

CS 526WS Fall 2019

Enterprise and Cloud Computing

Instructor

[Dominic Duggan](#)

Contact: Canvas Email.

Class Schedule: Monday-Sunday.

Virtual Office Hours: Friday 2-3pm (Zoom) or by appointment.

Virtual Session URI: <https://stevens.zoom.us/j/791972242>

Class Materials: <https://sit.instructure.com/courses/34642>

Course Objectives

This course covers the computing background for large-scale enterprise computing, including the out-sourcing of computing to the cloud. The course includes developing and deploying Web and Web service applications in the cloud, for both client-facing and B2B applications. The course also considers cloud support for enterprise integration and Internet of Things, and NoSQL data stores such as MongoDB and DocumentDB. Finally the course considers virtualization and its role in the cloud, including security in virtualization.

Cloud computing: SaaS, PaaS (e.g. Windows Azure) and IaaS (e.g. Amazon EC2). Web applications in the cloud: ASP.NET MVC and Windows Azure. Enterprise Web services: Windows Communication Foundation (WCF), gRPC and Web API. Serverless and microservices. Gathering and processing data using NoSQL data stores, e.g., MongoDB and DocumentDB. Virtualization as the basis for scalable enterprise and cloud computing: Xen, KVM, z/VM. Secure virtualization, e.g., Security Enhanced Linux (SELinux). Programming experience with Java or C# is required.

Outcomes

[Virtualization] Explain the total cost of ownership rationale for virtualization, and explain software and hardware support for virtualization.

[Administration] Manage resources and applications on virtualized server architectures and in the cloud.

[Security] Use support in environments such as SELinux for secure enterprise computing.

[Cloud Computing] Use cloud computing frameworks and NoSQL data stores for enterprise applications.

[Service-Oriented Architecture] Explain protocol stacks for Web services. Implement and deploy ASP.NET and Web service applications in the cloud.

Course Schedule

Week	Date	Topics Covered	Reading	Assignments
0	8/19	ORIENTATION		
1	8/26	Introduction to enterprise and cloud computing: SaaS, PaaS, IaaS. Introduction to Windows Azure.	Azure WA 1, 3	
2	9/3	Server-side processing in cloud applications: ASP.NET MVC.	ASP, Core	
3	9/9	Application architectures and database storage. Entity Framework and Language in Query (LINQ).	ASP, Core	
4	9/16	Web server security. User authentication and authorization. Threats and defences: SQL injection, XSS, CSRF.	ASP, Core	A1: Server-side processing.
5	9/23	Cloud storage: Blobs, NoSQL (Tables) and Relational (SQL Database). Content distribution networks (CDN). Azure Resource Manager.	Azure WA 7, 8, 13	
6	9/30	Services and Contracts. Web services for B2B E-commerce. Example: Google Adwords. Contract languages. WCF vs REST vs gRPC.		A2: Entity Framework and LINQ.
7	10/7	Web Services: Web API. Azure Webjobs. Azure Functions. Serverless architectures and microservices.	ASP Azure	
8	10/14	Enterprise integration and messaging services: Azure Event Hub and Event Grid, Azure Storage Queue, Azure Service Bus.	Azure WA	A3: Cloud storage
9	10/21	NoSQL data stores: MongoDB and DocumentDB. Azure Cosmos DB API.	Azure	
10	10/28	Fundamentals of virtualization. Processor and memory virtualization.	HFD 3, 4	A4: Cloud deployment
11	11/4	Secure virtualization. KVM and SELinux. Type enforcement. SVirt.		
12	11/11	SELinux Reference Policy.		A5: Azure micro service
13	11/18	Input-output virtualization. Data center design: virtualization and interconnection networks.	HFD 3, 4	
	11/25	THANKSGIVING RECESS		
14	12/2	Azure and Internet of Things.		A6: SELinux
	12/9-12/14	FINAL EXAM		

Recommended Text

- [Core] *Pro ASP.NET Core MVC 2, 7th Ed* by Adam Freeman. ISBN 978-1484231494. Apress, 2017.
- [Azure] *Azure for Developers* by Kamil Mrzygłod. ISBN 978-1789340624. Packt Publishing, 2018.

