



Specialty I		Specialty II
Artificial Intelligence	Design & Development	S1-AIN-DD-01: Analyze AI systems to differentiate the types of problems they address. S1-AIN-DD-02: Modify AI system training data to improve fairness and accuracy in outputs. S1-AIN-DD-03: Create an application using a prebuilt supervised learning model to make a classification or prediction. S1-AIN-DD-04: Compare data representations and how representation choice constrains applicable algorithms. S1-AIN-DD-05: Evaluate whether an AI or non-AI computational solution is appropriate for a real-world problem.
	Data Science for AI	S2-AIN-DD-01: Analyze problems that can be addressed using unsupervised learning. S2-AIN-DD-02: Optimize an AI algorithm's performance for a given problem. S2-AIN-DD-03: Create an application using a complex supervised learning model.
	Human Responsibility	S1-AIN-DS-06: Examine how data flows through a neural network structure. S1-AIN-DS-07: Apply data acquisition, cleaning, and transformation techniques to prepare data for AI analysis.
	Professional Practice	S2-AIN-DS-04: Evaluate metadata and data pipelines to support transparency in AI model selection and deployment. S2-AIN-DS-05: Transform data to meet the input requirements of an AI algorithm.
		S1-AIN-HR-08: Plan safeguards for AI systems that protect human well-being and privacy while ensuring meaningful human involvement in decision-making. S1-AIN-HR-09: Analyze the potential biases and limitations of AI systems. S1-AIN-HR-10: Analyze the environmental impacts of widespread AI adoption.
		S2-AIN-HR-06: Develop a policy that promotes transparency in AI applications. S2-AIN-HR-07: Analyze how model optimization choices impact a model's performance, interpretability, and fairness.
		S1-AIN-PP-11: Integrate a prebuilt AI agent into an application. S1-AIN-PP-12: Analyze how AI tools shape user experiences for people with diverse backgrounds and characteristics. S1-AIN-PP-13: Assess how unauthorized data collection has influenced the practice of training AI models. S1-AIN-PP-14: Evaluate how ethical implications of AI have changed over time.
		S2-AIN-PP-08: Develop an AI agent to accomplish a defined task. S2-AIN-PP-09: Develop a professional communication artifact by interpreting technical AI results for diverse audiences. S2-AIN-PP-10: Debate aspects of AI regulatory frameworks and legislation across countries.



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Cybersecurity	Network Theory & Design	S1-CYB-ND-01: Analyze the role of network services and protocols in secure communication and their potential vulnerabilities. S1-CYB-ND-02: Examine the concepts of the Open Systems Interconnection (OSI) model and their role in network communication. S1-CYB-ND-03: Distinguish between networks based on their protocols, topologies, and addressing schemes. S1-CYB-ND-04: Examine security risks in digital systems and corresponding mitigation strategies.	S2-CYB-ND-01: Integrate security features in networking hardware and software. S2-CYB-ND-02: Design a secure network, including servers, switches, routers, endpoints, and firewalls. S2-CYB-ND-03: Evaluate the security implications of different network topologies.
	Network Operations	S1-CYB-NO-05: Apply diagnostic tools and techniques to resolve network connectivity issues. S1-CYB-NO-06: Analyze system processes and network activity using command-line tools to identify potential security concerns.	S2-CYB-NO-04: Analyze network traffic patterns to distinguish between normal and potentially malicious behavior. S2-CYB-NO-05: Analyze cybersecurity tasks to improve efficiency and reliability.
	Threats & Security Measures	S1-CYB-TS-07: Analyze how common cyber threats related to network activity exploit system vulnerabilities. S1-CYB-TS-08: Evaluate a security threat using the CIA triad, states of data, and types of control. S1-CYB-TS-09: Analyze how encryption methods in network communication protect privacy and security. S1-CYB-TS-10: Evaluate security measures as part of a layered defense strategy to protect sensitive information.	S2-CYB-TS-06: Design access controls to protect sensitive information. S2-CYB-TS-07: Evaluate security risks to determine appropriate risk management strategies. S2-CYB-TS-08: Examine an incident response plan for a real-world scenario.
	Cybersecurity Policies	S1-CYB-CP-11: Explain the importance of cybersecurity policies in protecting organizational assets and mitigating risks. S1-CYB-CP-12: Explain key components of effective security policies.	S2-CYB-CP-09: Debate how various regulations impact organizational security policies, procedures, and compliance.
	Professional Practice	S1-CYB-PP-13: Analyze the potential consequences of a cybersecurity decision on individuals, organizations, and society. S1-CYB-PP-14: Analyze social engineering techniques and how they exploit human cognitive biases and organizational weaknesses. S1-CYB-PP-15: Translate cybersecurity concepts, risks, and solutions clearly to both technical and nontechnical audiences.	S2-CYB-PP-10: Analyze the benefits, risks, and ethical implications of AI in cybersecurity. S2-CYB-PP-11: Analyze cybersecurity vulnerabilities and incidents to inform responsible disclosure practices. S2-CYB-PP-12: Create documentation of cybersecurity processes and decisions that supports team coordination and accountability.

