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		Specialty I	Specialty II
Software Development	**Program Design & Development**	S1-SWD-01: Apply linear data structures to organize and access collections of data when solving computational problems. S1-SWD-02: Design software that accounts for scalability and manages complexity through abstraction. S1-SWD-03: Use integrated development environment (IDE) features to streamline software development, including code editing, debugging, version control, and project management.	S2-SWD-01: Apply associative and hierarchical data structures to solve computational problems. S2-SWD-02: Develop a prototype using diverse user personas and user journey maps to guide design decisions. S2-SWD-03: Develop a project in interactive cycles, documenting changes and the rationale for each cycle. S2-SWD-04: Modify an existing algorithm to improve efficiency, considering factors such as data structures and algorithmic paradigms.
	User Experience (UX)	S1-SWD-04: Refine a user interface design using accessibility and responsive design tools. S1-SWD-05: Apply the user experience design principles to create software that serves intended users and contexts.	S2-SWD-05: Implement the user experience design process by collecting data from intended users. S2-SWD-06: Apply UI design principles and tools to create user-friendly, accessible, and responsively designed interfaces.
	Testing & Refining Code	S1-SWD-06: Evaluate AI-assisted test case recommendations to identify and address gaps in test coverage. S1-SWD-07: Use AI-assisted IDE features to understand unfamiliar code and identify errors during debugging. S1-SWD-08: Design thorough and systematic test cases that exercise the functionality of a program, considering potential edge cases, error conditions, and user inputs.	S2-SWD-07: Apply AI-assisted IDE features to test and refine complex software projects. S2-SWD-08: Employ systematic debugging techniques on complex software projects to identify, isolate, and fix program errors, utilizing debugging tools and effective problem-solving strategies.
	Professional Practice	S1-SWD-09: Develop software collaboratively, setting team norms to integrate diverse viewpoints, using software development best practices.	S2-SWD-09: Apply an industry-standard software development process to plan and deliver software projects while prioritizing equity and justice.

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		Specialty I	Specialty II
Cybersecurity	**Network Theory & Design**	S1-CYB-01: Analyze network services and protocols to explain their role in secure communication and potential vulnerabilities. S1-CYB-02: Explain the concepts of the OSI model and its role in network communication. S1-CYB-03: Classify a network by its protocols, topologies, and addressing schemes. S1-CYB-04: Investigate security risks in digital systems and corresponding mitigation strategies.	S2-CYB-01: Integrate security features in networking hardware and software. S2-CYB-02: Design a secure network, including servers, switches, routers, endpoints, and firewalls. S2-CYB-03: Analyze the security implications of different network topologies to identify potential vulnerabilities and mitigation strategies.
	Network Operations	S1-CYB-05: Apply diagnostic tools and techniques to resolve network connectivity issues. S1-CYB-06: Use command-line programming to audit system processes, monitor network traffic, and scan for vulnerabilities.	S2-CYB-04: Analyze network traffic patterns to distinguish between normal and potentially malicious behavior. S2-CYB-05: Use a scripting language securely to automate security operations.
	Threats & Security Measures	S1-CYB-07: Analyze how common cyber threats related to network activity exploit system vulnerabilities. S1-CYB-08: Compare encryption methods used in network communication and how they protect privacy and security. S1-CYB-09: Classify a security threat using the CIA triad, states of data, and types of control. S1-CYB-10: Discuss security measures to protect sensitive information.	S2-CYB-06: Implement access controls to protect sensitive information from unauthorized access and data breaches. S2-CYB-07: Evaluate security risks to determine appropriate risk mitigation strategies. S2-CYB-08: Discuss incident response plans and processes for real-world scenarios.
	Cybersecurity Policies	S1-CYB-11: Explain the importance of cybersecurity policies in protecting organizational assets and mitigating risks. S1-CYB-12: Identify key components of effective security policies.	S2-CYB-09: Debate how various regulations impact organizational security policies, procedures, and compliance.
	Professional Practice	S1-CYB-13: Explain social engineering techniques and how they exploit human cognitive biases and organizational weaknesses. S1-CYB-14: Analyze the potential consequences of cybersecurity decisions on individuals, organizations, and society. S1-CYB-15: Communicate cybersecurity concepts, risks, and solutions clearly to both technical and non-technical audiences.	S2-CYB-10: Practice responsible disclosure of vulnerabilities and incidents in accordance with professional protocols. S2-CYB-11: Document cybersecurity processes and decisions in a manner that supports team coordination and accountability. S2-CYB-12: Analyze the potential benefits, risks, and ethical implications of AI in cybersecurity, including its use in threat detection, incident response, and offensive cyber operations.

