IE 477/478 Systems Design: Analysis and Synthesis
Second Week: Essentials

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Course Coordinators

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University-Industry Collaboration
Student Projects Coordinator

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Teaching Assistants

24 September 2025

Course mission

System view

Factories, banks, restaurants, online shopping sites, airlines,

- *divide into parts:*
  inventories, production lines, manpower, orders, customers
- *study parts and their interrelations:*
  correlated demand, pull, push, precedence, starvation, wip, loss sales, risks
- synthesize:
  demand forecasts, basestock levels, production schedules, maintenance

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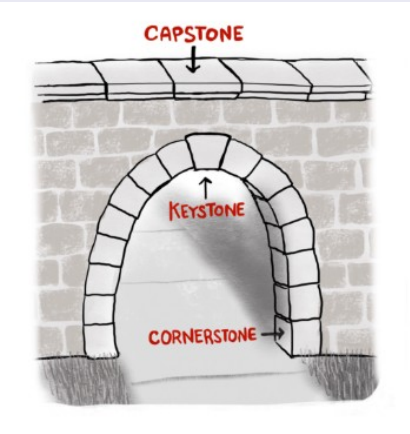
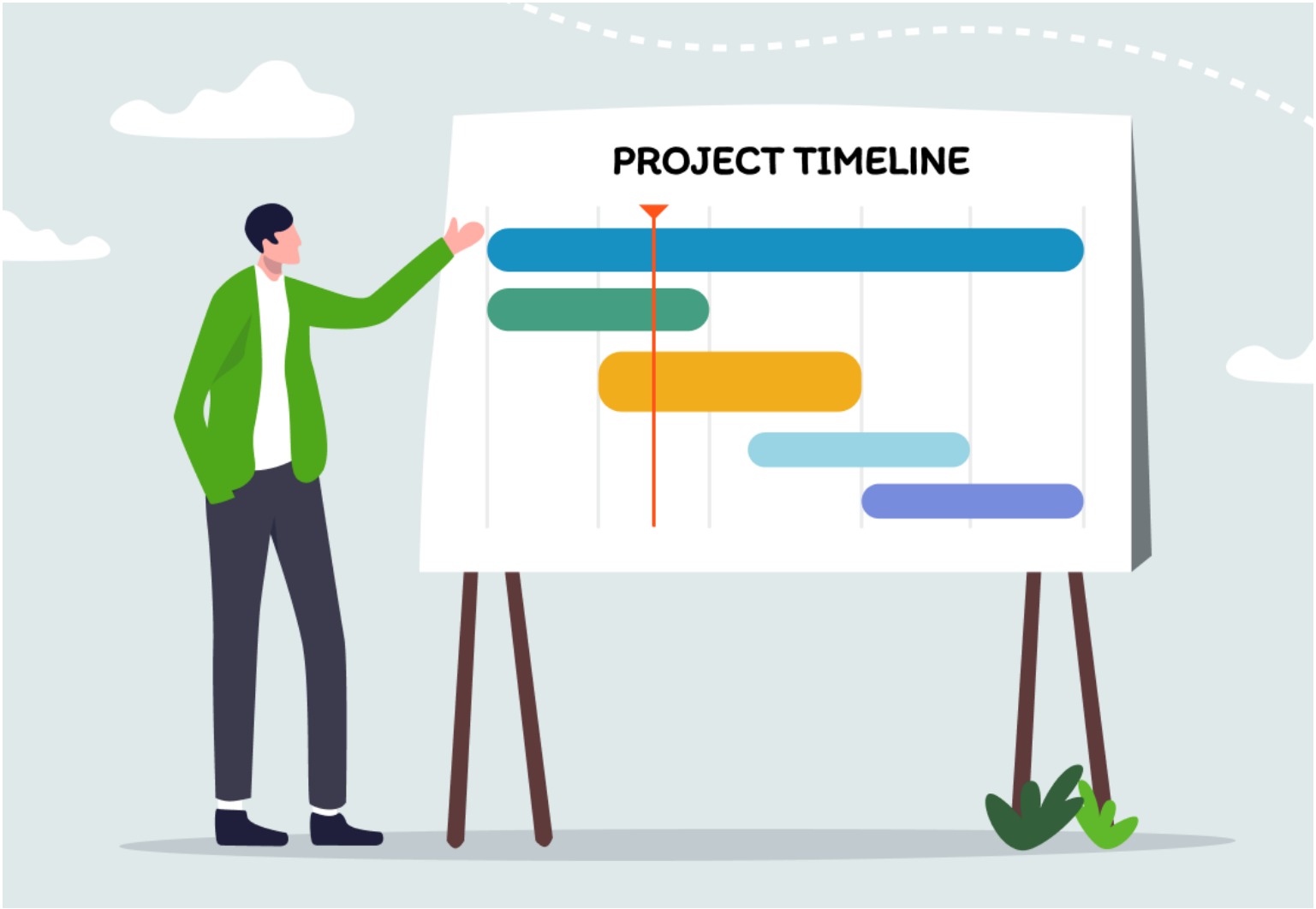
Capstone



