



# Low Noise Electronics

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# Class Information

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- Lecture language: **English**
- Class time
  - Tuesday 9:30 ~12:10
- Classroom
  - EE Bldg II (電機二館) R104
- Class webpage
  - <http://cc.ee.ntu.edu.tw/~emery/Courses>



# Textbook

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- No textbook
- Lecture is based on class notes
- References
  - Low-Noise Electronic System Design  
by C. D. Motchenbacher, J. A. Connelly
  - Noise in Linear and Nonlinear Circuits  
by Stephen A. Mass



# Grading

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- Exam: 40%
- Final project & presentation: 60%
  - Contents (novelty and completeness) : 30pts
  - Presentation and report: 20pts
  - Q&A (class participation): 10pts
    - Good questions and answers: 2pts
    - Average questions: 1pt
    - Present in English: 3pts (fair or better, but presenter only)
    - Present in English: 1pts (really bad, but presenter only)



# What Is Expected Of Students?

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- Follow academic honor code of NTU
  - No cheating
  - No plagiarism (copy other's work)
  - <http://www.foothill.edu/services/honor.html>
- Respect other students in class
- Be responsible for the material covered or assigned in class regardless of attending the class or not



# Class Coverage - Tentative

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- Random process and classic noise
- Noise in analog circuits
  - ✓ Amplifier noise model
  - ✓ Noise in solid-state devices and circuits
- Noise in RF circuits
  - ✓ RF Basics
  - ✓ RF noise fundamental and linear model
  - ✓ Noise measurement
  - ✓ Low noise amplifier
  - ✓ Phase noise
- Noise in digital system
  - ✓ Jitter
  - ✓ Cross-talk
  - ✓ Substrate Coupling



# Important Dates

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- **May 15**: Midterm Examination
- **May 22, May 29**: Project present
- **June 5**: IMS MTT-S, RFIC (no class)



# Final Project

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- Grouping: to be determined
- References are must
- Presentation file (PPT) can be the report
- Possible topics (paper survey, design, or development)
  - Broadband, multi-band, or novel LNA (but no common LNA)
  - Low phase noise oscillators, dividers, etc.
  - Noise model (device, circuit, etc.)
  - Signal integrity (jitter, crosstalk, substrate coupling, etc.)
  - EMI/EMC
  - Anything related to “noise”
  - Note: circuit-level simulation is enough (no need to do layout)



# Introduction

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- Noise is the awful enemy
  - It can't be eliminated under normal condition
- Noise is our awesome friend
  - That is why they are willing to pay you big bucks