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		Specialty I	Specialty II
Artificial Intelligence	**AI Design and Development**	S1-AIN-01: Describe the differences between deterministic and probabilistic algorithms. S1-AIN-02: Compare data representations and how representation choice constrains applicable algorithms. S1-AIN-03: Investigate AI systems to differentiate the types of problems they address. S1-AIN-04: Modify AI system inputs to optimize accuracy and reduce bias in outputs. S1-AIN-05: Create an application using supervised learning models.	S2-AIN-01: Investigate problems that can be addressed using unsupervised learning. S2-AIN-02: Create an application using complex supervised learning models. S2-AIN-03: Optimize AI algorithms to improve performance. S2-AIN-04: Modify an AI algorithm to optimize its performance for a given problem.
	Data Science for AI	S1-AIN-06: Analyze metadata and data pipelines to support transparency in AI model selection. S1-AIN-07: Explain neural network structure. S1-AIN-08: Apply data acquisition, cleaning, and transformation techniques to prepare data for AI analysis.	S2-AIN-05: Transform and restructure data for AI analysis. S2-AIN-06: Evaluate metadata and data pipelines to support transparency in AI model deployment.
	Human Responsibility	S1-AIN-09: Analyze the environmental impacts of widespread AI adoption. S1-AIN-10: Promote safeguards in AI systems that protect human well-being, privacy, and ensure meaningful human involvement in decision-making. S1-AIN-11: Analyze the potential biases and limitations of AI systems.	S2-AIN-07: Propose a policy change that would promote transparency in AI applications. S2-AIN-08: Analyze how model optimization choices impact a model's performance.
	Professional Practice	S1-AIN-12: Explore how AI tools shape user experiences for people with diverse backgrounds and characteristics. S1-AIN-13: Use AI as a tool for software development of an AI agent. S1-AIN-14: Debate trade-offs between respecting creators' intellectual property rights and using their works to train AI models. S1-AIN-15: Evaluate AI versus non-AI computational solutions for real-world problems. S1-AIN-16: Evaluate the ethical implications of AI throughout history and into the future.	S2-AIN-09: Debate aspects of AI regulatory frameworks and legislation across countries. S2-AIN-10: Demonstrate professional communication by adapting technical AI results for diverse audiences. S2-AIN-11: Use an AI-assisted development workflow to design, implement, and optimize an AI agent.

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		Specialty I	Specialty II
Physical Computing	**Hardware & Circuit Design**	S1-PHY-01: Construct an electrical circuit to power and control physical computing devices, including creating and interpreting schematic diagrams.	S2-PHY-01: Develop an electromechanical system using CAD tools for design and testing, considering power requirements, motor types, and control algorithms.
	Sensors, Actuators & Peripherals	S1-PHY-02: Integrate sensors, actuators, and peripherals with physical computing devices to extend their functionality and gather real-world data for analysis and control.	S2-PHY-02: Evaluate sensor types and implement closed-loop feedback control to maintain a desired outcome.
	Programming & Software Development	S1-PHY-03: Implement software to control physical devices.	S2-PHY-03: Develop an application that extends functionality and user engagement with physical devices.
	Connectivity & Internet of Things	S1-PHY-04: Employ IoT devices to collect sensor data and transmit it locally using device-to-device or device-to-gateway communication. S1-PHY-05: Implement IoT communication by connecting physical devices with protocols, applying security practices.	S2-PHY-04: Employ IoT devices to collect and transmit data, enabling remote monitoring and control of physical systems. S2-PHY-05: Develop an embedded network, evaluating trade-offs among network protocols, security measures, and scalability.
	Professional Practice	S1-PHY-06: Evaluate social, technical, and sociotechnical impacts of physical computing projects to assess viability S1-PHY-07: Collaborate using the engineering design process to develop and refine physical computing solutions for diverse users. S1-PHY-08: Evaluate the security implications of physical computing projects, including data privacy, unauthorized access, and potential vulnerabilities, and implement measures to mitigate risks. S1-PHY-09: Collaborate using project management methodologies to design, develop, and test physical computing projects.	S2-PHY-06: Analyze how physical computing technologies could shape social processes, communities, power, and equity in global society. S2-PHY-07: Use a source control system to coordinate development in physical computing projects.

