Mathematics for Computer Science

MIT 6.042J/18.062J

DAG's & Scheduling

Some Course 6 Prerequisites

18.01 → 6.042
18.01 → 18.02
18.01 → 18.03
6.001 → 6.034
6.042 → 6.046

8.02 → 6.002
18.03, 6.002 → 6.004
6.001, 6.004 → 6.033
6.033 → 6.857
6.046 → 6.840

indirect prerequisites

u is an indirect prereq of v when there is a positive length path from u to v in the prerequisite digraph R:

$$u\, R^{+}\, v$$

a minimal subject?

a minimal subject has no preequisites --a Freshman subject

nothing → d

18.01 8.02 6.001

a minimum subject?

minimum means earliest of all:
an indirect prereq. of everything
none in this example
there used to be one at MIT:
orientation week seminar on
on summer book assignment

Some Course 6 Prerequisites

18.01 → 6.042
18.01 → 18.02
18.01 → 18.03
6.001 → 6.034
6.042 → 6.046

8.02 → 6.002
18.03, 6.002 → 6.004
6.001, 6.004 → 6.033
6.033 → 6.857
6.046 → 6.840

identify minimal elements

Constructing a Term Schedule

18.01 8.02 6.001

start schedule with them

Some Course 6 Prerequisites

18.01 → 6.042
18.01 → 18.02
18.01 → 18.03
6.001 → 6.034
6.042 → 6.046

8.02 → 6.002
18.03, 6.002 → 6.004
6.001, 6.004 → 6.033
6.033 → 6.857
6.046 → 6.840

