

ENTS 657: Satellite Communications Systems Syllabus

Course Description

This course will examine satellite telecommunication systems with an emphasis on modern systems and their link budgets. Topics will include a historical perspective, current systems, orbital mechanics and constellations, choice of orbital parameters, propagation considerations, link budgets, interference issues, and other obstacles, and existing and proposed mobile and modern satellite systems. It will also look at some of the business aspects such as the cost of deploying and maintaining these systems.

Instructor Contact Information

Dr. Michael Dellomo
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Office hours:
1363 AV Williams Building
Days and times will be announced in class and
posted on my website at
www.ece.umd.edu/~mdellomo/advising.html .

Required Books

Principles of Communications Satellites, by G. Gordon and W. Morgan

Course Policies

Attendance & Participation

Attendance and participation are not required and students will not be graded on it. However, it is highly recommended that students attend lectures to ask questions about the course.

Assignments

All assignments must be submitted by deadlines given in class. Each student is expected to complete the assignment on their own, however, it is acceptable for students to compare answers and check each others' work. Plagiarism, however, is not permitted. It is each student's responsibility that the assignments are submitted in a timely matter so the professor can assess the assignment. In any event, all work must be completed by the end of the course.

Academic Integrity

The University of Maryland has a nationally recognized Honor Code, administered by the Student Honor Council. This code sets standards for academic integrity for all undergraduate and graduate students, and you are responsible for upholding these standards in this course. It is very important for you to be aware of the consequences for cheating, fabrication, facilitation and plagiarism. For more information please visit: [visit: https://studentconduct.umd.edu](https://studentconduct.umd.edu). Students who engage in academic dishonesty in this course will receive no points for the assignments and will be reported to the Honor Council and the Office of Judicial Programs for further action. There will be no warnings! Remember, it is not worth it!

Persons with disabilities

Students with a documented disability should inform the instructor as soon as possible if academic accommodations are needed. Accommodations for individuals with disabilities can be arranged through the Disability Support Service (DSS), a division of the University Counseling Center. Please call 301.314.7682, web: <https://www.counseling.umd.edu/ads/>, or visit Shoemaker Building for more information.

Video Taping, Recording and Photographing

It is against University and Program policy to video tape, record, or photograph lectures unless done in accordance with the procedures for Persons with Disabilities. Lecture material is considered to be copyrighted by the University and unauthorized reproduction is considered to be copyright infringement. The instructor will make available and distribute any necessary material which is too detailed for conventional note taking.

Cell phones

Any use of cell phones is not permitted during class time. Please turn off all cell phones prior to the start of class.

Grading

The course will consist of 4 assignments, one midterm and one final exam. The point breakdown is given below.

Homework	100 points	4 assignments, 25 points each
Midterm	100 points	Date Announced in Class
Final	<u>200 points</u>	Date Announced in Class
Total	400 points	

Class assignments

Each assignment is worth 25 points and will be given in more detail as the course progresses. The assignments consist of using the STK tool to simulate communications satellite scenarios. The objective is to expose students to the tool and allow them to explore satellite communications systems in as real a manner as possible.

Tentative Course Schedule (will be adjusted as the course progresses)

1. Introduction (~1.5 weeks)
 - General Overview
 - Types of Satellite Communications Systems
 - Some History and modern systems
2. Basic Link Budgets (~1.5 weeks)
 - Antennas
 - Propagation
 - Noise, C_0/N_0 , C/N
3. Orbital Mechanics (~2 weeks)
 - Basic Equations
 - Special Orbits
 - Geometry and Movement
 - Constellations
 - Real World Effects
 - Orbital elements
4. RF and Licensing Issues (~1 week)
 - Spectrum Allocations
 - Modulation, Multiplexing, Multiple Access
 - Current and Future Trends

5. Detailed Link Budget Considerations (~5 weeks)
 - Antennas
 - Transmitters
 - Propagation and Rain
 - Receivers, LNAs, Figure of Merit
 - Total System Performance
 - More Detailed Link Budgets

6. Spectrum Sharing (~2 weeks)
 - Additional Noise Issues
 - Interference and Coordination
 - MSS Issues

7. Additional Topics (~1 week) (optional topics pending time)
 - Telemetry and Tracking
 - Power Limitations
 - Spacecraft Control
 - Reliability