

# Lect. 1: Introduction

---

What is electronics?

Art and science of **directing electrons**  
(or any other charge carriers) to **perform useful works**

## Directing electrons

- Apply potential difference → Voltage (V)
- Flow of electrons → Current (I)
- Electronic devices useful for directing electrons:

resistor (R), capacitor (C), inductor (L)

**diode, transistors**

# Lect. 1: Introduction

---

What is electronics?

Art and science of **directing electrons**  
(or any other charge carriers) to **perform useful works**

**Perform useful works**

Electronics devices

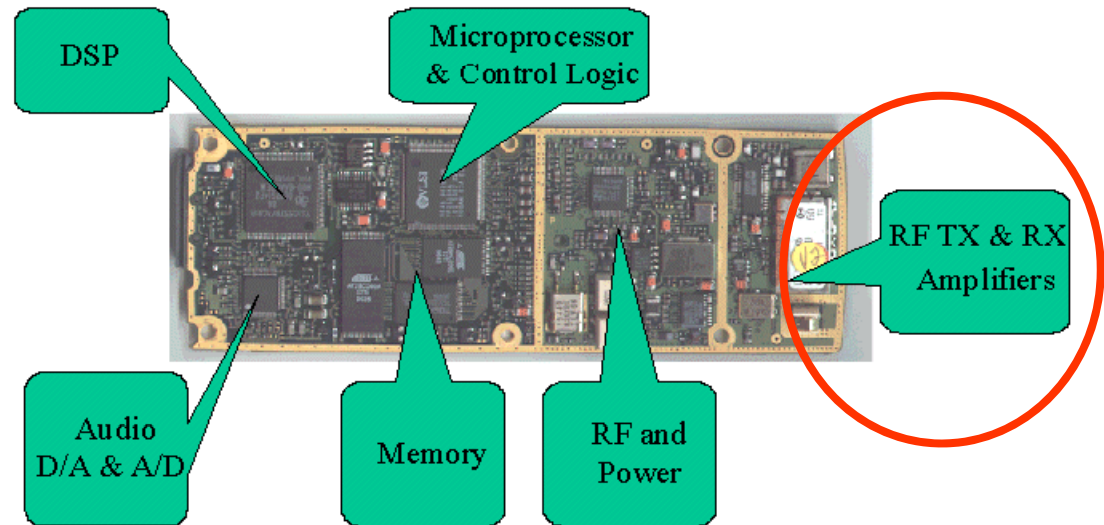
→ Electronic circuits

→ Electronic systems (electronic appliances)

