UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Departament d'Enginyeria Civil i Ambiental

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URBAN MOBILITY
Fall 2017 (Q1)

Format: 6 ECTS – 3 hours of lecture and discussion per week – 12 weeks.
Class Meets: Monday 11.00 to 14:00 h, A1-102.
Instructor in Charge: **Francesc Soriguera (FS)**
Other Instructors: Enrique Jiménez (GSI)
Student Evaluation: 3 Homework Assignments (Individual). Each one accounting for 15% of the final grade.
1 Mini Project (Groups up to 3 people). Accounting for 20% of the final grade.
Final exam (open notes, open books). Accounting for 35% of the final grade.

Basic Reference:

– Daganzo, C.F. (2010). *Public Transportation Systems: Basic Principles of System Design, Operations Planning and Real-Time Control*, Institute of Transportation Studies, University of California, Berkeley.

Date (Professor)	Session	TOPIC
1st Block. Collective transportation		
02/10 (FS)	1	**Urban Mobility.** Course contents, organization and evaluation. **Introduction to public transportation planning.** Definitions. General ideas regarding demand & politics. Standards. Planning & design approaches. **Shuttle systems – individual transportation.** Time independent demand. Time dependent demand. Adaptive demand. Vickrey model for the morning commute. **Shuttle systems – collective transportation.** Time independent demand. Time dependent demand. Transit & cars together.
16/10* (FS)	2	**Spatial consolidation - Corridors.** Idealized analysis. Limits to door-to-door speed. What we can do about it? Realistic analysis and optimization.
		HW 1 is due.
23/10 (FS)	3	**Corridors – Hierarchies.** Realistic analysis. Spatio-temporal accessibility. Agency costs & formulation. Solution & discussion. **Generalization to simple service.** One or two directional service. Local bus routing possibilities.
30/10* (FS)	4	**2D-Systems – Idealized analysis.** New role for transfers. Systems with & without transfers.
		HW 2 is due.
6/11 (FS)	5	**2D-Systems – Realistic analysis.** Types of networks. People routing. Derivation of agency & user costs. Solution & comparison. **Modifications for practical applications.** Capacity constraint. Infrastructure cost. Skip stops. Different demand densities. Hybrid grids.
13/11 (FS)	6	**2D-Systems – Hierarchies.** Feeder systems. **Comparison of individual transportation & collective transportation.** Economies of scale. Stable & unstable equilibria. Routing flexibility.
2nd Block. Transit network design – Barcelona case study		
20/11* (FS)	7	**Hybrid grids.** The hybrid concept. LCF & constraints. Solution. **Discussion.** Transit networks for different cities (Barcelona case study). Spatial coverage. Effects of demand intensity and city size. The role of metro and LRT. Implementation issues. Multiple transit systems. Hierarchy in 2D (feeder systems).
		HW 3 is due.
3rd Block. Paratransit – Flexible transit and vehicle sharing strategies		
27/11 (FS)	8	**Flexible transit without fixed routes.** Benefits of flexible routes. Ways of delivering flexibility.
4/12 (FS)	9	**Taxis.** Model. Solution & discussion. Taxi with a buffer of pax.
11/12* (FS)	10	**Dial-a-ride.** Model. Comments. **Vehicle sharing.** System types. Analysis of 1-way with periodic balancing. Discussion.
		MP 1 is due.

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4th Block. Urban traffic management		
18/12 (FS)	11	**MFD urban traffic regulation: Concepts & definitions.** Macroscopic approach to urban traffic regulation. Gridlock concept. Macro fundamental diagram. Future traffic signals: MFD regulation. AB control rule. Empirical analysis: on the existence of the MFD. Simulation. Multiple zones extensions.
8/01 (Guest prof. J. Ortigosa)	12	**MFD urban traffic regulation.** The Zurich experience. 3D Macro Fundamental Diagram.
Exam		
15/01* (FS)	13	**Final exam** (open notes, open books)

Additional References:

1st to 3rd Blocks:	- Ceder, A. (1999) *Transportation and traffic theory*. Pergamon. Elsevier Science Ltd. - Ceder, A. and N.H.M. Wilson (1986). Bus network design. *Transportation Research Part B*, 20 (4), 331-334. - Daganzo, C.F. (2010) Structure of competitive transit networks. *Transportation Research Part B*, 44(4), 434–446. - Estrada, M., M. Roca-Riu, H. Badia, F. Robusté and C.F. Daganzo. (2011) Design and implementation of efficient transit networks: Procedure, case study and validity test. *Transportation Research Part A*, 45 (9), 935-950. - TRB. (2003) *Transit Capacity and Quality of Service Manual. 2nd Edition*. Transit Cooperative Research Program,Washington DC. - Vuchic, V. (2005) *Urban Transit Operations, Planning and Economics*. John Wiley & Sons. - Vuchic, V. (2007) *Urban Transit Systems and Technology*. John Wiley & Sons.
4th Block:	- Daganzo, C.F. (2007) Urban gridlock: Macroscopic modeling and mitigation approaches. *Transportation Research Part B* 41(1), 49-62. - Daganzo, C.F. and N. Geroliminis. (2008) An analytical approximation for the macroscopic fundamental diagram of urban traffic. *Transportation Research Part B* 42(9), 771-781. - Daganzo, C.F., J. Laval and J.C. Muñoz. (2002) Some ideas for freeway congestion mitigation with advanced technologies. *Traffic Engineering and Control* 43, 397-403. - Geroliminis, N. and C.F. Daganzo. (2008) Existence of urban-scale macroscopic fundamental diagrams: Some experimental findings. *Transportation Research Part B*, 42(9), 759-770. - Gonzales E.J., N. Geroliminis, M. Cassidy and C.F. Daganzo. (2010) On the allocation of city space to multiple transport modes. *Transportation Planning and Technology* 33 (8), 643-656. - Hall, R.W. (2003) *Handbook of Transportation Science*. Kluwer Academic Publishers.