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Data Science	**Creation & Curation**	S1-DSC-01: Apply exploratory data analysis techniques to non-hierarchical data. S1-DSC-02: Discuss the metadata when using data collected by others. S1-DSC-03: Write code to manipulate and transform data to prepare for analysis.	S2-DSC-01: Select appropriate data to collect for a data science project based on available tools, skills, and project goals. S2-DSC-02: Apply exploratory data analysis techniques to hierarchical structured data sources. S2-DSC-03: Document the origin, structure, and preparation of datasets to support clarity and reproducibility. S2-DSC-04: Write code to collect and integrate data from multiple sources.
	Analysis & Modeling Techniques	S1-DSC-04: Apply an appropriate analytic or visualization technique for categorical and quantitative data. S1-DSC-05: Examine missing data and its impact on data analysis. S1-DSC-06: Analyze structured categorical and/or quantitative datasets, using computational tools and libraries.	S2-DSC-05: Apply models to explain relationships, make predictions, and evaluate the influence of different variables. S2-DSC-06: Apply strategies for handling missing data while considering the effects on analysis results. S2-DSC-07: Analyze unstructured, mixed data type, or high-dimensional datasets using computational tools and libraries.
	Interpreting Models, Problems, & Results	S1-DSC-07: Interpret the results of data analyses to explain patterns, anomalies, and trends, and connect them back to the original problem or research question. S1-DSC-08: Explain how dataset size affects model stability and performance. S1-DSC-09: Assess the appropriateness of predictive models for the specific problem being addressed.	S2-DSC-08: Evaluate the performance of models using established metrics. S2-DSC-09: Explain the trade-off between interpretability, accuracy, and generalizability as it relates to model complexity. S2-DSC-10: Analyze how adding or removing variables affects model behavior and performance.
	Visualization	S1-DSC-10: Create a visualization that clearly communicates key findings to diverse audiences, selecting appropriate chart types and formatting. S1-DSC-11: Demonstrate how common graphical conventions are used in data visualizations and how breaking these conventions can lead to misleading interpretations.	S2-DSC-11: Create a visualization that accurately represents data and avoid misleading design choices. S2-DSC-12: Critique a data visualization for misleading elements and their role in spreading misinformation.
	Professional Practice	S1-DSC-12: Apply ethical principles to data collection, analysis, and communication to promote privacy, transparency, and accountability. S1-DSC-13: Assess how data collection and use may impact marginalized and underrepresented groups. S1-DSC-14: Communicate results of data analyses in formats appropriate for audiences with different backgrounds and perspectives.	S2-DSC-13: Apply ethical, legal, and social considerations when working with large-scale datasets, predictive models, and emerging technologies. S2-DSC-14: Communicate technical results for diverse stakeholders in written reports, presentations, and interpersonal communication. S2-DSC-15: Evaluate protective measures in data collection, usage, and governance for privacy, security, and fairness.

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Game Development	**Design**	S1-GMD-01: Analyze the fundamental components of games, including players, rules, actions, and outcomes.	S2-GMD-01: Apply responsible design principles to the design and development of engaging and meaningful game experiences.
	Program Development	S1-GMD-02: Enhance existing rule-based logic to control Non-Playable Characters (NPC). S1-GMD-03: Create a storyboard to plan and communicate game narratives and interactive experiences. S1-GMD-04: Develop an interactive experience to support gameplay. S1-GMD-05: Conduct a basic usability test on a game by identifying key user flows, collecting observable data, and translating that data into actionable design revisions. S1-GMD-06: Create a user-friendly interface for a game, considering accessibility, usability, and aesthetics.	S2-GMD-02: Construct a rule-based AI to control an NPC. S2-GMD-03: Implement basic 2D and 3D animations for game assets using keyframing and foundational animation principles. S2-GMD-04: Evaluate game interactions that use a variety of input devices to enhance immersion and player experience. S2-GMD-05: Compare two versions of the same game to determine which version performs better based on defined metrics.
	Architecture	S1-GMD-07: Describe the key architectural features of modern GPUs and their implications for game development.	S2-GMD-06: Explain the role of graphics processing units (GPUs) in game development, including their impacts on rendering performance, visual fidelity, and the overall gaming experience.
	Professional Practice	S1-GMD-08: Analyze the ethical implications of copyright and intellectual property in game development. S1-GMD-09: Collaborate effectively within diverse teams to plan, develop, and iterate on game development projects.	S2-GMD-07: Apply ethical principles in the design and development of games. S2-GMD-08: Collaborate effectively in a project team by defining and executing assigned roles, communicating clearly, and managing shared resources to deliver a game project.

X+CS	S1-XCS-01: Identify and explain connections between CS concepts and practices and those from a non-CS discipline (X). S1-XCS-02: Apply computational thinking to reinterpret a problem and design a solution within a non-CS discipline (X). S1-XCS-03: Investigate a computer science innovation in a non-CS discipline (X). S1-XCS-04: Model relationships within a non-CS discipline using data, visualizations, and computational methods. S1-XCS-05: Assess how well an algorithm solves problems within a non-CS discipline (X) by analyzing their accuracy, efficiency, and relevance to the intended goal.