Master of Science in Computer Science Courses Descriptions

Course Code	Course Name	Course Description
CSC 601	**Advanced Algorithm**	(3 Credits, Prerequisite: None) This course offers an in-depth exploration of advanced algorithms and problem-solving strategies. It covers design paradigms such as divide and conquer, greedy algorithms, dynamic programming, and graph algorithms. Students will also study complex theory, approximation methods, and randomized algorithms. The course emphasizes analyzing performance and proving correctness, preparing students for solving high-level computational challenges and conducting research in algorithm design.
CSC 602	**Advanced Operating Systems**	(3 Credits, Prerequisite: None) This course investigates the architectural and conceptual underpinnings of modern operating systems. Key topics include advanced process and thread scheduling, deadlock handling, memory segmentation and paging, virtual memory, device drivers, and file systems. Students will examine distributed OS components, cloud OS functionality, and current research on scalability, fault tolerance, and security. Practical labs support theoretical concepts through simulations and real OS kernel configuration.
CSC 603	**Advanced Computer Networks**	(3 Credits, Prerequisite: None) This course covers advanced topics in computer networks, including congestion control, network security, mobile and wireless communication, multimedia transmission, and software-defined networking. Emphasis is placed on protocol internals, performance modeling, network programmability, and simulation using tools like NS-3 or Cisco Packet Tracer. Students will be exposed to cutting-edge developments in cloud networking and IoT infrastructure.
CSC 604	**Research Methodology**	(3 Credits, Prerequisite: None) This course prepares students for scientific inquiry by focusing on research methods relevant to computer science. Students will learn to critically analyze scholarly literature, formulate hypotheses, define research objectives, and apply qualitative and quantitative techniques. Topics include survey design, experimental design, statistical inference, and data interpretation. At the end of the course, students produce a detailed, academically sound research proposal on a chosen topic.
CSC 610	**Mathematics for Machine Learning**	(3 Credits, Prerequisite: CSC 601) This course equips students with mathematical tools fundamental to understanding machine learning. Topics include

		vector spaces, matrix decompositions, eigenvalues, probability distributions, expectation, variance, optimization techniques, and gradient-based learning. The course integrates theory with computational practice to build intuition and mathematical maturity needed for AI and data science applications.
CSC 611	**Natural Language Processing**	(3 Credits, Prerequisite: CSC 601) This course introduces algorithms and models for processing natural language. Topics include syntax and parsing, information retrieval, semantic analysis, sentiment detection, machine translation, and neural NLP using transformers like BERT and GPT. Applications range from chatbots and virtual assistants to text mining and summarization. Students will gain hands-on experience building NLP pipelines and working with corpora.
CSC 612	**Advanced Artificial Intelligence**	(3 Credits, Prerequisite: CSC 601) The course explores sophisticated AI topics such as probabilistic reasoning, Markov decision processes, logic-based agents, and advanced planning strategies. Students will also study real-world AI deployments in robotics, intelligent assistants, and autonomous systems. Implementation assignments focus on agent-based modeling and performance benchmarking. Emphasis is placed on interpretability, ethical considerations, and scalability.
CSC 613,	**Data Science and Machine Learning**	(3 Credits, Prerequisite: CSC 601) This course presents a comprehensive data science workflow, from data ingestion and preprocessing to modeling, evaluation, and visualization. Algorithms covered include decision trees, support vector machines, k- means, principal component analysis, and ensemble techniques. Students gain experience with real datasets using Python, Jupyter, pandas, scikit-learn, and TensorFlow. Practical labs emphasize insight-driven decision-making and reproducibility.
CSC 680	**Special Topics in AI**	(3 Credits, Prerequisite: CSC 610) This course addresses current innovations and challenges in artificial intelligence. Topics may vary each semester but can include reinforcement learning, AI ethics, explainability, generative adversarial networks, federated learning, or AI in healthcare. The course combines literature review, seminar discussions, and hands-on implementation of recent algorithms. Students engage with cutting-edge research and develop independent mini projects.
CSC 620	**Managing Information Security**	(3 Credits, Prerequisite: CSC 603) Students explore security governance frameworks, risk management practices, compliance standards, and business continuity planning. The course also discusses the human, legal, and ethical dimensions of cybersecurity management. Through case studies and simulations, students gain experience in

		developing policies, assessing organizational vulnerabilities, and aligning security strategy with business goals.
CSC 621	**Cybersecurity Risk Analysis**	(3 Credits, Prerequisite: CSC 603) This course provides tools and methodologies for identifying, analyzing, and mitigating information security risks. Topics include asset valuation, threat and vulnerability modeling, risk matrices, impact assessments, and ISO risk treatment planning. Students learn to use frameworks such as OCTAVE and FAIR and develop practical risk assessment reports for various IT environments.
CSC 622,	**Penetration Testing and Ethical Hacking**	(3 Credits, Prerequisite: CSC 603) Provides hands-on training in penetration testing techniques using ethical hacking principles. Students will learn reconnaissance, vulnerability scanning, exploitation, post-exploitation, and reporting. Tools such as Kali Linux, Metasploit, and Wireshark are introduced. Emphasis is placed on legal compliance, documentation, and professional conduct during testing engagements.
CSC 623	**Advanced Digital Forensics**	(3 Credits, Prerequisite: CSC 603) Focuses on digital evidence collection, preservation, and analysis. Students learn about file system forensics, registry analysis, RAM and network forensics, anti-forensics, and legal requirements for evidence admissibility. Tools such as EnCase, FTK, and Autopsy are used in lab exercises. Students simulate investigations from incident to courtroom presentation.
CSC 690	**Special Topics in Cybersecurity**	(3 Credits, Prerequisite: CSC 603) Covers emerging threats and trends in cybersecurity such as IoT vulnerabilities, cloud-native attacks, blockchain forensics, secure software development, and zero-trust architectures. Students engage in technical readings, applied labs, and presentations. The course encourages critical thinking on the balance between innovation and protection in evolving threat landscapes.
CSC 699	**Thesis**	(6 Credits, Prerequisite: CSC 604) The thesis involves the design and execution of a substantial research project. Students work under faculty supervision to identify a research gap, define objectives, and design methodologies. They conduct experiments, analyze data, and draw conclusions. The project culminates in a formal thesis and oral defense. Emphasis is placed on originality, critical thinking, scientific writing, and contribution to the field of computer science.