Other Recommended Texts

- [MVC] *Professional ASP.NET MVC 5* by J. Galloway, P. Haack, B. Wilson, K. S. Allen, D. Matson. ISBN 978-1118794753. Wiley, 2014.
- [HFD] *Distributed and Cloud Computing* by K. Hwang, G. Fox and J. Dongarra. Morgan-Kaufmann, 2011.
- [WA] *Programming Windows Azure: Programming the Microsoft Cloud* by Sriram Krishnan. O'Reilly, 2010.

Class Format

1. **Lecture slides and podcasts:** I will be making slides and podcasts available for the lectures at the beginning of each week.
2. **Reading:** There will be reading associated with each topic. Besides the recommended texts, much of the reading will be provided on-line.
3. **Discussion:** You can use on-line discussion groups to discuss the course material.
4. **Interactive discussion:** There will be periodic on-line interactive sessions on-line, to give people the opportunity to discuss parts of the course interactively. These discussions will be announced in advance.
5. **Assessment:** Course workload includes weekly quizzes, laboratory exercises on a cloud system, and a final exam.
6. **Virtual Office Hours** are a weekly synchronous session (through Zoom) to give you the opportunity to ask questions related to course material and/or assignments.
7. I will be available via **Canvas email** and will respond as soon as I am available (generally within 24-48) hours. For the online discussions, I will check in at least 3 times per week. Often I will not need to respond to questions, as students often can answer each others' questions before I have a chance to respond. For urgent matters, feel free to email me; Canvas email is much preferred as the Canvas mailbox is not as cluttered as regular email (and gets forwarded to my regular email anyway).

Grading

The breakdown of grades is as follows:

- Quizzes: 40%
- Labs: 50%
- Final: 10%

Software

All assignments will be done in the C# programming language, using the Visual Studio Community Edition IDE. This IDE runs on the Windows operating system, so you should have access to either a Windows physical machine or install a Windows virtual machine on your computer. Parallels is a good hypervisor for the Mac, that installs Windows for free, while Virtual Box is a good hypervisor for Linux. Although Visual Studio Code runs on Linux, and there is also Visual Studio for Mac, it is not clear that the tooling is as complete for these as it is for Visual Studio Community.

Late Policy

Assignments may be submitted after the due date, but up until the cutoff date, with a penalty of -5%. Assignments may be submitted up until the second cutoff date (usually two weeks after the original due date), with an additional penalty of -20%. Assignments may be submitted up until the third cutoff date (usually three weeks after the original due date), with an additional penalty of -25%. There will be no extensions past the third cutoff date. If the cutoff date is the same as the due date, no late extensions are allowed. Please note that an assignment with a penalty of -50% still carries a much higher grade than no assignment at all. *Please also note that resubmission of assignments is not allowed. We do not have the resources to regrade assignments, so please be sure to submit the final version when it is ready.*

All exam and mini-exams must be submitted by the time and date posted. There will be no extensions and no late submissions allowed. However, assuming that N mini-exams are administered during the semester, your mini-exam grade will be based on the best N-1 of your mini-exam scores. Therefore you maximize your possible grade by taking all mini-exams, but you do not suffer any penalty if you miss a single mini-exam. It is your responsibility not to miss more than one mini-exam.

Ethical Conduct

Undergraduate Honor System

Enrollment into the undergraduate class of Stevens Institute of Technology signifies a student's commitment to the Honor System. Accordingly, the provisions of the Stevens Honor System apply to all undergraduate students in coursework and Honor Board proceedings. It is the responsibility of each student to become acquainted with and to uphold the ideals set forth in the Honor System Constitution. More information about the Honor System including the constitution, bylaws, investigative procedures, and the penalty matrix can be found online at <http://web.stevens.edu/honor>.

The following pledge shall be written in full and signed by every student on all submitted work (including, but not limited to, homework, projects, lab reports, code, quizzes and exams) that is assigned by the course instructor. No work shall be graded unless the pledge is written in full and signed.

"I pledge my honor that I have abided by the Stevens Honor System."

[Reporting Honor System Violations](#)

Students who believe a violation of the Honor System has been committed should report it within ten business days of the suspected violation. Students have the option to remain anonymous and can report violations online at www.stevens.edu/honor.

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.