# Lect. 1: Introduction

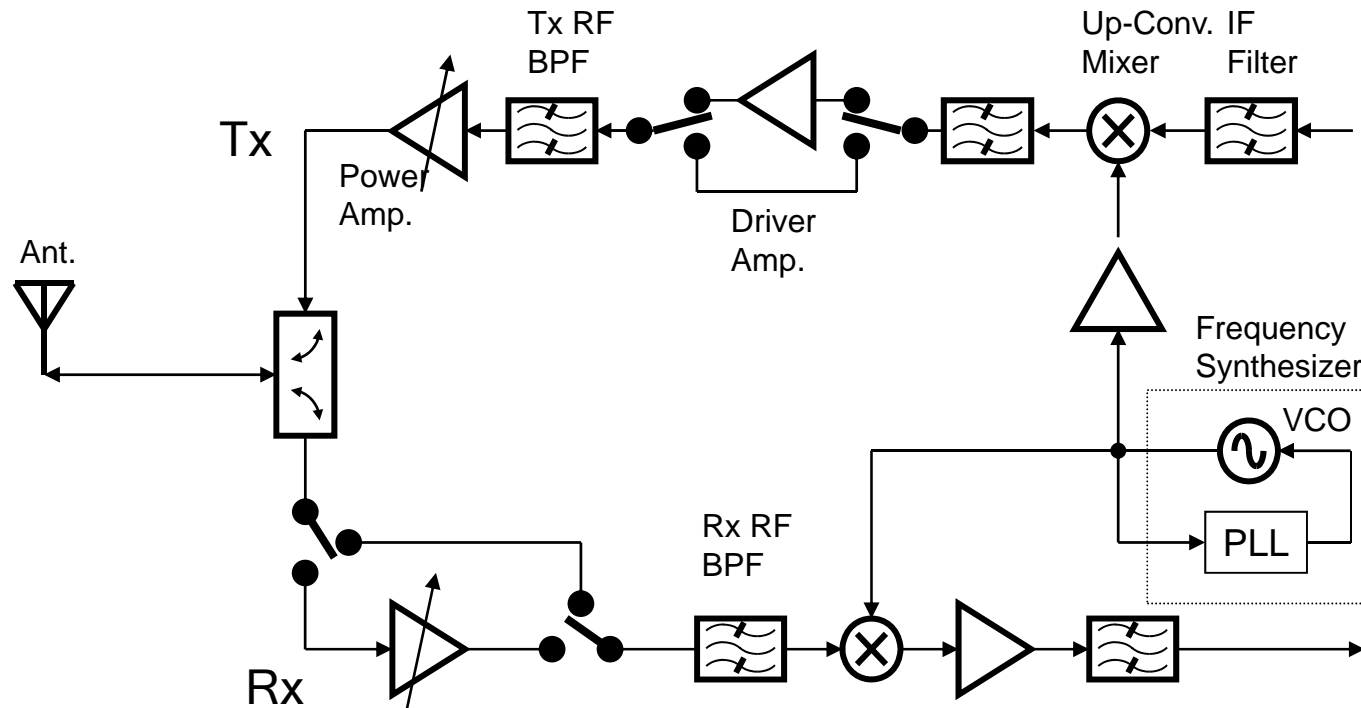
---

Ex: Cell phone



# Lect. 1: Introduction

## RF block for a cell phone

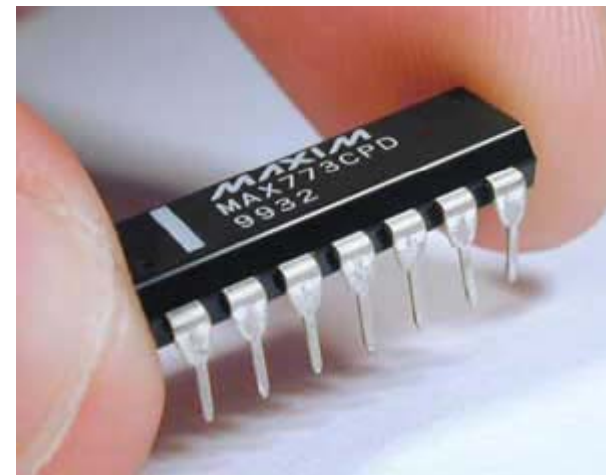
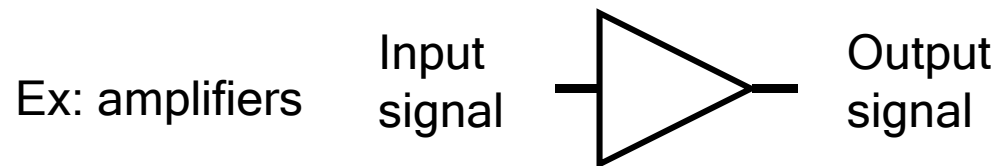


