



UNIVERSITY OF NAIROBI
DEPARTMENT OF PHYSICS
BACHELOR OF SCIENCE IN MICROPROCESSOR
AND INSTRUMENTATION TECHNOLOGY

2014/2015 ACADEMIC YEAR

SPH 432 – Satellite and Mobile Communication Systems
4th YEAR COURSE

Instructor: Mr. Robinson Ndegwa
Instructor Information
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URL:

Syllabus

PART I: Satellite

- General requirements of satellite communication; Digital communication for satellite systems;
- Geometrical consideration of geo-stationary satellites; Orbits; Earth-satellite distance; Station antenna; Pointing angles; Earth coverage;
- Earth station technology: transmitters, receivers; Antenna system; Satellite repeater station technology; Altitude and orbit sub-system; Telemetry; Tracking and command; Electric power supply;
- Launching and positioning of a geo-stationary satellite;
- Payload;
- Calculations of velocity increment; Orbit inclination correction; Characteristics of thrusters and launch vehicles; Station keeping for inclination correction;
- Astronomical consideration on movement of satellite;
- Digital communication systems used from space to ground via satellite;

PART II: Mobile Communication Systems

- Elements of cellular radio system design; Specifications of analogue systems;
- Cell coverage for signal and traffic;
- Cell-site antennas; Mobile antennas;
- Co-channel interference reduction; Types of non-channel interference;
- Frequency management and channel assignment;
- Handoffs and dropped calls;
- Operational techniques and technologies;
- Switching; Data links; Microwave links;
- System evaluation;
- Digital cellular systems;
- Intelligent call concept and applications; Intelligent network for wireless communication

Topics	Outline	Contact Hours	Dates
Lesson 1: Introduction	What is a satellite? What is an orbit? <ul style="list-style-type: none"> ❖ Kepler's Laws of Planetary Motion ❖ The Six Keplerian Elements 	2 hrs	13 th Jan 2015
	<ul style="list-style-type: none"> ❖ Geometrical consideration of geo-stationary satellites 	1hr	19 th Jan 2015
Lesson 2: Satellite or space segment	payload	2 hrs	20 th Jan 2015
	spacecraft subsystems	1hr	26 th Jan 2015
Lesson 3: Launch system	Launch vehicle or Launch site launcher LEOP- Launch and Early Orbit Phase <ul style="list-style-type: none"> ❖ Sequence of Events (SOE): Launching, parking, transfer, final or operational stage 	2 hrs	27 th Jan 2015
	Tutorial 1	1 hr	2nd Feb 2015
Lesson 4: Ground segment	Earth station technology: Antenna system; transmitters, receivers; Satellite repeater station technology; Telemetry; Tracking and command;	2 hrs	3 rd Feb 2015
	Flight dynamic	1hr	9 th Feb. 2015
Lesson 5: Elements of cellular radio system design;	Specifications of analogue systems; Cell coverage for signal and traffic; Cell-site antennas; Mobile antennas; Co-channel interference reduction; Types of non-channel interference; Frequency management and channel assignment;	2hrs	10 th Feb 2015
Lesson 6: Handoffs and dropped calls;	Handoffs and dropped calls;	1hr	16 th Feb 2015

	CAT	2 hrs	17th Feb 2014
Lesson 7: Operational techniques and technologies;	Switching; Data links; Microwave links; System evaluation;	1hr	23 rd Feb 2015
Lesson 8: Digital cellular systems;	Digital cellular systems;	2hrs	24 th Feb 2015
Lesson 9: Intelligent call concept and applications;	Intelligent call concept and applications;	1hr	2 nd March 2015
Lesson 10: Intelligent network for wireless communication	Intelligent network for wireless communication	2hrs	3 rd March 2015
	Tutorial 2	1 hr	24th Mar 2015

Note: All classes will be held in **Room 230A** On **Mon : 8-9am** and **Tue. 8-10am**

1. Textbook and References

- **Space systems Engineering** Third Edition by Peter Fortescue, John Stark and Graham Swinerd
- **Space mission Analysis** Third Edition by James R wetz and Willy J Larson
- **Satellite Communication** 2nd Ed. By Timothy Pratt, Charles Bostian and Jeremy Allnutt
- **Electronic Communication Systems** 4th Edition by William Schweber

2. Grading Rule

Evaluations will be based on two continuous assessment tests (CAT), three tutorials, homework assignment, the class project, and a final exam. The tables below provide the weight distribution of each category with details on the project evaluation, and the scale for final grade assignment.

Grading Categories		Grade Scale	
Categories	Grading	Points	Grade
CAT 1	10	0-39	E
CAT 2	10	40-49	D
TUTORIALS	10	50-59	C
EXAM	70	60-69	B
PTOTAL	100	70-100	A