



Computer Science Micro-Credentials

Embedded Micro-Credentials

Micro-credentials offer FXUA's eventual graduates the ability to demonstrate real-world mastery of competencies and skills in specific knowledge areas. The purpose of these micro-credentials is to demonstrate a strong knowledge-base in areas that are in high demand to eventual employers. FXUA's micro-credentials can be completed as stand-alone demonstrations of a student's achievement in a specific content area. Students can demonstrate their skills and achievement of content area knowledge throughout their program, meaning that students do not have to wait until graduation to be able to demonstrate their abilities. There is no additional cost for micro-credentials that are associated with a student's program of study. Students can choose to take additional courses outside of their major to add additional micro-credentials to their portfolio.

Assessment Strategies

These embedded skills-based micro-credentials occur in courses that are closely related to and emphasize the specific skills outlined in the micro-credential descriptions. Through course-based assessment tools, students demonstrate their knowledge of these skills. Often times, these course-based assessments are practically-oriented projects, presentations, simulations, or other representations of tasks and skills performed in the world-of-work.

Levels

Micro-credentials are offered along four distinct levels:

- **Foundational:** Foundational micro-credentials represent completion of entry-level knowledge. These topics would be open to learners who have little experience in the content area.
- **Intermediate:** This level represents learners who have some knowledge of the content area, but would still be considered beginner-learners. This would represent knowledge above the foundational level, but would not represent individuals who have extensive knowledge or experience with the topic. While this level could be open to individuals with little background in the content area, it would be expected that these individuals would need to spend significant time filling in prior knowledge gaps.
- **Advanced:** This level would be most appropriate for individuals who have prior knowledge on the topic or similar topics, and/or who use the information contained in the course on a regular basis. These learners typically are looking to find ways to expand their understanding of the topic and/or find efficiencies in their work.
- **Expert:** This level represents competencies and skills that would be required of an expert or master in the field. These topics are typically offered at the master's level, and would represent content that includes both theory and practice.

Awarding Micro-Credentials

Embedded micro-credentials are earned at the completion of a course or series of courses. These micro-credentials are awarded digitally in the form of a badge that completers can use in their professional profiles and on their resumes.

Computer Science Micro-Credentials

Essentials of Programming (EoP)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of programming emphasizes on how to think and be as a programmer. It focuses on the building blocks of program structure, modules, algorithms, syntax, and semantics. It also teaches problem-solving for many scenarios using different programming languages. Earning this micro-credential demonstrates foundational knowledge of languages like C++ and Python where every programming language works for special types of applications like web, database, mathematical formulas, and mobile phones.	Foundational	Computer Science	<ul style="list-style-type: none"> • Ability to code programs using programming pseudo languages • Ability to troubleshoot programs • Languages: C++ and Python 	COMP 109; COMP 121; COMP 329	9 credits

Advanced Programming (AP)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Advanced programming emphasizes on how to develop and solve real world problems. It focuses on building prototypes, data models, and schemes, in addition to perform testing, analyzing, maintaining, and troubleshooting programs. Earning this micro-credential will let students build sophisticated applications like robotics, games, networking devices, and cyphering. Programming languages like Python, R, C#, and Java advanced libraries could be used for this purpose.	Advanced	Computer Science	<ul style="list-style-type: none"> • Data modeling • Prototyping • Troubleshooting • Languages: C#, Python, R, Java Advanced Libraries 	COMP 413; COMP 414; COMP 440	9 credits

Essentials of Computer Ethics (ECE)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
This micro-credential discusses the organizational impact and the social and ethical implications of computer technology, in addition to the rights and duties related to the actions of computing professionals. Its goal is to identify and formulate answers to questions that deal with the moral basis of individual responsibilities and actions, as well as with the moral foundations of public policy. It investigates the context in which professionals work, the laws and how they are created, human aspects of running a company, software contracts and liability, intellectual property rights, and the legislation that affects the way in which computers are used or misused. Topics include social, legal, financial, organizational, and ethical issues in the context of the information technology industry; the role of professional codes of conduct and ethics; and key legislation.	Advanced	Computer Science	<ul style="list-style-type: none"> • General principles of moral theory • Internet Governance • Social Networking and its pros and cons • Net Neutrality • Free Speech and Censorship • Intellectual Property • Privacy Rights • Securing Digital Contents 	COMP 130; And COMP 332; or COMP 430	6 credits

Essentials of Computer Networks (ECN)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of computer networks develops student knowledge in networking OSI and TCP/IP standard models, networking devices, and networking addressing. It also teaches students the main networking management, supervisory, and internet protocols. Students use simulators like	Foundational	Computer Science	<ul style="list-style-type: none"> • TCP/IP and OSI models • Networking devices • Design network prototypes • Troubleshoot networks 	COMP 270; COMP 360; COMP 380; COMP 391	12 credits