amplifiers, filters, mixers .... → Electronic circuits

# Lect. 1: Introduction

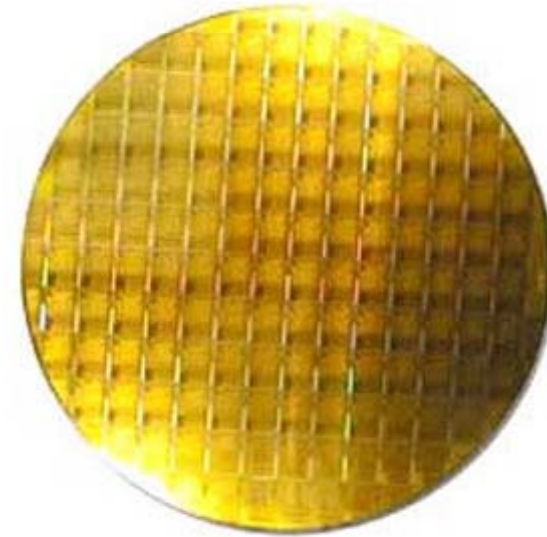
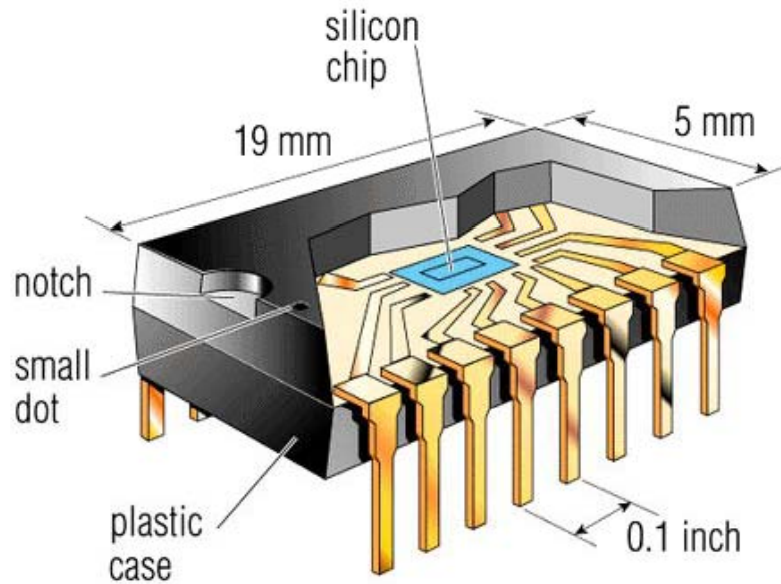
---

How do you make electronic circuits?



# Lect. 1: Introduction

---

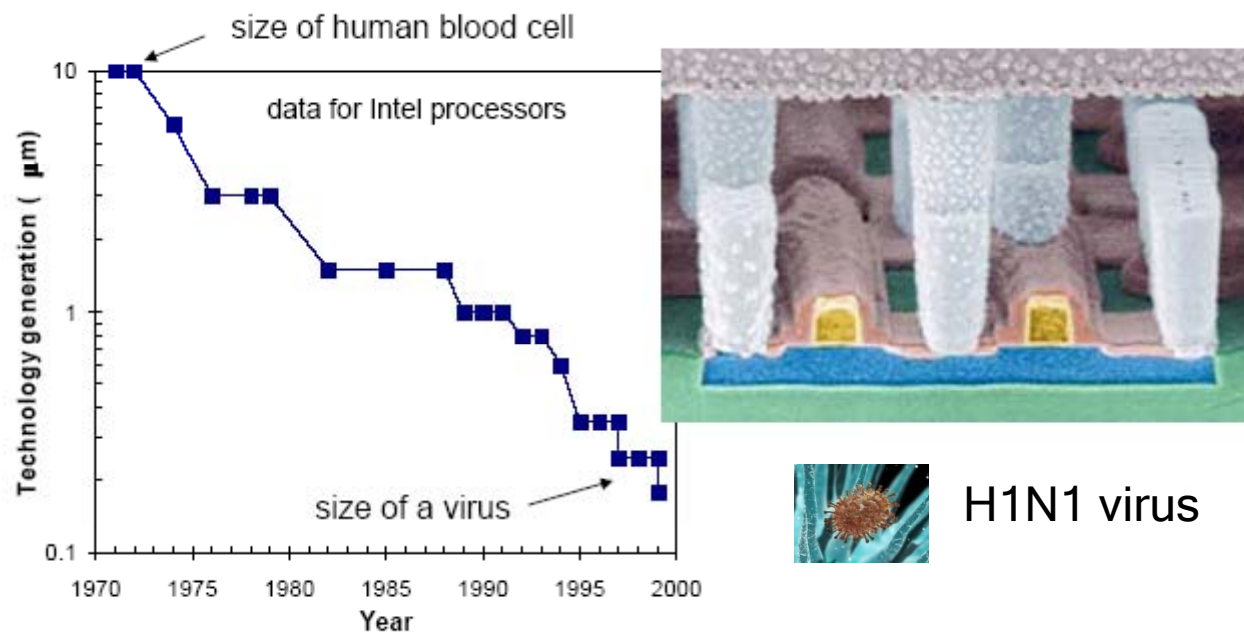


Electronic Circuits are (mostly) made by Silicon Integrated Circuit (IC) Technology  
→ Microelectronics

