EEE 5321 (and EEL 4930) – CMOS Amplifiers (Spring 2011)

Course Calendar (Version 23 from 4/19/11)

Wk	Date	Lect.	Topic	Razavi's Text	Comments
1	T 1/11	1	Course Introduction: Syllabus, Course Logistics and Grading Policy; Review of basic MOSFET Device Properties	 Ch. 2	
1	Th 1/13	2	Review of basic MOSFET Device Properties: Level 1 model - Basic I-V relationships, V_{TH} and λ	Ch. 2	
2	T 1/18	3	Review of basic MOSFET Device Properties: Level 1 model - λ and channel length modulation; PSPICE: MOSFET DC Operation; Demonstration of the MOSFET Body Effect; MOSFET small-signal parameters and the Small Signal Assumption	Ch. 2 PSPICE Tutorials Ch. 2	
2	Th 1/20	4	MOSFET small-signal parameters (including small-signal parameters for the Body Effect); Basics of a MOSFET as a Small-Signal Amplifier CS Amplifier with R_D Load – Simplified treatment and simple design strategy	Ch. 2 Ch. 3	
3	T 1/25	5	PSPICE: Analysis of CS Amplifier with R_D Load (Transient and AC Sweep); Current Mirror Current Source - Basic operation, Sink vs. Source, Current Steering; Introduction to CS Amplifiers with Diode-Connected Load	PSPICE tutorials Ch. 5 Ch. 3	HW1 (CS amplifier with RD load design + current mirrors) given
3	Th 1/27	6	PSPICE: FFT, distortions and the small-signal assumption; DC Sweep for input signals amplitudes CS Amplifier with Diode-Connected Load – Analysis and intro to Design	 Ch. 3	
4	T 2/1	7	Analysis and Design of CS Amplifier with Diode-Connected and Current Source Loads	Ch.3	
4	Th 2/3	8	CS Amplifier Design using PSPICE and EXCEL Solver Optimizer Source Follower - Introduction	Ch. 3 Ch. 3	
5	T 2/8	9	Source Follower Amplifier Analysis (Briefly) PSPICE: Monte Carlo Analysis of CS Amplifier with R_L load; R_L TOLERANCE and V_{TH} DEV effect	Ch. 3 Ch. 3	HW2 given (CS+CD MC, CS + EXCEL Solver)
5	Th 2/10	10	PSPICE: Design of CS Amplifier with Current Source load		HW1 due
6	T 2/15	11	General theoretical relationships derived for CS Amplifier with Source Degeneration; Common-Gate Amplifiers – Analysis and Design	Ch. 3 Ch. 3	
6	Th 2/17	12	PSPICE: Design of a CG Amplifier		
7	T 2/22	13	Basics of Cascode Amplifiers Differential Amplifier – Basics	Ch. 3 Ch. 4	
7	Th 2/24	14	Differential Amplifier – Differential Mode	Ch.4	HW2 due

			operation,		
8	T 3/1	15	Differential Amplifier - Common-Mode Operation; PSPICE: Differential Amplifier basics – DC analysis, differential and common-mode performance	Ch. 4	
8	Th 3/3	16	Differential Amplifiers - MOSFET Loads (including Current Mirror Load); Design of Differential Amplifier; Introduction to Gilbert Cells	Ch. 4	
9	3/7-3/11		**Spring Break**		
10	T 3/15	17	Gilbert Cell – an analog multiplier – basics PSPICE: Design of a differential amplifier with current mirror load		HW3 given (CG Amplifier Design, Differential Amplifiers)
10	**Th 3/17**		**Midterm Exam** Selections from Ch. 2, 3: CS Amplifiers, Source Followers, Current Mirrors		
11	T 3/22	18	PSPICE: Design of differential amplifier with current mirror load (cont'd)		
11	Th 3/24	19	Amplifiers MOSFET High-Frequency capacitance effects; High Frequency Response of Amplifiers – basic concepts, Miller Effect	Ch. 6	
12	T 3/29	20	**Guest Lecture by Wilfredo Rivas-Torres: ADS Basics (DC Simulation, AC Simulation, Time Response)**		
12	Th 3/31	21	**Guest Lecture by Wilfredo Rivas-Torres: Design using the ADS Optimizer (Harmonic Balance Analysis)**		
13	T 4/5	22	Bandwidth of CS Amplifiers PSPICE: CS Amplifier Bandwidth and Miller Effect Bandwidth of source follower Amplifiers	Ch. 6 Ch. 6	HW3 due HW4 (Amp BW) given
13	Th 4/7	23	High-Frequency Response of CG, Cascode and Differential Amplifiers Introduction to OTA Amplifiers and applications	Ch. 6	
14	T 4/12	24	PSPICE: Bandwidth Improvement of Differential Amplifiers through Cascoding; Feedback in CMOS Amplifiers – basic concepts: The closed-loop gain formula, the basic high open-loop gain design philosophy, gain-bandwidth product	Ch. 9	
14	Th 4/14	25	Feedback in CMOS amplifiers - basic concepts; Feedback Amplifier Types; Feedback impact on R_{in} and R_{out}; Feedback sensing structures; Negative feedback implementation structures	Ch. 9	Hw5 (Feedback amplifier design and stability compensa-tion)
15	T 4/19	26	Multi-stage operational amplifiers:	Ch. 10	

			Compensation design for stabilizing a feedback multi-stage op-amp		
15	Th 4/21	27	PSPICE: Conceptual Compensation Design of Feedback Amplifier using block diagrams; Compensation in an actual multi-stage amplifier		
16	T 4/26	28	Feedback amplifiers examples		
16	**Th 4/28/11 10:30-1:00**		**Final Exam** Ch. 3 (Cascode and CG Amplifiers), Ch. 4 (Differential Amplifiers), Ch. 6 (Bandwidth of CS and Cascode Amplifiers), Ch. 9, 10 (Feedback in Amplifiers)		HW5 due