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Data Science	Creation & Curation	S1-DSC-CC-01: Apply exploratory data analysis techniques to non-hierarchical quantitative data. S1-DSC-CC-02: Interpret metadata when using data collected by others. S1-DSC-CC-03: Develop a program to manipulate and transform data to prepare for analysis.
	Analysis & Modeling Techniques	S2-DSC-CC-01: Apply exploratory data analysis techniques to a hierarchical structured data source. S2-DSC-CC-02: Document the origin, structure, and preparation of a dataset to support clarity and reproducibility. S2-DSC-CC-03: Develop a program to collect and integrate data from multiple sources. S2-DSC-CC-04: Choose appropriate data to collect for a data science project based on available tools, skills, and project goals.
	Model Interpretation & Reasoning	S1-DSC-AM-04: Apply appropriate analytic and visualization techniques for categorical and quantitative data. S1-DSC-AM-05: Examine missing data and its impact on data analysis. S1-DSC-AM-06: Analyze structured categorical and/or quantitative datasets, using computational tools and libraries.
		S2-DSC-AM-05: Build a model to explain relationships, make predictions, and evaluate the influence of different variables. S2-DSC-AM-06: Evaluate strategies for handling missing data. S2-DSC-AM-07: Analyze an unstructured, mixed-type, or high-dimensional dataset using computational tools and libraries.
	Visualization	S1-DSC-MI-07: Interpret the results of a data analysis to explain patterns, anomalies, and trends, and connect them back to the original problem or research question. S1-DSC-MI-08: Explain the appropriateness of predictive models for the specific problem being addressed. S1-DSC-MI-09: Explain how dataset size affects model stability and performance.
	Professional Practice	S2-DSC-MI-08: Evaluate the performance of models using established metrics. S2-DSC-MI-09: Analyze the trade-offs between interpretability, accuracy, and generalizability as they relate to model complexity. S2-DSC-MI-10: Analyze how adding or removing variables affects model behavior and performance.
		S1-DSC-VZ-10: Create a data visualization that communicates key findings to diverse audiences. S1-DSC-VZ-11: Analyze how graphical conventions in data visualizations support accurate interpretation and how breaking conventions can mislead.
		S2-DSC-VZ-11: Create a visualization that accurately represents data and avoids misleading design choices. S2-DSC-VZ-12: Critique a data visualization for misleading elements and their role in spreading misinformation.
		S1-DSC-PP-12: Apply ethical principles to data collection, analysis, and communication to promote privacy, transparency, and accountability. S1-DSC-PP-13: Assess how data collection and use may impact marginalized and underrepresented groups. S1-DSC-PP-14: Document data analysis results in a format appropriate for an audience with diverse backgrounds and perspectives.
		S2-DSC-PP-13: Evaluate ethical, legal, and social considerations when working with large-scale datasets, predictive models, and emerging technologies. S2-DSC-PP-14: Evaluate protective measures in data collection, usage, and governance for privacy, security, and fairness. S2-DSC-PP-15: Translate technical results for diverse audiences in professional communication artifacts.

Specialty I		Specialty II	
Game Development	Design & Development	S1-GMD-DD-01: Analyze the fundamental components of a game, including players, rules, game mechanics, and outcomes. S1-GMD-DD-02: Create a storyboard to plan and communicate a game's narrative and interactive experience. S1-GMD-DD-03: Develop an interactive experience to support gameplay. S1-GMD-DD-04: Adapt rule-based logic to improve control of game agents or systems.	S2-GMD-DD-01: Justify the use of responsible design principles in developing an engaging, meaningful game experience. S2-GMD-DD-02: Develop a system that programmatically controls 2D or 3D animation states based on game logic and player interactions. S2-GMD-DD-03: Construct in-game artificial intelligence to control NPC behavior.
	Player Experience	S1-GMD-PX-05: Create a user-friendly interface for a game, considering accessibility, usability, and aesthetics. S1-GMD-PX-06: Optimize basic game usability through user testing and identifying actionable design revisions.	S2-GMD-PX-04: Evaluate game interactions using diverse input devices to enhance immersion and player experience. S2-GMD-PX-05: Evaluate two versions of a game using defined metrics to determine which performs better.
	Architecture	S1-GMD-AR-07: Examine the key architectural features of computing hardware and their implications for game development.	S2-GMD-AR-06: Analyze game system architectures that support scalability, maintainability, and performance.
	Professional Practice	S1-GMD-PP-08: Analyze the ethical implications of copyright and intellectual property in game development. S1-GMD-PP-09: Develop a game project collaboratively within a diverse team.	S2-GMD-PP-07: Create a game utilizing ethical principles in the design and development process. S2-GMD-PP-08: Collaborate effectively in a project team by defining and executing assigned roles, communicating clearly, and managing shared resources to deliver a game project.



