CSL 356
Algorithm Design & Analysis

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CSL 201 : Data Structure
Discrete Str. & Recurrence
elementary Discrete Probability

Lecture Notes (Reference books)
→ ① Dasgupta, Papadimitriou & Vazirani
→ ② Cormen, Leiserson, Rivest S
→ ③ Aho Hopcroft & Ullman
→ ④ — & Tardos

2 Minor
20% each

40% 3

2017.
1. Can we design an *algorithm* for any "problem"?
   (computational)

* Properties
  1. must be correct for all inputs
  2. must terminate

Answer = "No"
   → Goedel Incompleteness Thm
Tiling Problems

Proving Correctness of Programs (using programs)

code \rightarrow \text{Specification} \rightarrow \text{Output} \rightarrow \text{Y/N}
Designing of "Efficient" algorithms

Running Time  Space

Time Complexity  Space Complexity

Measure/Estimate of time/space the program takes and often expressed as (asymptotic behavior) functions of input size using 'O' - Big Oh notation:

\[ O(n^2) \quad O(n^3 \log^3 n) \quad \ldots \]

\[ O(n^2 + n \log n) \sim O(n^2) \]

Design and then analyze
Computational Model

1 processor? -> multiple processors

$O(n^2)$ $O\left(\frac{n^2}{p}\right)$

# processors

-> what are capabilities of a processor
   
   basic instruction set
   
   clock speed

Computing the $n^{th}$ Fibonacci No

$F_0 = 0$ $F_1 = 1$ $F_i = F_{i-1} + F_{i-2}$