Mobile and Wireless Communication (3 – 1 – 0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

- To provide overall knowledge of wireless communication systems and technologies,
- To be able to design basic wireless communication systems

Course Contents:

1. Introduction **(4 hrs)**

1.1 Definition, advantages and disadvantages of Wireless Communication System
1.3 Evolution of Mobile Radio Communications (1G to 4G and beyond)
1.4 Wireless Systems and comparisons (CDMA, GSM & DECT)

2. Principles of Cellular Concept **(6 hrs)**

2.1 Introduction to Cellular Terminology
2.2 Cell structure and Cluster
2.3 Frequency Re-use , Planning, Spectrum Utilization and Channel Assignment Strategies
2.5 Handoff Strategies, types and practical considerations
2.6 Interference and System Capacity
2.7 Trunking and Grade of Service (GOS)
2.8 Improving Capacity and Coverage in Cellular System

3. Mobile Radio Propagation **(8 hrs)**

3.1 Introduction to Radio Wave Propagation
3.2 Large scale path loss
  3.2.1 Concept of Free Space Propagation Model
  3.2.2 The Three Basic Propagation Mechanism (Concept of Reflection, Diffraction & Scattering)
  3.2.3 Link Budget Design
  3.2.4 Indoor Propagation Models (partition loss, log-distance model, multi breakpoint model & attenuation factor model)
  3.2.5 Outdoor Propagation Models (Okumura, Hata Model & Longley-Rice)
3.3 Small Scale fading and multipath
  3.3.1 Parameters of Mobile Multipath Channel (time dispersive, Coherent bandwidth, Doppler spread and Coherent time)
  3.3.2 Types of Small Scale Fading (flat, frequency selective, fast and slow)
  3.3.3 Rayleigh and Ricean fading distribution

4. Modulation Technique, Channel and Speech Coding **(10 hrs)**

4.1 Review of Modulation Technique (Analog and Digital Modulation)

4.1.1 Linear Modulation Technique (BPSK, DPSK, QPSK's)
4.1.2 Non linear Modulation Techniques (BFSK, MSK, GMSK)
4.2 Spread Spectrum Modulation Technique (direct sequence and frequency hopped)
4.3 Orthogonal Frequency Division Multiplexing (OFDM)
4.4 Concept of Channel coding
4.4.1 Review of Block, Cyclic, Convolutional, Hamming, Hadamard
4.5 Characteristics of speech signal and its significance
4.6 Significance of Vocoders and its types (Channel, Formant, Linear predictive coders)
4.7 The GSM Codec

5. Equalization and Diversity **(4 hrs)**

5.1 Introduction and Fundamental of Equalization
5.2 Linear and Non linear equalizers
5.2 Introduction to Diversity and its Technique
5.3 RAKE Receiver
5.4 Interleaving

6. Multiple Access in Wireless Communications **(4 hrs)**

6.1 Review of Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), principle and applications
6.2 Spread Spectrum Multiple Access (SSMA) principle and applications
6.2.1 Frequency Hopped Multiple Access (FHMA)
6.2.2 Direct Sequence Multiple Access (eg. CDMA)
6.3 Space Division Multiple Access (SDMA)
6.4 Hybrid Spread Spectrum Multiple Access Techniques

7. Wireless System and Standards **(9 hrs)**

7.1 Global System for Mobile (GSM): Service and Feature, System and Architecture, Example of GSM Call
7.2 Code Division Multiple Access (CDMA): Frequency and Channel Specifications, Forward CDMA Channel, Reverse CDMA Channel
7.3 Recent development (Compare Global trends with that of Nepal)
7.4 Basic Overview of DECT, WLAN, WiFi, WiMAX, LTE
7.5 Overview of Mobile Operating System(e.g. Android, iOS)

Practical:

Case Study (Mobile service operation, Network service operation, Internet Service Operation)

Text Books:

1. *Wireless Communications Principles and Practice*, Theodore S Rappaport
2. *Modern Wireless Communications*, Simon Haykin & Michael Moher, Pearson Education, 2007.

Reference Books:

1. *Wireless Communications*, Andreas. F. Molisch, John Wiley.
2. *Mobile Communication*, J. Schiller.

3. *Wireless Communications and Networks*, William Stallings, Pearson Education Asia.
4. *Modern Digital and Analog Communication System*, B. P. Lathi.
5. *Digital Communication system*, J. Proakis.
6. *Mobile Phone Operating Systems*, By Books Llc