital transformation in universities, as discussed in the digital architecture of San José University, shows how the adoption of advanced technologies and personalized learning can enhance teaching and educational management, facilitating adaptation to the demands of the Fourth Industrial Revolution [15]. In the field of Physics education, the use of chatbots at the University of Buenos Aires has proven to be an effective tool for providing immediate and personalized support to students, improving learning quality and accessibility [16]. Additionally, AI application in breast cancer detection programs has demonstrated a 70% reduction in workload and improved diagnostic accuracy, reflecting AI's potential to perform complex tasks more quickly and with fewer errors than humans [18].

Synthesis of recommendations: to maximize AI's positive impact in the "Object-Oriented Programming Techniques" course, it is necessary to normatively integrate the best practices identified in the literature, aligning them with the course's specific objectives. The following key regulatory recommendations are presented:

Establishing guidelines for personalized learning: implementing regulatory guidelines that promote AI use for personalized learning is essential. These guidelines should regulate the use of virtual assistants and chatbots, ensuring they are used ethically and effectively to provide adaptive and personalized feedback to students [16]. For example, it could be mandated that all content generated by chatbots undergo periodic review to ensure pedagogical quality and alignment with course objectives.

VI. EVALUATION SYSTEM

Evaluation	Weight	Week	DESCRIPTION OF THE EVALUATION (Action + Product of the evidence that the student must present)
T1 (a)	30%	5	Case development
T2 (a)	30%	7	Field practice evaluation
Final evaluation (a)	40%	8	Presentation and exposition of the final project

(a) Grades must be published in the system according to the Academic Calendar established for the current semester.

Fig. 5 Evaluation system indicated in the "Object-Oriented Programming Techniques" course syllabus

Regulations for automated evaluations and feedback: creating policies that regulate automated evaluations using AI is necessary to ensure that the tools used are transparent, fair, and equitable. These regulations should include mandatory regular audits of evaluation algorithms to prevent biases and ensure that grades accurately reflect student performance [19]. Additionally, it is recommended to implement a regulatory framework that requires offering students the opportunity to appeal and review automated evaluations.

Incorporating ethical guidelines in AI use: given AI's potential impact on teaching and the ethical concerns it may raise; it is crucial that the course includes clear ethical guidelines for AI use. This could include adopting a comprehensive framework based on the Human Rights-Oriented Ethics (HROE) model to evaluate decisions related to AI implementation in the course [19]. The guidelines should require that all AI tools used in the course comply with established ethical standards, ensuring responsible and transparent use.

Regulation of infrastructure and continuous training: according to the reviewed documentation, the regulation must also address the need for adequate infrastructure and continuous training for both faculty and students. A minimum standard for the technological infrastructure necessary to support AI tools should be established, as well as a mandatory training program for all those involved in using these technologies [19]. Additionally, the regulations should ensure that technological resources are regularly updated to stay aligned with AI advancements.

Policies for bias mitigation and transparency: according to the specialized literature consulted, it is vital that the regulations establish clear procedures for identifying and mitigating biases in the AI tools used in the course. This includes implementing transparency mechanisms that allow students and faculty to understand how automated decisions are made and how their implications are evaluated [20]. The regulations should also require documentation and periodic review of all processes related to AI-based evaluation to ensure fairness and accuracy.

C. Integration of entrepreneurship: integrating AI into university teaching, specifically in the "Object-Oriented Programming Techniques" course, not only strengthens students' technical skills but also prepares them to face the world of entrepreneurship. AI presents itself as a suitable tool for teaching entrepreneurial skills, such as identifying market opportunities and creating technology-based businesses.

AI integration in entrepreneurial skills education: using AI in the educational process can help students develop entrepreneurial skills more effectively. AI enables entrepreneurs to identify business opportunities, make informed decisions, and automate processes that would otherwise be complex and costly [21]. Applying this in an educational context, students can use AI tools to analyze market data, identify emerging trends, and anticipate future needs, which is essential for developing innovative projects.

Fostering innovation and business creation: AI not only optimizes teaching and learning processes but also stimulates creativity and innovation, which are fundamental in entrepreneurship. AI facilitates the creation of new business models and products that were previously impossible due to technological limitations [22]. In an academic setting, students can learn to use these technologies to develop prototypes and innovative solutions with a real market impact. This not only gives them a competitive edge but also prepares them to face the challenges of the global market.