Build a path/gate to solutions of problems

- Cornerstones: IE 303, IE 325 (modeling, optimization)
- Keystone: IE 375 (resource allocation of all kinds)
- Capstone: IE 477/478 (analysis and synthesis)

The whole is more than the sum of its parts.


PROJECT TIMELINE

Timeline

24
Sep
Wed
Today

Timeline

24 Sep Wed

Today

1 Oct Wed

21 Oct Tue

Timeline

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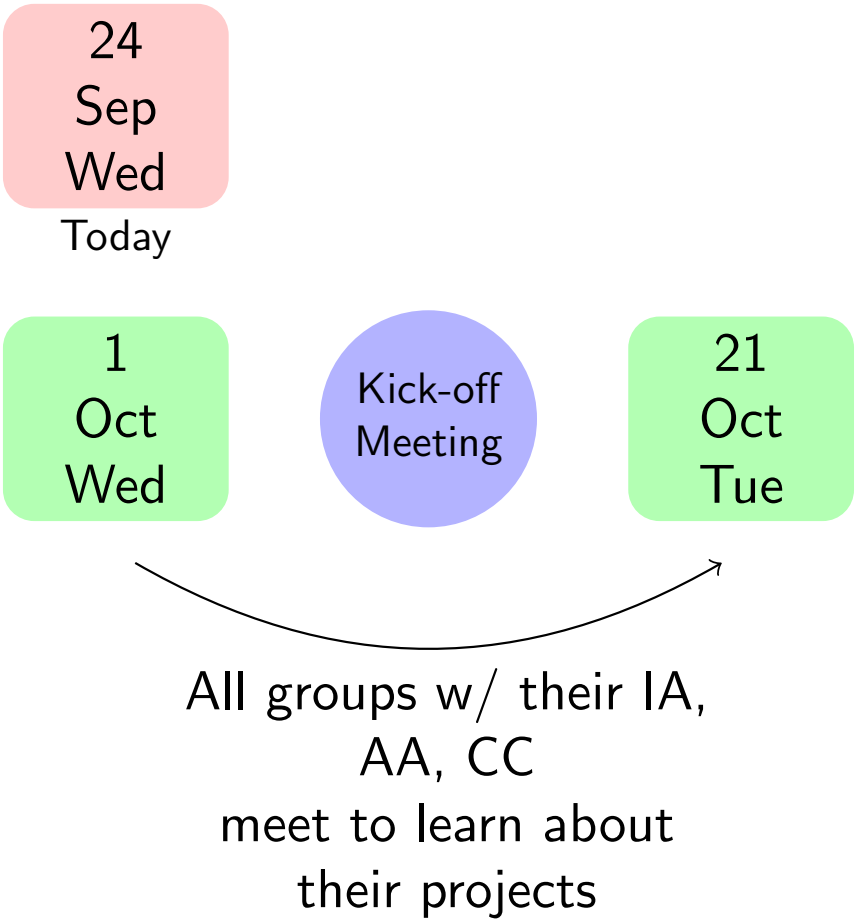
All groups w/ their IA, AA, CC
meet to learn about
their projects

