SUBJECT DESCRIPTION FORM

Subject title: Satellite Communications – Technology and Applications

Subject code: EIE509

Credit value: 3

Responsible staff and department:  
Dr Francis C.M. Lau, EIE

Pre-requisite:  
Nil

Recommended background knowledge:  
Knowledge of digital communication systems.

Mutual exclusions: Nil

Learning approach:  
Mainly lecture-based, supplemented with laboratory, site visit and case study.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture/Tutorial</td>
<td>33 hours</td>
</tr>
<tr>
<td>Laboratory/Site Visit/Case Study</td>
<td>9 hours</td>
</tr>
</tbody>
</table>

Assessment:  
Continuous Assessment 100%

Continuous assessment will take the form of assignments, tests, case study and presentations.

Objectives:  
This subject will introduce students with the conventional and advanced technologies used in satellite communication systems. The students will study the design parameters of the transceiver on the performance of the link quality. Various multiple access techniques and resource allocation strategies will be compared to point out their relative merits and demerits. The multibeam and regenerative satellites networks, which render the use of small size earth station terminals possible, will also be discussed. Examples on current applications and future development of satellite communication systems will be given.
Keyword syllabus:

1. Introduction
   1.1 Historical background of satellite technology development.
   1.2 Organisation of a satellite communications system.
      - Space segment.
      - Ground segment.

2. Orbits
   2.1 Overview of orbits.
   2.2 Orbit dynamics and Kepler’s laws.
   2.3 Relative movement of two point bodies.
   2.4 Orbital parameters.
   2.5 Earth-satellite geometry.
      - Slant ranges.
      - Elevation angle.
      - Azimuth angle.

3. Link Analysis
   3.1 Basic satellite link analysis.
   3.2 Effect of rain on link performance.

4. Multiple Access
   4.1 Traffic routing.
   4.2 Frequency division multiple access.
   4.3 Time division multiple access.
   4.4 Code division multiple access.
   4.5 Fixed and on-demand assignment.

5. Multibeam Satellite Networks
   5.1 Advantages and disadvantages.
   5.2 Transponder hopping.
   5.3 On-board switching.
   5.4 Beam scanning.
   5.5 Intersatellite links.

6. Regenerative Satellite Networks
   6.1 Transparent and regenerative repeaters.
   6.2 Comparison of link budgets.
   6.3 On-board processing.
   6.4 Effect on Earth stations.

7. Global Mobile Satellite Services
   7.1 LEO mobile satellite systems, Iridium.
   7.2 MEO mobile satellite systems, ICO.
   7.3 GEO mobile satellite systems, Inmarsat.

8. Applications
   8.1 Examples of current satellite communication applications.

Indicative reading list and references:

Text book:
Reference books:

June 2009