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Physical Computing	Hardware & Circuit Design	S1-PHY-HC-01: Construct an electrical circuit to power and control a physical computing device.
	Inputs & Outputs	S1-PHY-IO-02: Integrate sensors, actuators, and peripherals into a physical computing system.
	Design & Development	S1-PHY-DD-03: Develop software to control a physical device using an iterative design process.
	Connectivity & Internet of Things	S1-PHY-CI-04: Use IoT devices to collect sensor data and transmit it locally using device-to-device or device-to-gateway communication. S1-PHY-CI-05: Implement IoT communication by connecting physical devices with protocols, applying security practices.
	Professional Practice	S1-PHY-PP-06: Use a version control system to coordinate development in a physical computing project. S1-PHY-PP-07: Evaluate social, technical, and sociotechnical impacts of a physical computing system. S1-PHY-PP-08: Evaluate the security implications of a physical computing system, including data privacy, unauthorized access, and potential vulnerabilities.
		S2-PHY-HC-01: Develop an electromechanical system using a CAD tool for design and testing.
		S2-PHY-IO-02: Design a closed-loop feedback control system to meet a desired outcome using varying sensor types.
		S2-PHY-DD-03: Develop an application that extends functionality and user engagement with physical devices.
		S2-PHY-CI-04: Develop an IoT system to manage the collection and transmission of data and enable remote monitoring and control of a physical system.
		S2-PHY-CI-05: Develop an embedded network, evaluating trade-offs among network protocols, security measures, and scalability.
		S2-PHY-PP-06: Apply a project management methodology to collaboratively design, develop, and test a physical computing project.
		S2-PHY-PP-07: Evaluate how physical computing technologies shape social processes, communities, power, and equity in global society.
		S2-PHY-PP-08: Develop a physical computing solution for diverse users using the engineering design process.



Specialty I		Specialty II	
Software Development	Design & Development	S1-SWD-DD-01: Implement linear data structures to organize and access collections of data when solving computational problems. S1-SWD-DD-02: Design software that accounts for complexity through abstraction. S1-SWD-DD-03: Use integrated development environment (IDE) features to streamline software development, including code editing, debugging, version control, and project management.	S2-SWD-DD-01: Apply associative and hierarchical data structures to solve computational problems. S2-SWD-DD-02: Develop a prototype using diverse user personas and user journey maps to guide design decisions. S2-SWD-DD-03: Develop a project in iterative cycles, documenting changes and the rationale for each cycle. S2-SWD-DD-04: Modify an existing algorithm to improve efficiency, considering factors such as data structures and algorithmic paradigms.
	User Experience	S1-SWD-UX-04: Refine a user interface design using accessibility and responsive design tools. S1-SWD-UX-05: Create software that serves intended users and contexts using human-centered design principles.	S2-SWD-UX-05: Evaluate the user experience to improve usability. S2-SWD-UX-06: Create a user-friendly, accessible, and responsively designed interface.
	Testing & Refining	S1-SWD-TR-06: Use AI-assisted IDE tools or features to understand unfamiliar code and identify errors during debugging. S1-SWD-TR-07: Design a test plan that exercises program functionality, including edge cases, error conditions, and varied user inputs.	S2-SWD-TR-07: Use an IDE to test and refine a complex software project. S2-SWD-TR-08: Debug a complex software project to identify, isolate, and fix errors.
	Professional Practice	S1-SWD-PP-08: Collaborate to develop software that reflects diverse perspectives.	S2-SWD-PP-09: Apply an industry-standard software development process to plan and deliver a project while prioritizing equity and justice.



		Specialty I	Specialty II
X+CS	X+CS	S1-XCS-XC-01: Explain connections between CS concepts and practices and those from a non-CS discipline (X). S1-XCS-XC-02: Formulate a computational solution to a problem in a non-CS discipline (X) using computational thinking. S1-XCS-XC-03: Analyze a computer science technology or approach used in a non-CS discipline (X). S1-XCS-XC-04: Model relationships within a non-CS discipline using data, visualizations, and computational methods. S1-XCS-XC-05: Assess how well an algorithm solves problems within a non-CS discipline (X) by evaluating its accuracy, efficiency, and relevance to the intended goal.	