# Lect. 1: Introduction

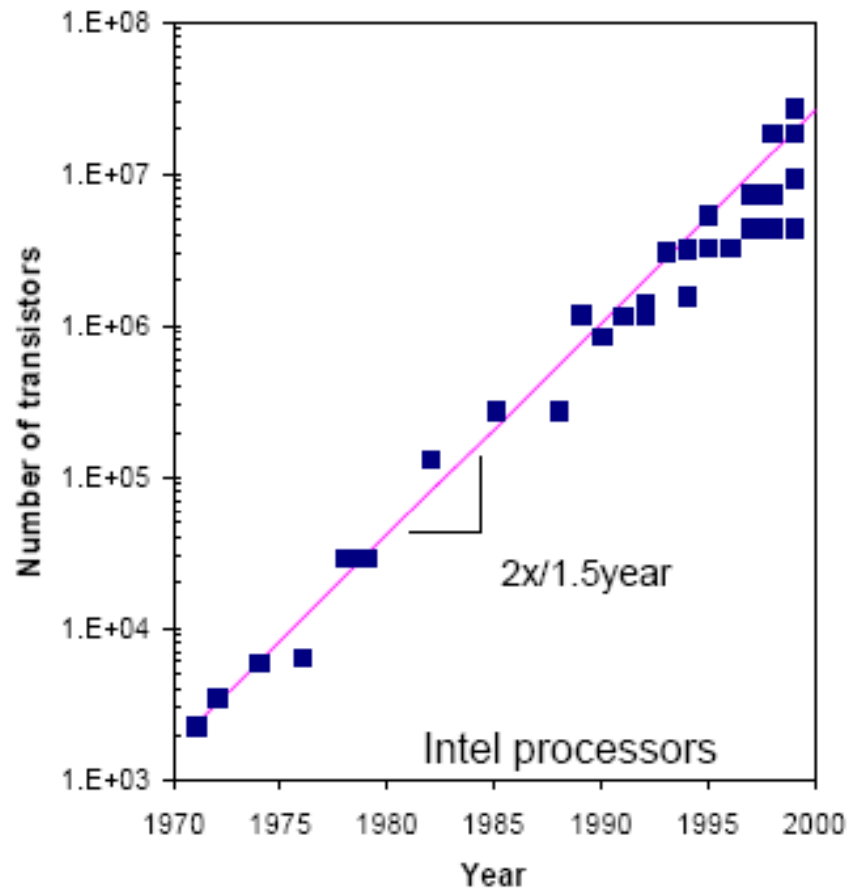
What is so special about Si Microelectronics?

1. Very small transistors



# Lect. 1: Introduction

## 2. Very high level of integration



About  $10^{18}$  transistors a year

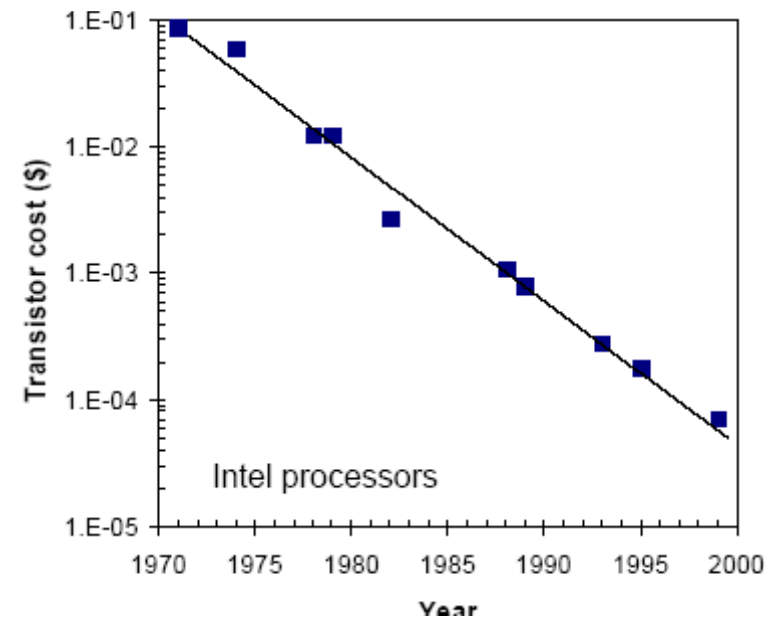
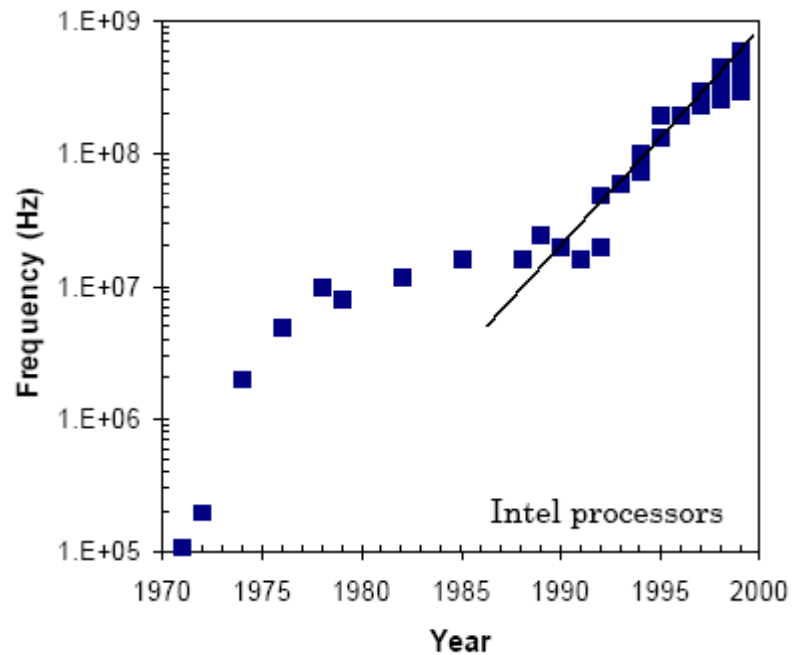
→ 10 to 100 times more than  
the total no. of ants on earth