remove minimal elements

Some Course 6 Prerequisites

→ 6.042
→ 18.02
→ 18.03
→ 6.034
6.042 → 6.046

→ 6.002
18.03, 6.002 → 6.004
6.004 → 6.033
6.033 → 6.857
6.046 → 6.840

remove minimal elements

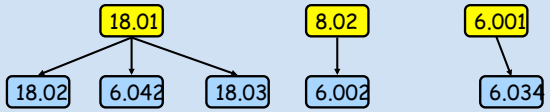
Some Course 6 Prerequisites

→ 6.042
→ 18.02
→ 18.03
→ 6.034
6.042 → 6.046

→ 6.002
18.03, 6.002 → 6.004
6.004 → 6.033
6.033 → 6.857
6.046 → 6.840

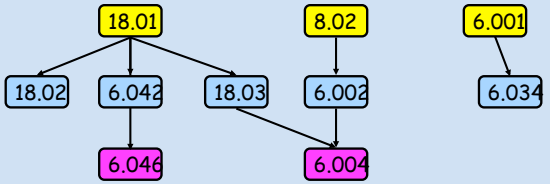
identify new minimal elements

Constructing a Term Schedule

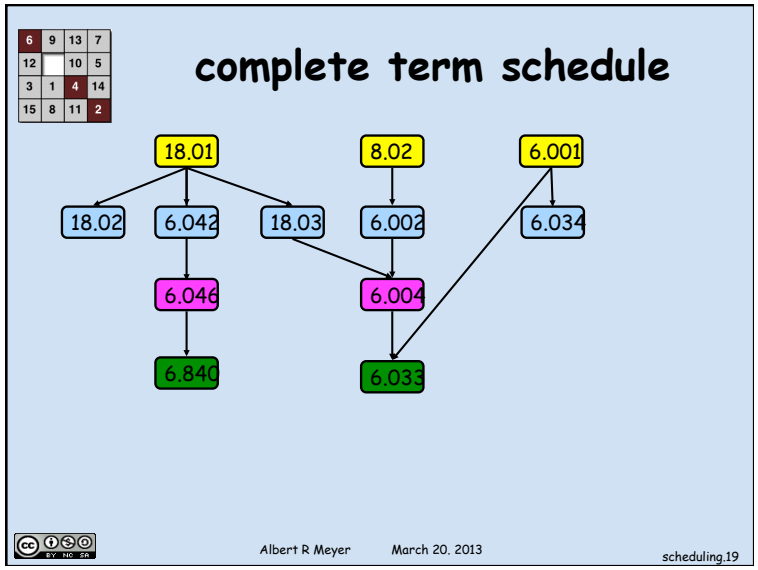


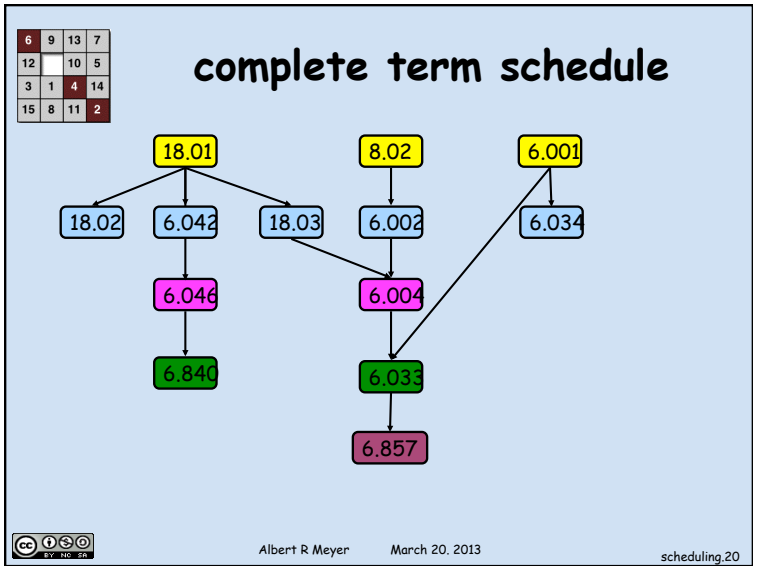
schedule them next

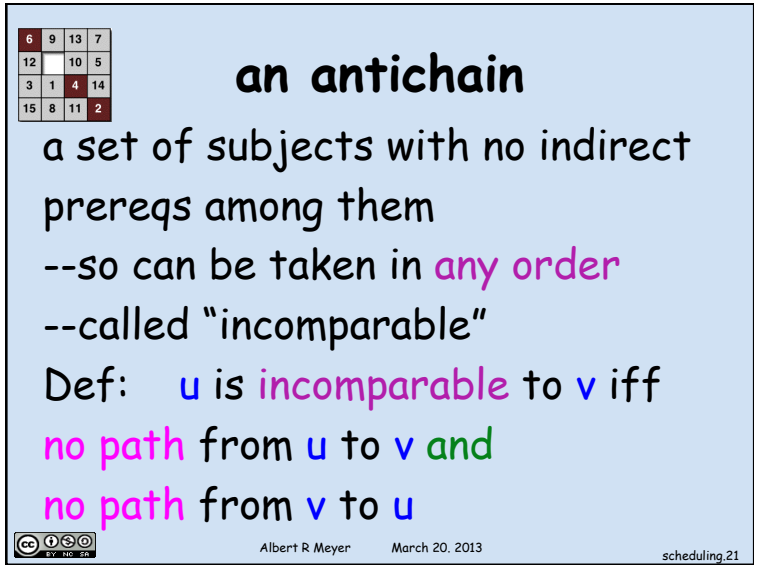
Constructing a Term Schedule

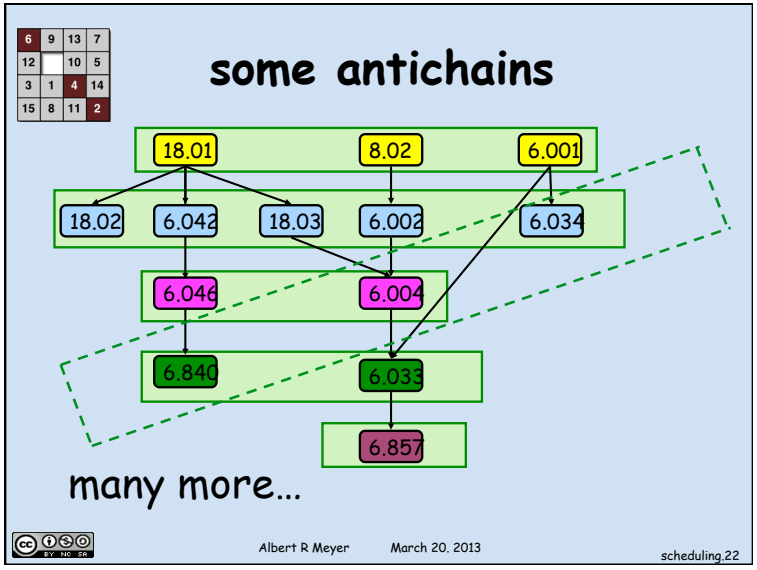


continue in this way…


complete term schedule
18.01
8.02
6.001
18.02
6.042
18.03
6.002
6.034
6.046
6.004
6.840
6.033
Albert R Meyer
March 20, 2013
scheduling.19


complete term schedule
18.01
8.02
6.001
18.02
6.042
18.03
6.002
6.034
6.046
6.004
6.840
6.033
6.857
Albert R Meyer
March 20, 2013
scheduling.20