Cisco Packet Tracer to design, test, and troubleshoot different types of networks like banks, clinics, shopping stores, or any other small business. Earning this micro-credential will give the student a good understanding of network standards, components, and protocols.			<ul style="list-style-type: none"> • Small business network design • Packet tracer 		
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Advanced Computer Networks (ACN)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Advanced computer networks emphasizes on teaching advanced networking and telecommunications schemes and algorithms. It focuses on initiating, processing, observing, maintaining, and guaranteeing delivery of data between sender and receiver. It teaches students many topics like encoding schemes, routing protocols, routing algorithms, wireless networking, and WAN protocols. Students use network simulators like GNS3 to design more complicated networks like universities, companies' headquarters, and hospitals. Earning this micro-credential will give students confidence in designing real-world networks in their future careers.	Advanced	Computer Science	<ul style="list-style-type: none"> • Troubleshooting • Switching and routing • Complicated network design • Internet protocols • GNS3 	COMP 412; COMP 486; COMP 503	9 credits

Essentials of Cybersecurity (ECS)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of cybersecurity emphasizes on educating students in the cybersecurity sense. It	Foundational	Computer Science	<ul style="list-style-type: none"> • Learn about hackers and attackers' tools 	COMP 130; COMP 345;	21 credits

<p>goes over the core security pillars that should be taught in cybersecurity essentials like confidentiality, integrity, availability, assurance, authenticity, and anonymity. It also teaches computer security incident response, computer criminal evidence collection, hacker tools analysis, computer/network forensic reporting, and investigation for email, malicious code, and networking devices attacks. Students get practical knowledge by working on tools like Wireshark and Nmap. Earning this micro-credential will enable students to examine information security threats, information security methods, and implementation approaches used in the information technology industry.</p>			<ul style="list-style-type: none"> • Cybercrime investigation • Attack analysis • Wireshark • Nmap 	<p>COMP 365; COMP 370; COMP 380; COMP 392; COMP 430</p>	
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Advanced Cybersecurity (ACS)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
<p>Advanced cybersecurity emphasizes on proposing, designing, implementing, and maintaining secured systems. Students dive deep into intrusion detection and prevention tools, in addition to network protection using different platforms like Kali-Linux, nmap, Nessus, and Wireshark. This micro-credential teaches students a deep knowledge on ciphering, cryptography, encryption, tunneling protocols, honeypots, and firewalls. It offers risk assessment, as well as mitigation plans for all inside and outside vulnerabilities. Earning this micro-credential will give the student a real-world experience on the tools used by penetration testers, ethical hacker, attackers, and security analyzers. It also offers mitigation plans, as well as</p>	<p>Advanced</p>	<p>Computer Science</p>	<ul style="list-style-type: none"> • Ethical hacking • Penetration testing • Firewall configuration • Kali-Linux • Wireshark 	<p>COMP 410; COMP 411; COMP 419; COMP 429; COMP 431; COMP 433; COMP 434; COMP 487</p>	<p>24 credits</p>

levels of defense to secure any company or organization they join in their future career.					
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Essentials of Artificial Intelligence and Machine Learning (EAI)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of artificial intelligence and machine learning paves the road for AI and ML students by offering topics in supervised and unsupervised learning methods. It covers generative and discriminative learning, parametric and non-parametric learning, neural networks, k-means clustering, adaptive control and reinforcement learning methods. This micro-credential goes over robotics principles as a very important real-world machine learning application. Students will be able to learn robotic basic programming application, decision-making algorithms, mobility, localization, and interactive settings using Python programming language. Students will work on Raspberry pi and robotic games to apply all the artificial intelligence and machine learning algorithms. Earning this micro-credential will give students experience on AI and ML world science by designing applications using decision-making algorithms.	Foundational	Computer Science	<ul style="list-style-type: none"> • Program Raspberry-Pi • Program game robots • Python language • Decision-making 	COMP 376; COMP 377; COMP 379; COMP 414; COMP 480	15 credits

Advanced Artificial Intelligence and Machine Learning (AAI)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Advanced AI and ML emphasizes deeply on diving into the field of robotics and smart devices.	Advanced	Computer Science	<ul style="list-style-type: none"> • Robotics programming • Troubleshooting 	COMP 393; COMP 394;	15 credits

Students learn about ML adaptive algorithms and stimulate their interests throughout their participation of the entire engineering design process. Students will learn about using AI and ML in industries like healthcare, financial services, media, manufacturing, creative arts, and consumer goods. Students go over designing robot wheels, arms, sensors, and motors, as well as working on smart devices like GPS's and drones using Python. Earning this micro-credential gives an excellent experience in ML algorithmic design, in addition to the experience in programming smart devices.			<ul style="list-style-type: none"> • Drone programming • Python 	COMP 420; COMP 421; COMP 422	
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Essentials of Data Science (EDS)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of data science emphasizes on understanding the algorithmic and statistical foundations of data science. It focuses on processing, analyzing, representing, and extracting massive data of different forms of datasets. Students will be taught different major data science algorithms like Linear Regression, SVM (Support Vector Machine), KNN (K-Nearest Neighbors), Logistic Regression, Decision Tree, K-Means, Random Forest, and Naive Bayes. Students will also go over algebraic tools to manipulate and analyze datasets like SPSS and MATLAB. Earning this micro-credential will give the student a very strong mathematical, analytical, statistical, and theoretical reasoning.	Foundational	Computer Science	<ul style="list-style-type: none"> • MATLAB • SPSS • Reasoning-based algorithms 	COMP 361; COMP 362; COMP 363; COMP 364; COMP 480; COMP 484	18 credits

