

**Department of Electrical Engineering, IIT Madras**  
**EE6141 : Multi-Carrier Communications**  
**List of Topics for Mini-Project – April 2015**

1. Interleaved FDMA and FDOSS – PAPR comparison with OFDMA and DFT-spread OFDMA

*Ref: Presentation on GMC (pdf file) by instructor course URL.*

2. Improving the performance of modified LS (m-LS) based channel estimation by using PDP knowledge and/or matrix regularization; study MSE improvement

*Ref: Discuss with instructor and TAs*

3. Improving the performance of FFT-based channel estimation by using PDP knowledge and/or windowing; study MSE improvement

*Ref: Discuss with instructor and TAs*

4. Filterbank Multicarrier (FBMC) block modulation study

*Ref: B. Farhang-Boroujeny, "OFDM versus filter bank multicarrier," in IEEE Signal Processing Magazine, May 2011.*

5. Generalized Frequency Division multiplexing (GFDM) study

*Ref:*

*(a) G. Fettweis, G. M. Krondorf and S. Bittner, "GFDM: Generalized frequency division multiplexing," in IEEE Vehicular Technology Conference (VTC Spring09), April 2009.*

*(b) N. Michailow, M. Matthe, I. S. Gaspar, A. Caldevilla, and L. Mendes, "Generalized frequency division multiplexing for 5th generation cellular networks," IEEE Trans. Commun., 2014*

6. Universal Filtered Multicarrier (UFMC) study

*Ref: V. Vakilian et al., "Universal Filtered Multicarrier Technique for Wireless Systems beyond LTE," IEEE Globecom-13, GA, Dec. 2013.*

*For topics 4 thro 6, also see G.Wunder et al, "5GNOW – Non-orthogonal Asynchronous waveforms for future mobile applications," pp.97-105, IEEE Communications Magazine, Feb.2014.*

7. Blind / semi-blind / non-coherent OFDM receivers – study and compare with coherent receiver

*Ref: See Hanzo's book on MC-CDMA and OFDM; also discuss with instructor.*

8. Biased estimator for OFDMA; as an example, look at the James-Stein estimator in the paper below

*Ref: Sheetal Kalyani, R. Lakshminarayanan, and K. Giridhar. "Biased estimators with adaptive shrinkage targets for orthogonal frequency division multiple access channel estimation." IET Communications 7.1 (2013): 13-22*

9. Space-time Block Codes and Space-frequency Block codes for OFDM links (e.g., Alamouti code). Comparison

10. Turbo-coded OFDM (convolutional turbo code mapped to various OFDM/OFDMA subcarriers

11. Any MIMO detection algorithm from the below review paper:

*Ref: S. Yang and L. Hanzo, "Fifty years of MIMO detection: the Road to Large-scale MIMO," see paper uploaded in course URL.*

12. Multi-carrier Direct Sequence CDMA (MC-DS-CDMA) – frequency domain channel equalization followed by despreading *Ref: See Hanzo's book on MC-CDMA and OFDM; Kaiser's book*