# Lect. 1: Introduction

---

3 and 4: Lots of functions with very high speed at very low price



# Lect. 1: Introduction

---

What do we plan to do in this course?

- Understand what transistors do: **new electronic devices**
- Learn how to use transistors for useful works:  
**electronic circuits for useful functions such as amplification**

# Lect. 1: Introduction

---

- Teaching Staffs

- Lecturer: Prof. Woo-Young Choi (최우영)

- Room: B625, Tel: 2123-2874

- Email: wchoi@yonsei.ac.kr, tera.yonsei.ac.kr

- T.A.'s: Young-Seok Park (박영석): circuit@tera.yonsei.ac.kr

- Jin-Soo Rhim (임진수): peter@tera.yonsei.ac.kr

- Room: B629, Tel: 2123-7709

- Class Hours

- Lecture: Tue. 11:00-11:50 pm, Thur. 9:00-10:50 pm at A653

- Tutorial: Mon. 11, 12 am or 6, 7 pm at A653

- (Homework solutions, quiz, make-up classes, etc)

- Office Hours: Tue. 9:00 - 10:50 am, Thur. 11:00-11:50, or by appointment

- Prerequisite: A passing grade in Basic Circuits

# Lect. 1: Introduction

---

- Textbook: **Fundamentals of Microelectronics** by Razavi
  - Class web page: [tera.yonsei.ac.kr](http://tera.yonsei.ac.kr) (Click Classes)  
Lecture notes will be available in PDF files before the class
  - Grades
    - **Projects:** 20 points x 2 times = 40 points
    - **Tests:** 20 points x 2 times = 40 points
    - **Quizzes:** 5 points x 3 = 15 points
    - **Presentations:** 5 points,  
“5 min. review” or “My favorite electronics”
  - Attendance: Random sampling  
Absent: - 0.5 point, Late: - 0.25 point
  - Homeworks.: When necessary  
No homework: - 1.0 points, Suspected of copying: -3 points
- Max. penalty points for attendance and H.W. : -10 points
-

# Lect. 1: Introduction

---

## ● Projects

Two electronic circuit design projects will be assigned to students. One project will be designing a BJT amplifier and the other a MOSFET amplifier. A similar circuit configuration will be given for both projects. BJT amplifier will be designed by an analytic technique and the MOSFET amplifier by PSpice simulation. Each student is expected to do the design project by himself or herself.

## ● 5 min. Presentation

Every student will have a chance to make 5 min. presentation. There are two types of presentation each student can choose from. In one type, a student will review lecture materials from the previous lecture. This will be done in every lecture after the first quiz. In the 2<sup>nd</sup> type, a student will choose his/her favorite electronic circuit/system and explain how it works in 5 mins. This will be done during the class at the end of semester. A sign-up sheet will be available later.