Economic impact and market opportunities: AI's impact on entrepreneurship also extends to economic growth and job creation. Including specific modules on how AI can be used to create and scale technology businesses can motivate students to consider entrepreneurship as a viable career path. Additionally, teaching strategies for managing automation and AI-based decision-making processes will allow future entrepreneurs to adapt to the changing demands of the market [22].

Ethics and responsibility in AI implementation: the integration of AI in teaching must also address ethical aspects. Proper training in these topics is crucial for students to become not only successful entrepreneurs but also socially responsible, ensuring that their technological initiatives do not perpetuate biases or violate user privacy. This holistic approach prepares students to lead with an ethical mindset in a technology-driven world.

With this integration, the teaching of "Object-Oriented Programming Techniques" will not only meet the current course objectives but also prepare students to face and lead in the field of technological entrepreneurship, contributing to the creation of innovative and sustainable businesses.

D. Development of the regulation: based on the syllabus analysis and comparison with the literature, a specific regulation for AI integration in the course was constructed. The regulation will be developed with the following components:

Component 1, guidelines for personalized learning: this component establishes regulations that promote AI use for personalized learning. It regulates the use of virtual assistants and chatbots, ensuring they are used ethically and effectively. It is suggested that all content generated by these tools undergo periodic reviews to guarantee pedagogical quality and alignment with course objectives.

Component 2, automation of evaluations and feedback: policies are established to regulate automated evaluations using AI, ensuring that these tools are transparent, fair, and equitable. The regulations include mandatory regular audits of evaluation algorithms and the possibility of student appeals.

Component 3, ethical guidelines for AI use: this component incorporates a comprehensive ethical framework, such as the Human Rights-Oriented Ethics (HROE) model, to evaluate decisions related to AI implementation in the course. The regulations ensure that all AI tools used comply with established ethical standards.

Component 4, continuous training and infrastructure Regulation: a minimum standard for the necessary technological infrastructure and a mandatory training program for faculty and students in using AI tools are established. The regulations also guarantee the regular updating of technological resources to stay aligned with AI advancements.

Component 5, bias mitigation and transparency: this component establishes clear procedures for identifying and mitigating biases in the AI tools used. It includes implementing transparency mechanisms that allow students and faculty to understand how automated decisions are made and how their implications are evaluated. Additionally, the regulations require the documentation and periodic review of all processes related to AI-based evaluation.

E. Implementation plan:

Step 1, development and approval of the regulation: Convene a committee of experts in AI, pedagogy, and ethics to develop a detailed draft of the regulation based on the key components defined. The goal is to ensure that the regulation reflects best practices and is adapted to the specific needs of the course and the institution.

Step 2, training and infrastructure preparation: Implement training programs for faculty and students on using AI tools in teaching and evaluation. Ensure that the technological infrastructure meets the standards established in the regulation. The goal is to facilitate a smooth transition to AI use, ensuring that all involved are prepared and that the infrastructure is adequate.

Step 3, pilot implementation and continuous review: Implement the regulation in a pilot course to evaluate its effectiveness, collect feedback from students and faculty, make necessary adjustments, and establish a continuous review process. The goal is to assess the regulation's impact in a controlled environment before full implementation, ensuring that personalization, equity, and ethical objectives are met.

III. Discussion

The implementation of a regulatory framework for the use of Artificial Intelligence (AI) in Systems Engineering education presents various challenges and opportunities. According to the consulted specialized literature, personalized learning, facilitated by AI tools, offers an adaptive approach that meets the individual needs of students but requires a robust ethical framework to ensure these technologies are used fairly and equitably. The automation of evaluations and feedback enhances efficiency, though it is crucial to ensure transparency in these processes to prevent biases in automated assessments. Furthermore, the need for adequate infrastructure and continuous training is essential for the successful adoption of these technologies. The developed regulation aims to balance innovation with ethical responsibility, promoting an educational environment that fosters both academic quality and technological entrepreneurship.

