STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

ELEC 405 – Satellite Communications

Prepared By: Stephen Frempong

SCHOOL OF ENGINEERING TECHNOLOGY
ELECTRICAL ENGINEERING TECHNOLOGY & ENGINEERING SCIENCE
DEPARTMENT
FALL 2018

A. TITLE : Satellite Communications

B. COURSE NUMBER: ELEC 405

C. CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)
Credit Hours: 3
Lecture Hours: 3 per week
Lab Hours: per week
Other: per week

Course Length: 15 Weeks

D. WRITING INTENSIVE COURSE: NO

E. GER CATEGORY: NO

F. SEMESTER OFFERED: SPRING/FALL

G. CATALOG DESCRIPTION: This course will emphasize on hardware and the basic operating techniques of every major supporting subsystem, the reliability analysis that allow satellites to operate for years without maintenance. Topics include: Propulsion, Structure, Thermal control, Reliability, Spacecraft testing, Spacecraft attitude, System performance, Telemetry, Tracking, and Command.

H. PRE-REQUISITES/CO-COURSES: ELEC 385 [Electronic Communications I] or permission of instructor.

CO-REQUISITES: NONE

I. GOALS (STUDENT LEARNING OUTCOMES)

Institutional Student Learning Outcome (ISLO's)
(1) Communication Skills (2) Critical Thinking (3) Foundational Skills (4) Social Responsibility (5) Industry, Professional, Discipline-Specific Knowledge and Skills.

Accreditation Board for Engineering and Technology ABET- Student Outcomes (a-k)

Course Objectives	ABET-Student Outcomes	Institutional SLO's

a. Understand Orbits and Launching Methods and perform calculations using Kepler's First/Second Laws, Apogee and Perigee Heights, Orbital Elements and Inclined Orbits.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	2. Critical Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.
2. Understand Geostationary Orbit, Antenna Look Angles, The Polar Mount Antenna Near Geostationary Orbits, and Earth Eclipse of Satellite Launching Orbits.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	2. Critical Thinking 5. Industry, Professional, Discipline-Specific Knowledge and Skills.
Perform calculations in equivalent isotropic radiated Power, Transmission Losses, The Link Power Budget Equation and System Noise.	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	2. Critical Thinking 5. Industry, Professional, Discipline-Specific Knowledge and Skills.

J. APPLIED LEARNING COMPONENT: CLASSROOM/RESEARCH

K. TEXTS:
Anil Kumar Maini and Varsha Agrawal, Satellite Technology: Principles and Applications, 1nd Edition, 111 River Street, Hoboken, New Jersey 07030: Wiley & Sons, 2007.

L. REFERENCES:
Dr. Louis J. Ippolito, Satellite Communications Systems: Atmospheric Effects, Satellite Link Design and System Performance, 1st Edition, 111 River Street, Hoboken, New Jersey 07030: Wiley & Sons, 2008.

M. EQUIPMENT: None

N. GRADING METHOD: A-F

O. MEASUREMENT CRITERIA/METHODS: Tests, and Research Paper.

P. DETAILED COURSE OUTLINE:

1. Overview of Satellite Systems
    a. Introduction
    b. Frequency Allocations for Satellite Services
    c. Intelsat
    d. U.S. Domsats
    e. Polar Orbiting Satellites
2. Orbits and Launching Methods
    a. Kepler's First/Second Laws
    b. Apogee and Perigee Heights
    c. Orbital Elements
    d. Inclined Orbits
3. The Geostationary Orbit
    a. Antenna Look Angles
    b. The Polar Mount Antenna
    c. Near Geostationary Orbits
    d. Earth Eclipse of Satellite
    e. Launching Orbits
4. The Space Segment
    a. The Power Supply
    b. Attitude Control
    c. Station Keeping
    d. Thermal Control
    e. Transponders
    f. The Antenna Subsystem
5. The Space Link
    a. Equivalent Isotropic Radiated Power
    b. Transmission Losses
    c. The Link Power Budget Equation
    d. System Noise
    e. Carrier-to-Noise Ratio
    f. The Uplink
    g. Downlink
    h. Effects of Rain
    i. Intermodulation Noise
6. Satellite Services and the Internet
    a. Network Layers
    b. The TCP Link
    c. Satellite Links and TCP
    d. Asymmetric Channels

7. Direct Broadcast Satellite Services
    a. Orbital Spacing
    b. Power Rating and Number of Transponders
    c. Frequencies and Polarization
    d. Transponder Capacity
    e. Uplink/Downlink Analysis
    f. Standing Wave Ratio
8. Satellite Services
    a. Satellite Mobile Services
    b. VSATs
    c. Radarsat
    d. Global Positioning Satellite System

9. LABORATORY OUTLINE: NONE