Timeline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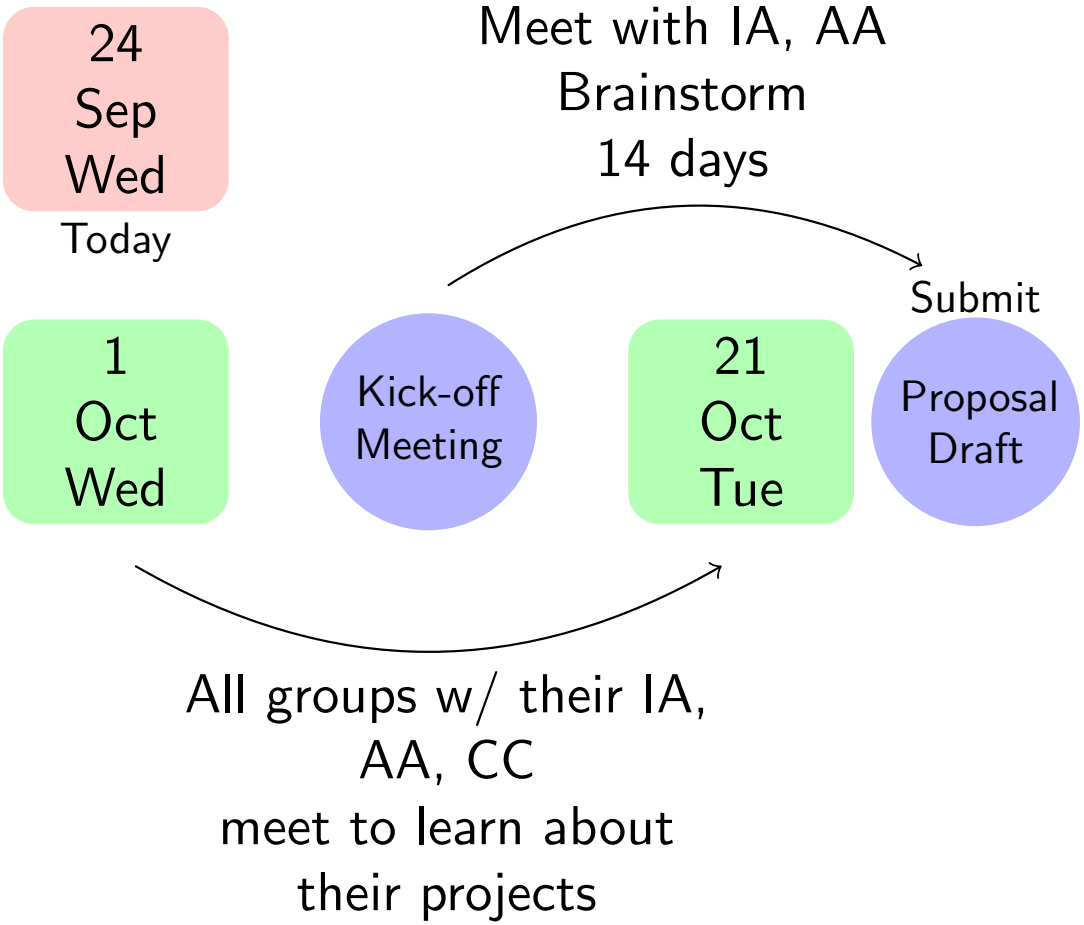
24
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Meet with IA, AA
Brainstorm
14 days
Submit
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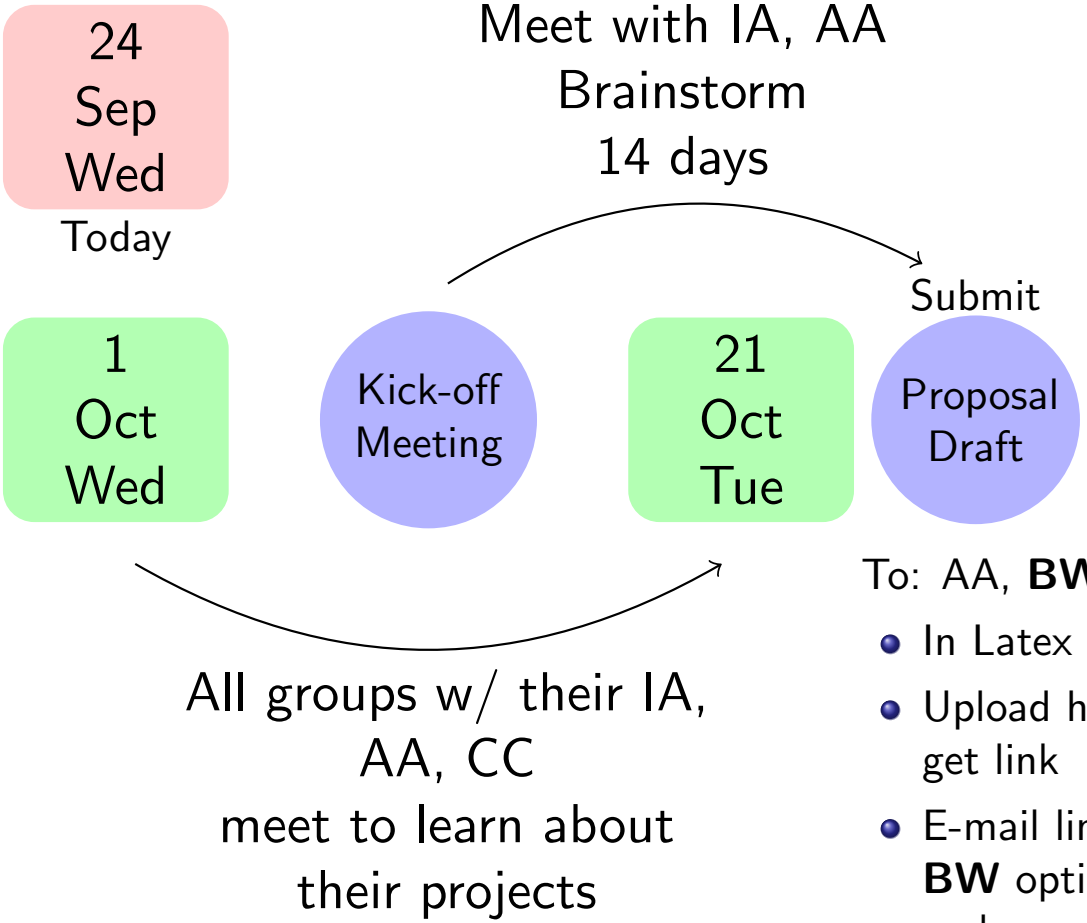

