

**Syllabus  
Select Term 2015**

**Course Title: Voice & Video Networks**  
**Course Number: CN 410**

**Course Description:**

Introduction to streaming media protocols and their implementation. Coverage includes VoIP, SIP, RTP QoS, Security, Unified Communication and the regulation of media content (voice, music, TV, videos) currently and historically.

**Prerequisite Courses:**

CN 400

**Course Overview**

This course is all about delivering information at the application level to meet the needs of the user, whether urgent and important or rich in detail. You will examine the application layer protocols that are used by the Internet to support a major subset of these messages by type, and a substantial majority of today's traffic when measured by the volume of payload bits delivered. Of course, we are talking about the protocols that underpin Internet voice and video services generally, and many other services that can easily use the same protocols to deliver user information.

You will look at voice and video services from two perspectives in this course: first as a driver for the evolution of electronic communications which have led to what we call the Internet today. Business messaging drove the development of the telegraph and later the telephone, both of which are powerful point-to-point messaging systems. Business advertising is all about distributing product information via "the message." This advertising provided the funding that drove the original over the air radio and television systems, and it drives many internet businesses today. The last decade has seen new forms of massive but personalized messaging (Twitter and its visual peers) that have proven to be very powerful in influencing our society and culture.

For your second perspective, you will make a detailed technical examination of the protocol elements themselves and how they are used in conjunction with the IP, TCP, and UDP protocols to enable streaming voice and video services. While the technical perspective will take the bulk of your time this term, the economic and social drivers are needed for the context they provide and the motivations for technical change thus engendered.

## Course Outcomes:

Upon completion of this course, the learner should be able to:

- Assess traditional voice and video delivery technologies for their impacts on today's IP delivered voice and video services.
- Describe the six most important SIP messages and how they are used to establish and take down a streaming media connection.
- Describe the mandatory SIP message header fields and explain how each is used to establish and take down a streaming media connection.
- Compare multimedia network topologies, bandwidth requirements and design constraints needed for different types of multimedia streams.
- Evaluate the advantages of Unified Communications for organizational applications.
- Compare cost, functionality and reliability of IP-based systems to that of traditional voice and video systems.
- Compare and contrast the digital encoding standards associated with audio compression techniques, including G.711, G.722 and G.729.
- Compare and contrast the digital encoding standards associated with video compression techniques, including MPEG1, MPEG2 and MPEG4 with newer approaches.
- Determine the appropriate QoS parameters necessary to support different types of voice and video applications.
- Compare standards-based implementations with proprietary services such as Skype.
- Appraise the current best practices for securing IP-based voice and video systems.

## Course Materials:

### Required Texts:

Johnston, Alan B. (2009). *SIP: Understanding the Session Initiation Protocol*. (3rd ed.): Artech House. ISBN 1607839954, 978-1607839958. Books 24x7, [http://common.books24x7.com.dml.regis.edu/book/id\\_42778/book.asp?bookid=42778&refid=J7X68](http://common.books24x7.com.dml.regis.edu/book/id_42778/book.asp?bookid=42778&refid=J7X68).

Swale, Richard, & Collins, Daniel. (2014). *Carrier Grade Voice over IP* (3rd ed.). New York: McGraw-Hill Education. ISBN 0071827714, 978-0071827713.

American Psychological Association. (2010). *Publication Manual of the American Psychological Association* (6th ed.). Washington, DC: American Psychological Association. ISBN 1433805618, 978-1433805615. Companion website: <http://www.apastyle.org>.

### Required Online Readings:

The following readings add to the material provided by the textbooks. Additional readings will be provided by the facilitator as they are needed.