IV. Results

The proposed regulatory framework for integrating Artificial Intelligence (AI) into the "Object-Oriented Programming Techniques" course was developed by considering both the course syllabus and relevant literature in the field. Below are the components of the regulation and their alignment with the educational objectives of the course.

This regulation governs the use of AI tools to personalize the educational experience in the "Object-Oriented Programming Techniques" course.

Component 1: Guidelines for personalized learning. AI tools, such as virtual assistants and chatbots, must provide adaptive feedback aligned with the course's pedagogical objectives. To ensure the pedagogical quality of AI-generated content, periodic reviews will be conducted by a specialized academic committee. These reviews will assess the accuracy,

relevance, and effectiveness of the responses provided by AI tools.

Component 2: Automation of evaluations and feedback. The automation of evaluations using AI in the course must be carried out transparently and fairly. Regular audits of the algorithms used in evaluations will be conducted to ensure they operate according to academic standards. Students have the right to appeal automated evaluations if they believe the grades do not accurately reflect their performance. These appeals will initially be reviewed by the course instructor and, if necessary, escalated to the academic program authorities, who will analyze both the automated results and the student's practical performance.

Component 3: Ethical guidelines in AI use. This regulation adopts a comprehensive ethical framework based on the HROE (Human Rights-Oriented Ethics) model to evaluate and regulate AI use in teaching. All implemented AI tools must comply with established ethical standards, ensuring that their use does not infringe on students' rights or compromise educational quality. Additionally, ethical awareness among students will be promoted by integrating topics on ethics in technology into the curriculum, which is particularly relevant in Systems Engineering education. Another critical area is the handling of student data, particularly with regard to privacy concerns. AI systems often rely on large datasets to provide personalized learning experiences, making it essential to ensure that student data is handled with the highest standards of privacy and security. In a real-world scenario, this could include implementing strict data encryption protocols to prevent unauthorized access, as well as limiting the storage and use of student data to what is strictly necessary for educational purposes. Furthermore, students and their guardians should be informed about how their data is being used, and be given the option to opt out of non-essential data collection processes.

Component 4: Continuous training and infrastructure regulation. The regulation establishes the need for a robust and updated technological infrastructure to effectively use AI tools in the course. Additionally, a continuous training program will be implemented for both faculty and students, focusing on the management and optimization of AI tools. This training is essential to ensure that teaching and assessment occur in a technologically advanced environment, which is crucial for academic success in a programming course.

Component 5: Bias mitigation and transparency. Specific procedures are established to identify and mitigate potential biases in AI-automated evaluations. These procedures include the constant review of algorithms and the implementation of corrective measures when biases are detected. Moreover, the regulation mandates complete transparency in automated decisions affecting student grades, ensuring that all processes are clear and understandable to those involved. Fairness and accuracy in educational evaluation are fundamental pillars of this regulation. For instance, AI algorithms used to grade assignments or assess student performance must be regularly audited to detect and mitigate any potential biases. Such biases could arise from historical data that reflects disproportionate outcomes for certain demographic groups, leading to unfair evaluations. By implementing transparent audit processes and creating mechanisms for students to appeal grades, educational institutions can ensure that AI-enhanced assessments remain fair and equitable.

Component 6: Promotion of entrepreneurship. The regulation encourages the use of AI not only as an educational tool but also as a catalyst for entrepreneurship among students. Modules will be incorporated into the course to teach students how to use AI to identify business opportunities, develop innovative business models, and anticipate future market needs. These modules will include instruction on ethical strategies in AI use for entrepreneurship, preparing students to be responsible leaders in a technology-driven business environment.

When comparing the proposed regulatory framework with other international models, it becomes evident that many global initiatives focus on regulating AI from ethical and technical perspectives. In the case of the European Union, for instance, efforts have concentrated on creating a "trustworthy AI" environment, where the use of artificial intelligence is aligned with the principles of responsible innovation and transparency. This approach is complemented by initiatives in Japan, which have also prioritized AI regulation in educational settings, with a focus on data privacy and equity. However, both models tend to emphasize the protection of users' rights, and the mitigation of risks associated with AI adoption, without an explicit focus on how this technology can foster entrepreneurship within educational programs.