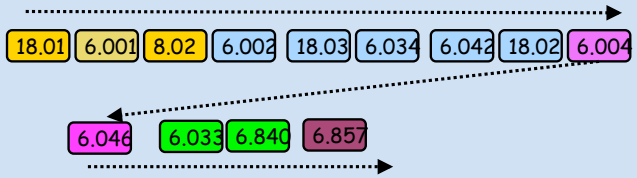

an antichain
a set of subjects with no indirect prereqs among them
--so can be taken in any order
--called "incomparable"
Def: u is incomparable to v iff
no path from u to v and
no path from v to u
Albert R Meyer
March 20, 2013
scheduling.21


some antichains
18.01
8.02
6.001
18.02
6.042
18.03
6.002
6.034
6.046
6.004
6.840
6.033
6.857
many more…
Albert R Meyer
March 20, 2013
scheduling.22

a leisurely schedule

Graduate taking only 1 subject/term?

Sure,

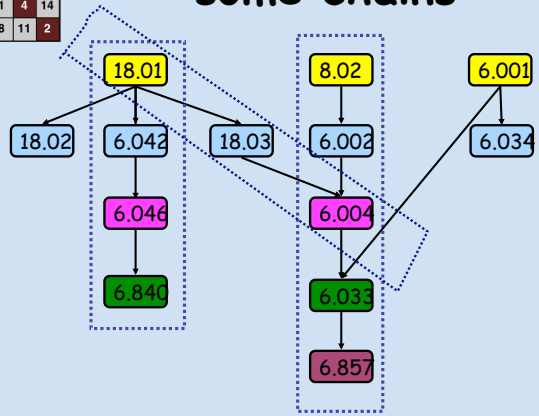


a topological sort

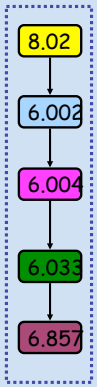
a chain

sequence of subjects that must be taken in order (subjects are comparable)

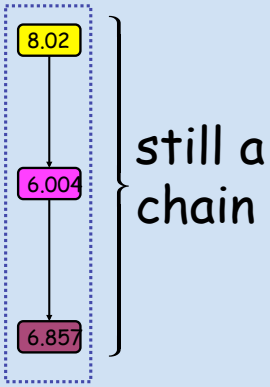
some chains



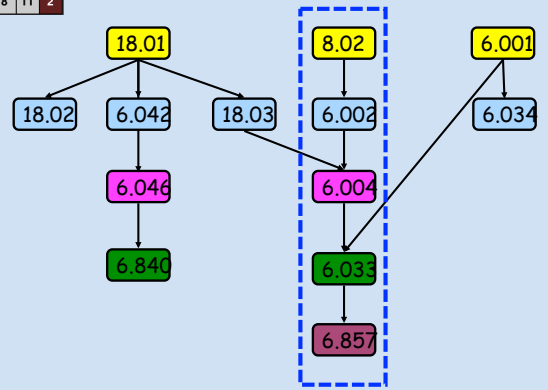
some chains



some chains



maximum length chain



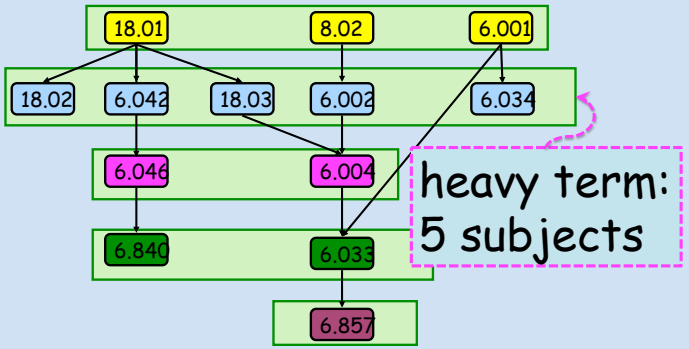
how many terms to graduate?

