Blue Marble University

Doctor of Science (D.Sc.) in Computer Science

Curriculum and Course Descriptions

(3 Year Online Program)

Our doctoral program in Computer Science is constantly evolving to ensure that we are at the cutting edge of all new technologies. We cover the hot areas of video gaming, virtual worlds, programming for mobile devices, and 3D Immersion Technology used in the entertainment industry. We stress academic scholarship and thinking outside of the box. We encourage both Directed Research and Independent Research. Our standing Directed Research project relates to the batch preparation of human stem cells and the computer controlled imaging mechanisms for cell counting and separation. Independent dissertation topics are left up to the student with the guidance and consent of supervising faculty. Every student must also create an Online Portfolio, being a digital presentation published on the internet which summarizes the students achievements, education, research interests, publications, and other interests.

The program comprises 75 trimester credits, and consequently is equivalent to that of a USA regionally accredited college or university. Upon completion, and for a nominal fee, graduates will be able to obtain a certificate of equivalency from a foreign education credentials evaluation service approved by the USA Department of Education for employment purposes in the USA.

We operate on a trimester schedule, which means that our academic year is divided into 3 segments of 4 months each. In each 4 month period, students take three courses. For some terms, or as determined by the University, students may be assigned courses in sequence, lasting about 1 month each. In that event, for any approximate one month period, a student will be studying one course.

The Following Curriculum is Listed in Sequence

Year	Term	Course Title and Description
1	1	**Theory and Principles of Programming:** Syntax of programming languages by parsing to abstract syntax. Semantics of common language constructs using an interpreter: arithmetic, symbolic, and conditional expressions; blocks; lexically-scoped recursive first-class procedures; control structures; and parameter passing variations. Static type checking and type inference; imperative, functional, and object-oriented language paradigms. Recent research and current trends.

Year	Term	Course Title and Description
		Operating Systems Research: Recent advances in the theory and practice of state-of-the-art methods in the structure and development of operating systems with an emphasis on parallel and distributed systems. Topics include research in operating system architectures, clusters, parallel and distributed operating systems, real-time issues, performance, and software engineering issues associated with systems development. An emphasis will be placed on current systems development, future directions, and research topics
		Data Communications and Computer Networking: Recent advances and trends in data communication and computer network research are explored with a focus on design and analysis. Included in the course topics are network structure, protocols, layering, wireless communication, ad-hoc and mobile networking, resource discovery and management, and network management. The course materials will provide a foundation for the study of recent advances and new applications in the expanding field of ad- hoc, mobile, and ubiquitous computing. Current topics are presented, as well as future research trends.
1	2	**Database Management Systems Research**: Theory and principles of databases and their management. Selected topics in design and implementation of traditional and nontraditional database management systems to retrieve and store various types of data. Current issues, trends, future directions, and research topics in the areas will be explored.
		Database Security: This course will include topics in, but not limited to, various database security models, access and authorization control mechanisms, secure database design, database intrusion prevention, privacy, confidential, and inference issues in statistical databases, database transaction audit, malicious transaction detection, database disaster and sabotage recovery techniques, privacy preservation in data mining, etc. Current issues, trends, future directions, and research topics in the areas will be explored.
		Cryptography: This course will focus on the existing and emerging techniques for cryptography and cryptanalysis. Particular attention will be placed on potential areas of research in cryptography.
1	3	**Artificial Intelligence (1)**: Theory and applications of artificial intelligence. Topics include knowledge representation, search, machine learning, and reasoning under uncertainty. Recent research and current trends are explored.
		Artificial Intelligence (2): Continuation of (1)