# Lect. 1: Introduction

---

## ● Lunch Meeting:

Students are encouraged to participate in lunch meetings with fellow students and professor. Lunch meetings will be held on Tuesday from 12:00 - 12:50 in my office. We can have free conversation on the course, future career plans, etc. Sandwiches and drinks will be provided. A sign-up sheet will be available on this Thursday during the class.

# Lect. 1: Introduction

---

- Class Schedule (Tentative and subject to changes)

- Part 1: Basics

- Part 2: BJT Circuits

- Part 3: MOS Circuits

# Lect. 1: Introduction

---

- Class Schedule (Tentative and subject to changes)

- Part 1: Basics

Lect. 1: Introduction

Lect. 2: Review of basic circuits

Lect. 3: Review of basic circuits

Lect. 4-5: Op-amp circuits

Lect. 6: Basics of semiconductors

Lect. 7: PN junction diode

Lect. 8-9: PN junction diode circuits

Quiz 1: 9/14



# Lect. 1: Introduction

---

- Class Schedule (Tentative and subject to changes)

- Part 2: BJT Circuits

- Lect. 10-11: Bipolar Junction Transistors (BJT)

- Lect. 12: BJT circuits at DC

- Lect. 13: BJT current source

- Lect. 14: BJT CE amplifier

- Lect. 15: BJT small signal model

- Lect. 16: BJT CB amplifier

- Lect. 17: BJT emitter follower

- Lect. 18: BJT differential pair

- Lect. 19: BJT multi-stage amplifier

Quiz 2: 9/28

Project 1: Due on 10/13

Test 1: 10/15

# Lect. 1: Introduction

---

- Class Schedule (Tentative and subject to changes)

- Part 3 : MOSFET circuits

- Lect. 20-21: MOSFETs

- Lect. 22: MOSFET small-signal model

- Lect. 23: MOSFET CS amplifier

- Lect. 24: MOSFET CG amplifier

- Lect. 25: MOSFET source follower

- Lect. 26: MOSFET cascode amplifier

- Lect. 27: MOSFET differential amplifier

- Lect. 28: MOSFET frequency response

- Lect. 29: MOSFET multi-stage amplifier

- Lect. 30: Frequency response of MOSFET amplifiers

- Lect. 31-33: Various topics on electronic circuits, if time allows

Quiz 3: 11/9

Project 2: Due on 12/1

Test 2: 12/3

# September (tentative, subject to changes)

(9/1)

일	월	화	수	목	금	토
		1 Lect. 1	2	3 Lect. 2,3	4	5
6	7 T	8 Lect. 4	9	10 Lect. 5,6	11	12
13	14 Quiz 1	15 LM Lect. 7	16	17 Lect. 8,9	18	19
20	21 T	22 LM Lect. 10	23	24 Lect. 11, 12	25	26
27	28 Quiz 2	29 LM DP 1 out Lect. 13	30			

# October (tentative, subject to changes)

(9/1)

일	월	화	수	목	금	토
				1 Lect. 14,15	2(추석)	3(추석, 개천절)
4(추석)	5 T	6 LM Lect. 16	7	8 Lect. 17,18	9	10
11	12 T	13 DP1 due DP1 solutions	14	15 Test 1	16	17
18	19	20	21 Mid-Term Exam Period	22	23	24
25	26	27 LM Lect. 19	28	29 Lect. 20,21	30	31

# November (tentative, subject to changes)

(9/1)

일	월	화	수	목	금	토
1	2 T	3 LM Lect. 22	4	5 Lect. 23,24	6	7
8	9 T Quiz 3	10 LM DP2 Out Lect. 25	11	12 Lect. 26,27	13	14
15	16 T	17 LM Lect. 28	18	19 Lect. 29,30	20	21
22	23 T	24 LM Lect. 31	25	26 Lect. 32,33	27	28
29	30 T					

# December (tentative, subject to changes)

(9/1)

일	월	화	수	목	금	토
		1 LM DP2 Due DP2 solutions	2	3 Test 2	4	5
6	7 T	8 LM Presentations	9	10 Presentations	11	12
13	14	15	16	17	18	19
← Final Exam Period →						
20	21	22	23	24	25	26
27	28	29	30	31		