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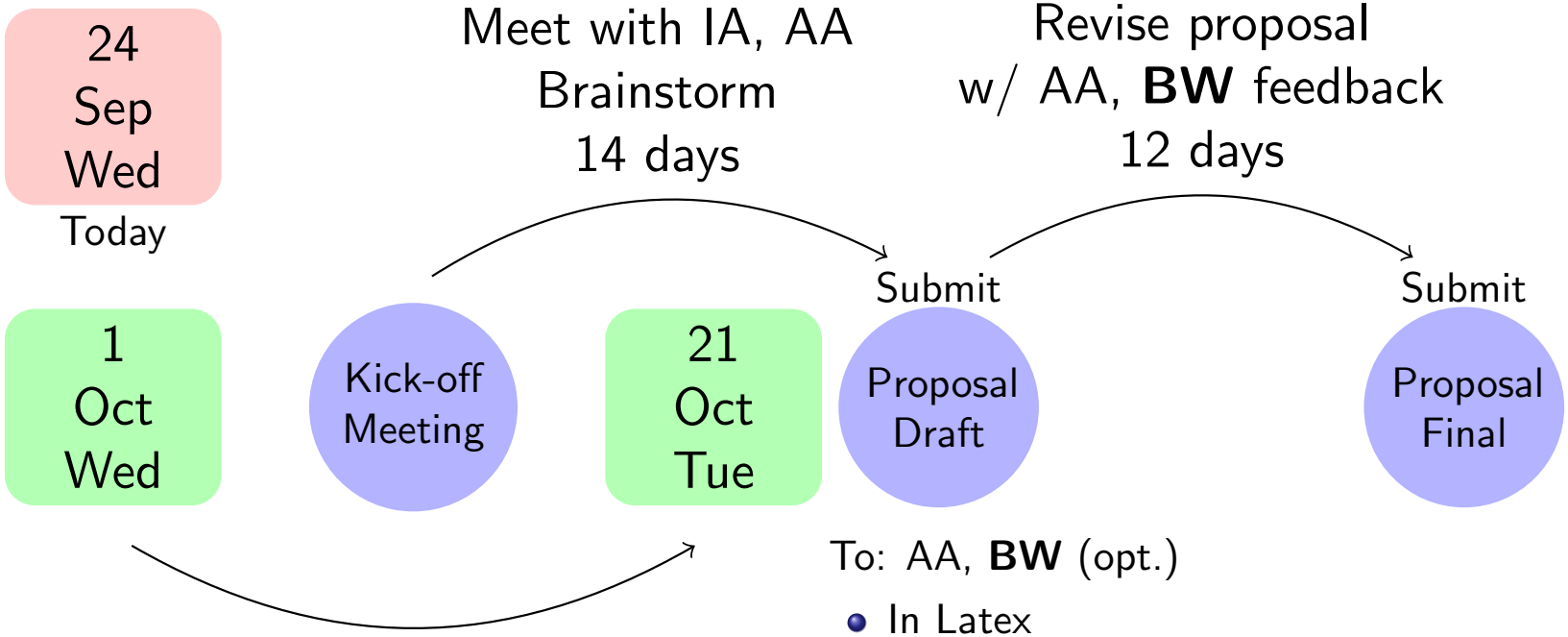