Year	Term	Course Title and Description
		Software Engineering: Covers advanced topics in areas of current research interest in the development of software- intensive systems. Topics may include metrics, requirements definition, development life cycles, software engineering processes, reuse, formal methods, verification and validation, and project management.
2	1	**Network Security:** This course will focus on the technical challenges of securing computer networks, the tools and techniques that have been developed to address these challenges, and the current research in protecting computer networks.
		Knowledge Discovery in Databases: This course will study a number of emerging technical approaches to knowledge discovery in databases such as algorithms for mining various types of data, measurements for set of mined rules, classification and predication, data clustering and summarization, finding dependency networks, analyzing changes, detecting anomalies, and their applications. Current issues, trends, future directions, and research topics in the areas will be explored.
		Computer Graphics: Principles of computer graphics including raster operations and 3D graphics: transformations, scene graphs and other modeling methods, hidden surface removal and rendering, programming and graphics systems, visualization, and computer animation. Recent research and current trends will be explored.
2	2	**Robotics**: Principles and concepts of modern robots and automated systems are developed: robot's intelligence, drive methods, motion control, and software and hardware support.
		Biometrics: Biometrics is an advanced technology that utilizes the intrinsic physiological or behavioral traits of individual for machine-based Automatic and reliable identification. It attracted much attention recently due the increasing demand for the security and privacy related applications in both academia and industry. This course covers the state-of-the-art biometrics science and technology with a balance between the basic theoretical background and practical applications. Topics include various biometric modalities-- face, fingerprints, voice, hand geometry, palmprint, iris, retina, signature, and so forth. Multimodal and multimodality biometric frameworks will also be discussed.
		Ethical Hacking: This colloquium focuses on legal and regulatory requirements, methodology and tools used for ethical hacking and penetration tests. We cover pre-test agreements, how to discover and exploit vulnerabilities, participate as a penetration test team and preparation of report.

Year	Term	Course Title and Description
2	3	**Programming for Mobile Computing:** This course explores programming for mobile devices. Students explore the history, terminology, theory, and the wide range of uses for mobile computing. Topics may include: programming a variety of mobile devices such as the iPhone, android mobile devices and windows mobile devices.
		Game Design: Theory and Practice: Includes video game design and programming, computer graphics, artificial intelligence, computer architecture and databases, and the study and use of the Flash Platform. An extensive list of course materials are required, such as but not limited to: Unity 3D game development environment; Art of Illusion, Wings 3d and Blender 3D modeling packages; Audacity, and Texture Editor. Heavy reliance is placed on online tutorials. Many sources are free, but a modest amount of $200 USD should be budgeted. It is anticipated that the student will be able to complete the creation of a new game, which may be 2D/3D, a web ready game, or a console prototype. We hope to include a consideration of the game development cycle from green-lighting a project to localization and street delivery. Topics taught in the course includes project life cycles, legal framework for game development, the business of game development, development of game assets, scheduling, and documentation methods.
		Virtual Worlds: History, Current Models, and New Creations: Discover virtual worlds using current virtual environments tools, such as Second Life. Featured topics include navigation, camera controls, object design and texturing, gestures, animations, sounds, basic use of tools and scripts. Using an activity-based learning approach, students create 3D virtual world content. Web based and software based worlds will be explored. Students will work on various projects including formulations designed to simplify the rapid deployment of virtual worlds into business web sites. Students will participate in actual creativity.
3	1	**3D Immersion Technology**: A very hot topic in the entertainment world will be explored.
		Research and Writing with Creation of Online Portfolio: With the guidance of the faculty, the student finalizes his/her Online Portfolio, presenting online their education, independent work, interests, and other accomplishments. As Dr. Gideon Burton stated: "You must consciously and conscientiously build your online presence....and use your college years to generate a body of visible and durable online work, openly accessible to the world, shouting who you are louder than any "graduated with honors" certification on a transcript one must pay to see."
		Directed Research: The student pursues research under direction of a faculty member.
3	2	**Dissertation I**

Year	Term	Course Title and Description
		Dissertation II
		Dissertation III
3	3	**Final Dissertation Preparation and Publication to Online Portfolio as well as other journals as appropriate**

Credits: Each of the above courses (with the exception of Final Dissertation Presentation which is 6 credits) consists of 3 trimester credits each. The total program comprises 75 trimester credits, which is the same as 62.5 Semester credits. 60 semester credits are ordinarily required for a PhD in the USA. Consequently, our program is equivalent to that of a USA regionally accredited college or university. Upon completion, and for a nominal fee, graduates will be able to obtain a certificate of equivalency from a foreign education credentials evaluation service approved by the USA Department of Education for employment purposes in the USA.