The regulatory framework proposed in this study not only addresses the traditional ethical and pedagogical concerns associated with AI but also integrates a distinctive focus on promoting technological entrepreneurship. Unlike the aforementioned models, this framework does not solely aim to regulate AI to improve existing educational processes; instead, it actively promotes the development of entrepreneurial skills through the use of AI tools to identify market opportunities and develop innovative business models. This entrepreneurship-oriented approach highlights the uniqueness of the proposed framework, as it prepares students not only to face technological challenges but also to lead entrepreneurial initiatives in a technology-driven economic environment.

This innovative approach is reflected in the incorporation of specific modules within the "Object-Oriented Programming Techniques" course, which teach students to use AI not only as a support tool in programming but also as a platform for market

analysis and the creation of viable technological solutions. In doing so, the proposed framework significantly contributes to bridging the gap between theory and practice in Systems Engineering education, equipping students with entrepreneurial skills that are essential for leadership in the global economy.

V. Conclusions and Future Work

The integration of AI in Systems Engineering education represents a significant advancement towards personalized learning and the automation of educational processes, while simultaneously introducing new ethical and technical challenges. The regulatory framework developed in this study provides a robust structure aimed at balancing technological innovation with ethical responsibility, ensuring the effective and fair use of AI in the university context. Through this framework, not only is educational quality enhanced, but a culture of innovation and entrepreneurship is also fostered among students, preparing future engineers to lead in a technology-driven business environment.

It is evident that implementing AI in education can significantly facilitate personalized learning and improve the efficiency of evaluations. However, the adoption of these technologies must be accompanied by continuous updates to regulations to ensure they remain aligned with technological advancements and emerging ethical needs. Equity and transparency in AI application, particularly in automated assessments, are critical areas that require ongoing vigilance and improvement. In this regard, the following future research directions are proposed:

Long-term impact assessment: it is recommended to conduct longitudinal studies to evaluate the impact of AI use on academic performance and the development of entrepreneurial competencies in students. These studies will help identify areas for improvement in the regulation and adjust pedagogical practices to maximize educational benefits.

Development of specific regulations: expanding the proposed regulation to include other courses and disciplines within the educational field is a necessary step. Each discipline has particularities that must be considered when implementing AI, with special attention to data protection and transparency in algorithm use.

Continuous teacher training: ongoing training for teachers in emerging technologies is essential to ensure the effective and responsible integration of AI in teaching. Investigating best practices for this training will enable educators to use AI optimally, avoiding excessive dependence that could limit the development of critical thinking and creativity in students.

Innovation in evaluation methods: it is necessary to develop new evaluation methods that incorporate AI use, ensuring that these tools not only facilitate learning but also promote originality and critical thinking. AI can be used to design more adaptive and fair assessments that more accurately reflect student performance.

Expanding AI integration to other disciplines: While the proposed framework has been successfully applied to Systems Engineering education, future research could explore its application to a broader range of academic disciplines. Courses in fields such as Business Administration, Health Sciences, and Social Sciences could significantly benefit from the integration of AI, particularly in areas like personalized learning, automated assessments, and ethical decision-making. For example, in Business Administration, AI could be used to simulate market scenarios, enabling students to develop strategic thinking skills and make data-driven decisions. Similarly, in Health Sciences, AI could enhance the learning experience by providing diagnostic tools and virtual simulations that allow students to practice and improve their clinical skills. In Social Sciences, AI can assist in the analysis of large datasets, enabling students to conduct more comprehensive research on social behaviors, trends, and policy impacts. Courses such as Psychology or Sociology could use AI to analyze qualitative data, providing insights that would otherwise be difficult to obtain manually. Additionally, integrating AI in Education itself—particularly in training future educators—can help them become proficient in leveraging these technologies in their classrooms, thus promoting a more adaptive and inclusive learning environment for students.

Integration of entrepreneurship in Education with AI: A promising research area is exploring how AI can be used to foster entrepreneurship among engineering students. This includes developing innovative business models using AI, identifying market opportunities, and teaching ethical strategies in technology use for entrepreneurship. Research in this area could not only improve students' preparation for the job market but also contribute to economic growth and job creation through new technology startups.

These research directions aim not only to keep pace with technological advancements but also to enhance an educational environment that fosters innovation and entrepreneurship, extending these benefits beyond Systems Engineering to other disciplines and educational contexts.

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