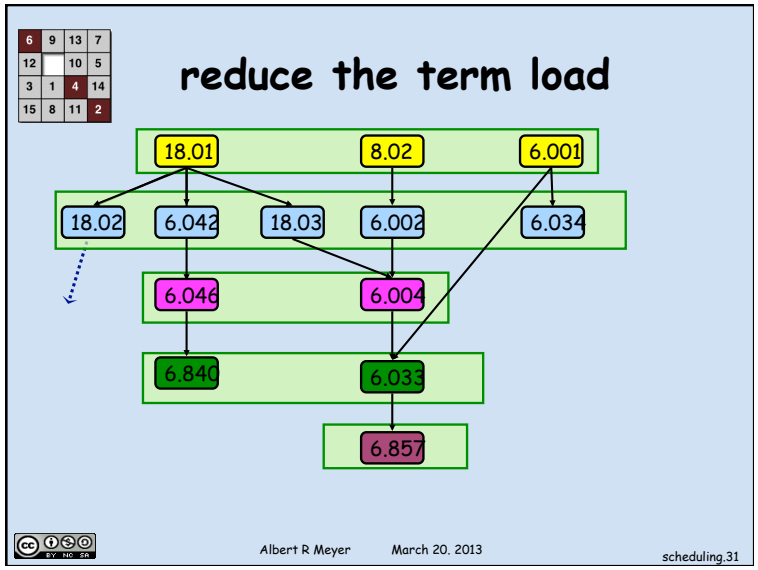
5 terms are necessary to graduate --because max chain length is 5

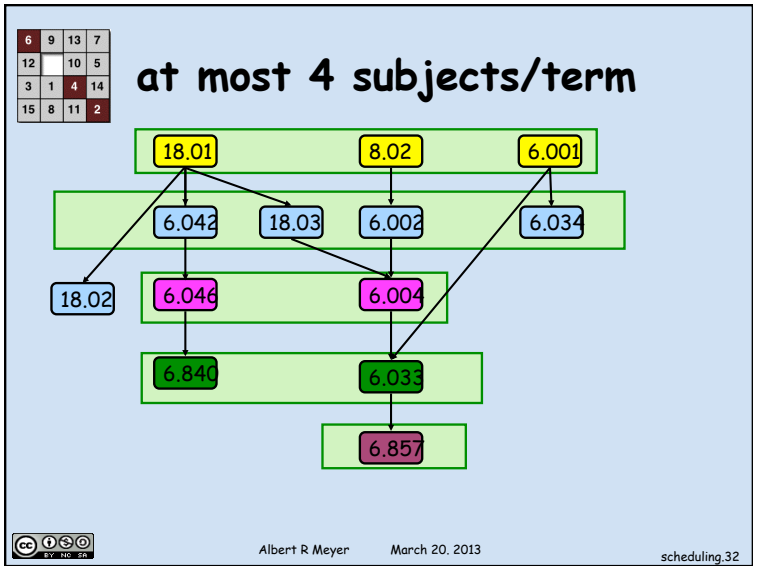
and 5 are sufficient

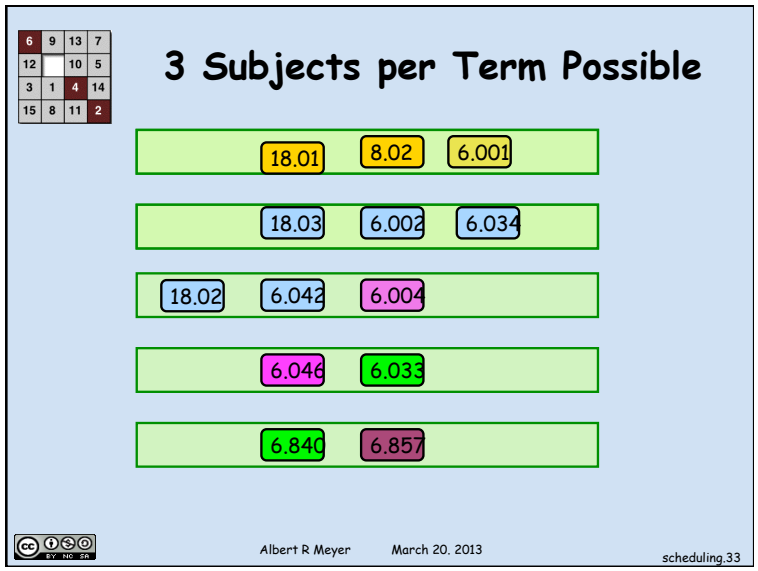
--if you can take unlimited subjects per term...

...sufficient




reduce the term load
18.01
8.02
6.001
18.02
6.042
18.03
6.002
6.034
6.046
6.004
6.840
6.033
6.857
Albert R Meyer
March 20, 2013
scheduling.31


at most 4 subjects/term
18.01
8.02
6.001
6.042
18.03
6.002
6.034
18.02
6.046
6.004
6.840
6.033
6.857
Albert R Meyer
March 20, 2013
scheduling.32


3 Subjects per Term Possible
18.01
8.02
6.001
18.03
6.002
6.034
18.02
6.042
6.004
6.046
6.033
6.840
6.857
Albert R Meyer
March 20, 2013
scheduling.33