CCE 3310 – Communications Systems

Department of Communications and Computer Engineering
University of Malta

Tutorial 2

1. Define Friis free space equation.

2. What are the limitations of the Friis free space equation?

3. Describe the mechanisms behind electromagnetic propagation that lead to impairments.

4. Explain small scale fading.

5. Explain large scale path loss.

6. A base station transmits 1W from a 20m tower to a receiver located 11km away. The gain of the transmitting antenna and the receiving antenna is 5dB and 2dB respectively. If the system is operating at 800MHz and there are 2dB losses in the system, what is the received power if the receiver antenna is 1.5m above the ground?

7. Compare the result in (6) with the free-space loss.

8. What are Empirical propagation models?

9. A base station in a medium-sized city transmits at 910MHz from an antenna situated on 15m tower. Use the Hata model to determine the path loss if the receiver is located 8km away from the transmitter and is 1.8m above the ground.

10. How can we share radio bandwidth between users?

11. How does Spread Spectrum work?

12. Explain DSSS and Frequency hopping techniques.

13. Describe the concept behind cellular systems.

14. How is cell splitting done?

15. ABC Ltd. has decided to enter the mobile telephony market. At startup a single base station having 24 FDM full-duplex channels is installed to cover a radius of 2km. If the average call service time is estimated as 70s, what is the call rate that can be handled if the target grade of service is 2%? If each user generates on

average 0.05 Erlang of traffic per hour, how many users is the company estimating?

16. One year later, the number of users found in (15) has increased by 150%, determine the new grade of service and show how the network needs to be modified to revert back to the original grade of service. Find the minimum number of base stations that are required.

17. Discuss the GSM services.

18. Describe the GSM architecture.

19. Explain the characteristics and the function of the mobile station.

20. Show how authentication is done in GSM.

21. What are the different channels and their function in GSM?

22. Show how a call from a mobile station and a call to a mobile station are done. Discuss also the messages that flow during these events.

23. Describe the issue of handover and how it affects performance.

24. What is GPRS and how does it interface with GSM?

25. Discuss the UMTS architecture.

26. Describe the UMTS Core network.

27. Explain the logical architecture of DECT.

28. Describe the concept behind satellite systems.

29. Describe (a) the space segment and (b) the ground segment in satellite systems.

30. What are orbits and how are these classified.

31. Describe the budget of a satellite link and give an example.