Overview

This course provides a broad and comprehensive perspective on emerging 5G mobile wireless networks. Key enabling technologies for 5G wireless networks are identified and discussed and the network architecture for 5G is examined. Of particular importance is the role of Software Defined Networks and Network Function Virtualization in 5G (both RAN and core networks). The architecture, advantages, and challenges of both the Cloud (or Centralized) RAN (C-RAN) and the Virtualized RAN (V-RAN) are examined. The goal, architecture, and benefits of networking slicing is also studied. Students will be asked to read scholarly papers in the field of next generation wireless networks and present their understanding and observations on these topics during three “online seminar and discussion” weeks during the semester.

Prerequisites: TM601, TM610, and TM615

Introduction to Course
- Challenging and comprehensive course.
- Two quizzes, a comprehensive final, and individual projects.
- All quizzes and exams are closed notes and closed books.
- For Section A (on-campus colleagues); the final exam will be given in-class and not online. (Please refer to the course schedule located at the end of this syllabus for the final exam date).
- For Section WO (on-line colleagues); I request that you take the final exam online at the beginning of the schedule class for the final exam. (Please refer to the course schedule located at the end of this syllabus for the final exam date). If you are unable to take the final exam due to a work commitment, please contact me directly to reschedule the test.
- All colleagues are required to read scholarly papers in the field of next generation wireless networks and present their understanding and observations on these topics during three “online seminar and discussion” weeks during the semester.
- All lecture notes, homework assignments and solutions, project descriptions, and this course syllabus will be available on the Canvas course web site. It is your responsibility to download the required material from the course website.
- Our weekly lectures are broadcasted (in real-time) to online students using Zoom. Each lecture is recorded and stored; you may access these Zoom lectures anytime during the semester.
- You are responsible for all course announcements and information for a class you do not attend. The course calendar, located at the end of this syllabus, is subject to change.
- Homworks are assigned weekly and are due at the start of each class. Please submit your homeworks by email (kryan@stevens.edu). Please do not use Canvas email to contact me.
- Homework assignments; points will be deducted for each assignment not submitted on time or for a poor quality submission
  - Note; No assignments will be accepted after the first class past the original due date
- Guidelines for an INC: Student has completed a significant portion of the course, is in good standing, and has an emergency (e.g. work or family). Student must request a grade of INC in writing before the academic deadline for an INC petition. (Please refer to the academic calendar on the Registrar’s web site for the date of the academic deadline to submit an INC petition).
- Please read, sign, and submit the ethical statement found in this course syllabus. If you have any comments or questions, please contact me to discuss.

Relationship of Course to Rest of Curriculum
This course provides a broad and comprehensive perspective on the evolution to next generation wireless networks. It builds upon the fundamental knowledge of cellular wireless networking provided in TM615 “Wireless Communications and Mobile Computing”. In addition to being an elective in the graduate telecommunications management program, it is an approved course in the Management of Wireless Networks graduate certificate program.

**Learning Goals**

Upon successful completion of this course the student will be able to:

1. Identify and discuss 5G network architecture and the associated key enabling technologies for emerging 5G networks

2. Articulate the role of Software Defined Networks and Network Function Virtualization in 5G (both RAN and core networks)

3. Describe the architecture, advantages, and challenges of both the Cloud (or Centralized) RAN (C-RAN) and the Virtualized RAN (V-RAN)

4. Examine the goal, architecture, and benefits of networking slicing

5. Discuss the impact of next generation wireless standards on both the fronthaul and backhaul networks and the resulting changes to the network architecture

6. Report and summarize your understanding and observations of at least three recently published scholarly articles in the field of next generation mobile wireless networks.

**Pedagogy**

The course will employ lectures, individual weekly homework assignments, and three student-led seminar and discussion weeks where each colleague will present their understanding and observations on recently published scholarly articles in the area of next generation wireless networks. Our weekly on-campus lectures are broadcasted (in real-time) to online students using Zoom. Each lecture is recorded and stored; you may access these Zoom lectures anytime during the semester from the course web site. In addition, all of the course lecture notes will be available on the course web site. There will also be two quizzes and a comprehensive final exam.