- Critelli, Anthony. (2014, June 22). Hacking VoIP – Decrypting SDES Protected SRTP Phone Calls. Retrieved Nov 1, 2014, from <https://www.acritelli.com/?p=185>.
- Geneiatakis, Dimitris, & Lambrinouidakis, Costas. (2007). A lightweight protection mechanism against signaling attacks in a SIP-based VoIP environment. *Telecommunication Systems*, 36(4), 153-159. DOI: 10.1007/s11235-008-9065-5. Retrieved from <http://dx.doi.org.dml.regis.edu/10.1007/s11235-008-9065-5>.
- Gupta, Prateek, & Shmatikov, Vitaly. (2007). *Security Analysis of Voice-over-IP Protocols*. Paper presented at the 20th Computer Security Foundations Symposium (CSF'07). DOI: 10.1109/CSF.2007.31. Retrieved from <http://doi.ieeecomputersociety.org/10.1109/CSF.2007.31>.
- Sicker, Douglas C., & Lookabaugh, Tom. (2004). VoIP Security: Not an Afterthought. *ACM Queue*, 2(6), 56-64. DOI: 10.1145/1028893.1028898. Retrieved from <http://dml.regis.edu/login?url=http://dl.acm.org/citation.cfm?doid=1028893.1028898>.
- Wikipedia. (2014, August 24). Cable television in the United States. Wikipedia. Retrieved August 30, 2014, from [http://en.wikipedia.org/wiki/Cable\\_television\\_in\\_the\\_United\\_States](http://en.wikipedia.org/wiki/Cable_television_in_the_United_States).
- Wikipedia. (2014, Aug 15). Electrical telegraph. Wikipedia. Retrieved Sept 15, 2014, from [http://en.wikipedia.org/wiki/Electrical\\_telegraph#History](http://en.wikipedia.org/wiki/Electrical_telegraph#History).
- Wikipedia. (2014, Sept 12). History of the Telephone. Wikipedia. Retrieved Sept 16, 2014, from [http://en.wikipedia.org/wiki/History\\_of\\_telephone](http://en.wikipedia.org/wiki/History_of_telephone).
- Wikipedia. (2014, Aug 28). Public Switched Telephone Network. Wikipedia. Retrieved Sept 30, 2014, from [http://en.wikipedia.org/wiki/Public\\_switched\\_telephone\\_network](http://en.wikipedia.org/wiki/Public_switched_telephone_network).
- Wikipedia. (2014, Sept 26). Video coding format. Wikipedia. Retrieved Sept 28, 2014, from [http://en.wikipedia.org/wiki/Video\\_coding\\_format](http://en.wikipedia.org/wiki/Video_coding_format).

### **Technology Tools:**

A personal computer with one of the following Windows operating systems: Windows 7 or 8.1. Wireshark will also run on Mac OS-X and Linux systems.

Wireshark. Download and install from <http://www.wireshark.org/>.

### **Optional Materials:**

A number of optional readings will be provided by the facilitator as the course progresses.

### **Pre-Assignment:**

Because of the accelerated format used for most of the courses offered by the College of Computer and Information Sciences, you are expected to begin your coursework before the course begins meeting. This section provides the initial assignment information that you need to get started with this course. To get started:

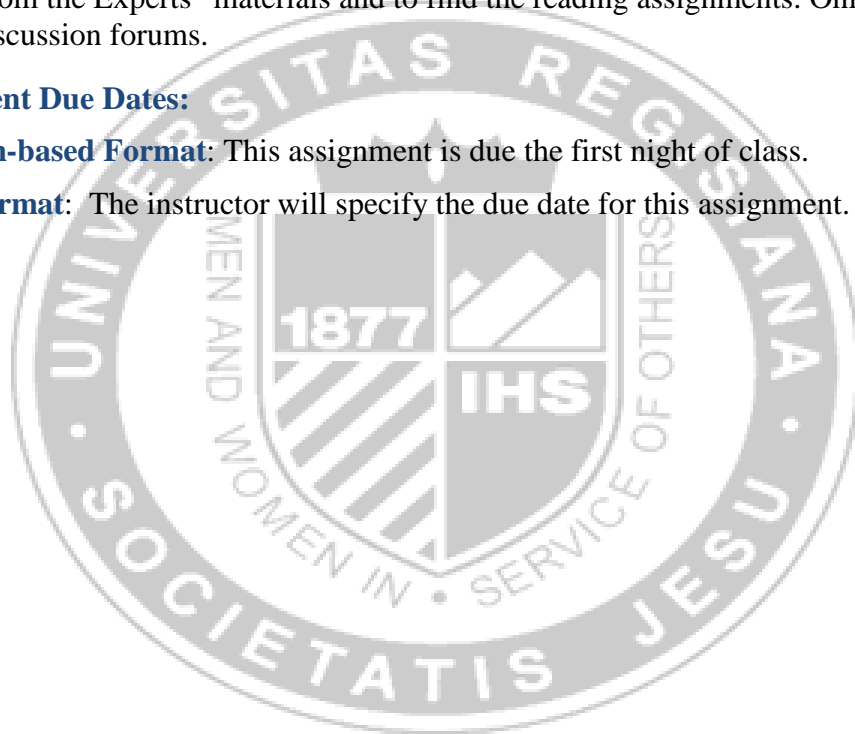
- Sign on to WorldClass (<https://worldclass.regis.edu>) and become familiar with the navigation of the course resources.
- Post your introduction in the introductions forum.
- Read Preface and Chapter One of Swale & Collins (2014).
- Read all of the Topic 1 WorldClass pages labeled “From the Experts”
- Additional online readings can be found in the Topic 1 To Do List in WorldClass.
- Instructor will assign written work and discussion topics.