Advanced Data Science (ADS)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Advanced data science emphasizes on processing big data. This advanced micro-credential focuses on the manipulating, storing, and analyzing very large volumes of structured, mostly relational data. It covers algorithms and applications in data warehousing, online analytical processing, mining frequent patterns and association rules, classification and predication, cluster analysis, implementations and applications of mining sequential and structured data, stream data, text data, Web data, spatiotemporal data, biomedical data, and other forms of complex data. Students will go over Hadoop, Hive and Pig, analysis of NoSQL storage solutions like HBase, Oracle NoSQL, and Cassandra to unstructured big data analysis process. Earning this micro-credential will give students the ability to use data warehousing technology and tools for marketing, financial decision-making, and gaining a competitive advantage.	Advanced	Computer Science	<ul style="list-style-type: none"> • Hadoop • NoSQL • Oracle NoSQL • Different dataset forms 	COMP 396; COMP 416; COMP 443; COMP 444; COMP 483; COMP 485	18 credits

Essentials of System Design (ESD)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of system design emphasizes on introducing the student to computer systems hardware and software. It goes over computer systems architecture like hardware organization,	Foundational	Computer Science	<ul style="list-style-type: none"> • Linux OS platform • Mac platform • MSDOS platform 	COMP 250; COMP 260; COMP 280; COMP 340;	18 credits

central processing units, instructions set design issues, micro-programmed control, addressing, memory hierarchies, bus control and timing, peripheral devices, and interrupt systems. It also covers the software aspects of system design in terms of operating system structure like concurrent processes, synchronization mechanisms, processor scheduling, memory management, and input/output management. Students will also be taught system security concepts to protect the system from threats, viruses, worms, malware, or remote hacker intrusions. Students will practice on different operating system command prompts like MSDOS, Linux, and Mac. Earning this micro-credential will give the student solid foundation on computer science hardware and software.				COMP 429; COMP 480	
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Advanced System Design (ASD)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Advanced system design emphasizes on advanced operating and distributed system topics. It goes over system privilege levels, deadlocks, central processing unit scheduling, memory management algorithms, semaphores, and file management. Students will also go over distributed systems structure, algorithms, architecture, input/output subsystems, shared memory, load-balancing, cache coherency, message passing, remote procedure calls, group communication, naming and membership problems, asynchrony, logical time and consistency, and fault-tolerance and recovery. Students will be taught the advanced	Advanced	Computer Science	<ul style="list-style-type: none"> Active Directory Remote system management Troubleshooting 	COMP 413; COMP 421; COMP 422	9 credits

security threat to the operating systems like hardware attacks, server domains poisoning, and system levels of defense. Students will go over tools like different operating system active directories, RAED server's technology, and security shield tools. Earning this micro-credential will give students advanced knowledge on systems design, which will prepare them to work on any platform and troubleshoot any problem based on their theoretical and practical experience.					
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Essentials of Software Application Development (ESAD)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
Essentials of software development emphasizes on developing software using programming languages, tools, platforms, or open source software. Students will design effective, interactive, and productive systems, and then evaluate these interactive computer system inputs and outputs, screen layouts, and machine design. Students will design using Python applications like machines controls, machine labels, machine translation, speech recognition, sentiment analysis, question answering, automatic summarization, and text classification. Earning this micro-credential will provide students with programming and critical thinking skills, in addition to an excellent knowledge of real-world software and application design structure.	Foundational	Computer Science	<ul style="list-style-type: none"> • Interactive machine design • Troubleshooting • Real-world NLP applications 	COMP 350; COMP 375; COMP 415; COMP 416; COMP 421	15 credits

Advanced Software Application Development (ASDE)

Description	Level	Domain	Skills Obtained	Associated Courses	Number of Credits Required to Earn
<p>Advanced software application development emphasizes on teaching the student to build advanced software in many fields like image vision, image processing, pattern recognition, and smart devices. Students will use programming languages like C# and Python, software, platforms, or open source tools to apply their designs. Students will design applications that will help in many industry fields like healthcare, banking, education, government, and manufacturing. Earning this micro-credential will give students the ability to design many real-world applications and develop their critical thinking and programming skills.</p>	Advanced	Computer Science	<ul style="list-style-type: none"> • Image processing • Smart device application • Troubleshooting 	COMP 417; COMP 418	6 credits