**Required Text(s)**

None

**Required Readings**

Recent (and related) IEEE articles will be selected for our readings
Additional Readings
None

Assignments
- Weekly comprehensive homework assignments
- An individual project

<table>
<thead>
<tr>
<th>Grading</th>
<th>Grade Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Homework Assignments</td>
<td>-0.5 for each assignment not submitted on time or a poor quality submission</td>
</tr>
<tr>
<td>Two Quizzes</td>
<td>15 each</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20</td>
</tr>
<tr>
<td>Projects</td>
<td>50</td>
</tr>
<tr>
<td>Total Grade</td>
<td>100%</td>
</tr>
</tbody>
</table>

Grading

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Numerical Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 and above</td>
</tr>
<tr>
<td>B+</td>
<td>87 to 89.9</td>
</tr>
<tr>
<td>B</td>
<td>83 to 86.9</td>
</tr>
<tr>
<td>B-</td>
<td>80 to 82.9</td>
</tr>
<tr>
<td>C+</td>
<td>75 to 79.9</td>
</tr>
<tr>
<td>C</td>
<td>70 to 74.9</td>
</tr>
<tr>
<td>C-</td>
<td>65 to 69.9</td>
</tr>
<tr>
<td>F</td>
<td>Below 65</td>
</tr>
</tbody>
</table>
**Ethical Conduct**

The following statement is printed in the Stevens Graduate Catalog and applies to all students taking Stevens courses, on and off campus.

“Cheating during in-class tests or take-home examinations or homework is, of course, illegal and immoral. A Graduate Academic Evaluation Board exists to investigate academic improprieties, conduct hearings, and determine any necessary actions. The term ‘academic impropriety’ is meant to include, but is not limited to, cheating on homework, during in-class or take home examinations and plagiarism.”

Consequences of academic impropriety are severe, ranging from receiving an “F” in a course, to a warning from the Dean of the Graduate School, which becomes a part of the permanent student record, to expulsion.


Consistent with the above statements, all homework exercises, tests and exams that are designated as individual assignments MUST contain the following signed statement before they can be accepted for grading.

____________________________________________________________________

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination. I further pledge that I have not copied any material from a book, article, the Internet or any other source except where I have expressly cited the source.

Signature _________________________          Date: _____________

Please note that assignments in this class may be submitted to [www.turnitin.com](http://www.turnitin.com), a web-based anti-plagiarism system, for an evaluation of their originality.

---

**Course/Teacher Evaluation**

Continuous improvement can only occur with feedback based on comprehensive and appropriate surveys. Your feedback is an important contributor to decisions to modify course content/pedagogy which is why we strive for 100% class participation in the survey.

All course teacher evaluations are conducted on-line. You will receive an e-mail one week prior to the end of the course informing you that the survey site ([https://www.stevens.edu/assess](https://www.stevens.edu/assess)) is open along with instructions for accessing the site. Login using your MyStevens (email) username and password. Simply click on the course that you wish to evaluate and enter the information. All responses are strictly anonymous. We especially encourage you to clarify your position on any of the questions and give explicit feedbacks on your overall evaluations in the section at the end of the formal survey which allows for written comments. We ask that you submit your survey prior to the last class.
<table>
<thead>
<tr>
<th>Class</th>
<th>Topic Covered</th>
</tr>
</thead>
</table>
| 1     | Course Introduction  
                  Introduction to SDN and NFV |
| 2     | 5G |
| 3     | 5G (cont.) |
| 4     | No Class Lecture; Online Seminar and Discussion Week  
                  Topics; 5G, SDN, NFV |
| 5     | SDN, NFV, and 5G  
                  Quiz One |
| 6     | SDN, NFV, and 5G (cont.) |
| 7     | C-RAN |
| 8     | No Class Lecture; Online Seminar and Discussion Week  
                  Topic; C-RAN |
| 9     | C-RAN (cont.) |
| 10    | Networking Slicing  
                  Quiz Two |
| 11    | Networking Slicing (cont.) |
| 12    | No Class Lecture; Online Seminar and Discussion Week  
                  Topics; Networking Slicing, Fronthaul & Backhaul |
| 13    | Fronthaul and Backhaul Networks in 5G |
| 14    | Fronthaul and Backhaul Networks in 5G (cont.) |
| 15 | Comprehensive Final Exam |