WorldClass is used with all courses offered by CC&IS. All courses use it for general and email communications between students and faculty and for the submission of assignments, via assignment drop boxes. All students will need to use the content area of the WorldClass to review the “From the Experts” materials and to find the reading assignments. Only online classes will use the discussion forums.

**Pre-Assignment Due Dates:**

**Classroom-based Format:** This assignment is due the first night of class.

**Online Format:** The instructor will specify the due date for this assignment.



## Course Assignments and Activities:

Topic	Subject Area	Readings	Assignments and Associated Points
1	Audio & Video Services	Swale & Collins (2014), Preface and Chapter 1.	Introductions Discussion Participation, 25 pts. No Written Assignment:
2	Basic Session Management & SIP	Johnston (2009), Chapters 2-6. Swale & Collins (2014), Chapter 5.	Discussion Participation, 25 pts. Virtual Lab 1: Looking at a Basic SIP Trace in Wireshark, 50 pts. Homework Assignment 1: Basic SIP Message Information, 100 pts.
3	Extending SIP Functionality	Johnston (2009) Chapters 7 to 9. Swale and Collins (2014) Chapter 6, pages 219 to 224 only, and Chapter 7, pages 275 to 285 only.	Discussion Participation, 25 pts. Virtual Lab 2: SIP Features, 50 pts. Homework Assignment 2: SIP Feature Handling, 100 pts.
4	Encoding Audio & Video signals	Johnston (2009) Chapter 12. Swale and Collins (2014) Chapters 2 pages 57 to 73 and Chapter 3.	Discussion Participation, 25 pts. Virtual Lab 3: RTP Transport of Audio & Video, 50 pts. Homework Assignment 3: Media Transport Protocols, 100 pts.
5	Maintaining Audio & Video Quality	Swale and Collins (2014) Chapter 8 pages 317 to 327, pages 340 to 341, pages 344 to 347, and pages 363 to 364.	Discussion Participation, 25 pts. Virtual Lab 4: Audio Compression, 50 pts. Homework Assignment 4, 100 pts.
6	SIP and NAT	Johnston (2009) Chapter 10.	Discussion Participation, 25 pts. Virtual Lab 5: NAT Traversal, 50 pts. Homework Assignment 5, 100 pts.
7	Securing SIP Sessions	Gupta, P., & Shmatikov, V.. (2007).	Discussion Participation, 25 pts. Virtual Lab 6: SIP Security, 50 pts. Homework Assignment 6, 100 pts.
8	Engineering a Carrier Grade SIP/Audio/Video network	Swale and Collins (2014) Chapters 7, 9, and 10.	Discussion Participation, 25 pts. Homework Assignment 7, 100 pts.
			<b>Maximum Points Possible: 1200</b>

## CC&IS Grading Scale

Letter Grade	Percentage	Grade Point
A	93 to 100	4.00
A-	90 to less than 93	3.67
B+	87 to less than 90	3.33
B	83 to less than 87	3.00
B-	80 to less than 83	2.67
C+	77 to less than 80	2.33
C	73 to less than 77	2.00
C-	70 to less than 73	1.67
D+	67 to less than 70	1.33
D	63 to less than 67	1.00
D-	60 to less than 63	.67
F	Less than 60	0

Additional information about grading can be found in the latest edition of the University Catalog, available at <http://www.regis.edu/Academics/Course%20Catalog.aspx>.

## CC&IS Policies and Procedures

Each of the following CC&IS Policies & Procedures is incorporated here by reference. Students are expected to review this information each term, and agree to the policies and procedures as identified here and specified in the latest edition of the University Catalog, available at <http://www.regis.edu/Academics/Course%20Catalog.aspx> or at the link provided.

- The CC&IS Academic Integrity Policy.
- The Student Honor Code and Student Standards of Conduct.
- Incomplete Grade Policy, Pass / No Pass Grades, Grade Reports.
- The Information Privacy policy and FERPA. For more information regarding FERPA, visit the [U.S. Department of Education](http://www.ed.gov).
- The HIPAA policies for protected health information. The complete Regis University HIPAA Privacy & Security policy can be found here: <http://www.regis.edu/About-Regis-University/University-Offices-and-Services/Auxiliary-Business/HIPAA.aspx>.
- The Human Subjects Institutional Review Board (IRB) procedures. More information about the IRB and its processes can be found here: <http://regis.edu/Academics/Academic-Grants/Proposals/Regis-Information/IRB.aspx>.

The CC&IS Policies & Procedures Syllabus Addendum summarizes additional important policies including, Diversity, Equal Access, Disability Services, and Attendance & Participation that apply to every course offered by the College of Computer & Information Sciences at Regis University. A copy of the CC&IS Policies & Procedures Syllabus Addendum can be found here: <https://in2.regis.edu/sites/ccis/policies/Repository/CCIS%20Syllabus%20Addendum.docx>.