

# Detailed Course Plan for ITWC Part-II

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## I. LECTURE-1: BROADCAST CHANNELS (SM)

Time and Venue: 10 Sep. 2012, 9:00 - 12:00 (Signalen)

Contents:

- 1) Degraded/non-degraded BC.
- 2) Capacity region of degraded BC (example: single-antenna Gaussian BC).
- 3) Coding/decoding strategies.
- 4) Known bounds for general BC.

Scribe: Reza Moosavi

## II. LECTURE-2: SINGLE USER GAUSSIAN VECTOR CHANNEL: PART-I (FAST FADING) (SM)

Time and Venue: 21 Sep. 2012, (9:00-12:00) (Signalen)

Contents:

- 1) Capacity of non-fading single-user MIMO channel (V-BLAST architecture).
- 2) Fading MIMO channels, slow and fast fading.
- 3) Capacity of fast fading MIMO channels (RCSI, Full CSI).
- 4) Receiver architectures (optimality of MMSE-SIC).

Scribe: T. V. K. Chaitanya

## III. LECTURE-3: SINGLE USER GAUSSIAN VECTOR CHANNEL: PART-II (SLOW FADING) (EL)

Time and Venue: 1 Oct. 2012, (9:00-12:00) (Signalen)

Contents:

- 1) Outage probability.
- 2) Error probability analysis (rank and determinant criterion). Diversity (space (TX and RX diversity), time, frequency diversity)
- 3) Space Time Block Codes (STBC)

Scribe: Hien Ngo

## IV. LECTURE-4: HOMEWORK-I (SM AND EL)

Time and Venue: 8 Oct. 2012 (9:00-12:00) (Signalen)

Contents: The problem set will be handed out on 24th Sep, and will be based on topics covered in Lectures 1,2, and 3.

## V. LECTURE-5: MULTIUSER GAUSSIAN VECTOR MAC (SM)

Time and Venue: 8 Oct. 2012, (13:00-16:00) (Signalen)

Contents:

- 1) Capacity region and strategies.
- 2) Sketch of achievability and converse proofs.

Scribe: Johannes Lindblom

## VI. LECTURE-6: WRITING ON DIRTY PAPER (SM)

Time and Venue: 17 Oct. 2012, 13:15 - 16:30 (Signalen)

Contents:

- 1) Problem motivation.
- 2) Information theoretic analysis for the Gaussian vector case.
- 3) Idea of Dirty Paper Coding (DPC).

Scribe: Mirsad

## VII. LECTURE-7: GAUSSIAN VECTOR BC: PART-I (SM)

Time and Venue: 22 Oct. 2012, 9:00 - 12:00 (Signalen)

Contents:

- 1) DPC rate region and achievability.

Scribe: Antonis Pitarokoilis.

## VIII. LECTURE-8: GAUSSIAN VECTOR BC: PART-II (SM)

Time and Venue: 29 Oct., 9:00 - 12:00 (Signalen)

Contents:

- 1) Converse, DPC rate region is infact the capacity region.

Scribe: Hien Ngo.

## IX. LECTURE-9: GAUSSIAN VECTOR BC: PART-II CONTINUATION (SM)

Time and Venue: 9 Nov., 9:00 - 12:00 (Algorithmen)

Contents:

- 1) Converse, DPC rate region is infact the capacity region.

Scribe: Antonios Pitarokoilis

## X. LECTURE-10: HOMEWORK-II (SM)

Time and Venue: 23 Nov., 9:00 - 12:00 (Algorithmen)

Contents:

- 1) Based on Lectures 5, and 6. Problem set will be handed out on 18 Oct.

## XI. LECTURE-11: HOMEWORK-III (SM)

Time and Venue: 29 Nov., 13:00 - 16:00 (Filtret)

Contents:

1) Homework-III will be based on lectures 7,8, and 9, and will be handed out on 9 Nov. 2012.

### REFERENCES

- [1] T. M. Cover and J. A. Thomas, "Elements of Information Theory, *Wiley*, 2nd Ed. 2006.
- [2] J. Wolfowitz, "Coding Theorems of Information Theory," *Ergebnisse Der Mathematik Und Ihrer Grenzgebiete*, 2nd Ed. 1964.
- [3] R. G. Gallager, "Information Theory and Reliable Communication, *Wiley*, 1968.
- [4] G. Kramer, "Topics in Multi-User Information Theory, *Now Publishers*, vol. 4, no.4-5, 2008.
- [5] D. N. C. Tse and P. Vishwanath, "Fundamentals of Wireless Communication,*Cambridge University Press*, 2005.
- [6] A. E. Gamal and Y. Kim, "Network Information Theory,*Cambridge University Press*, 2012.