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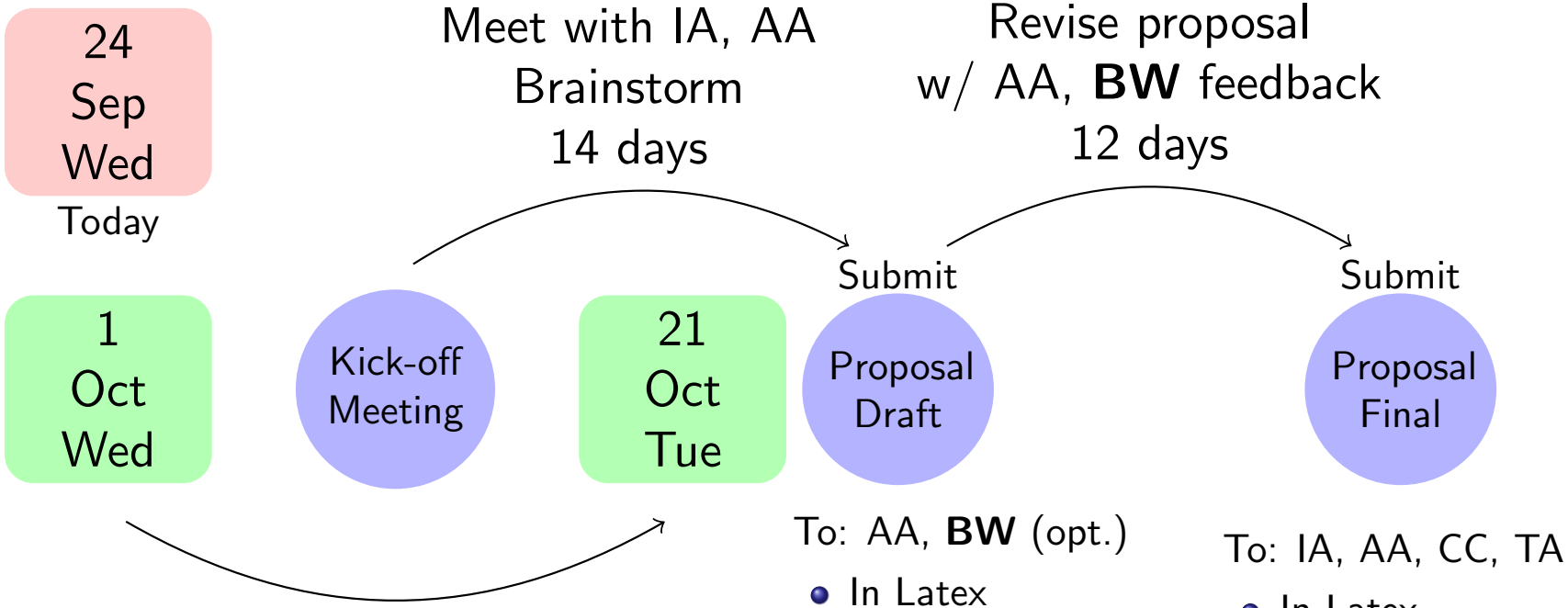

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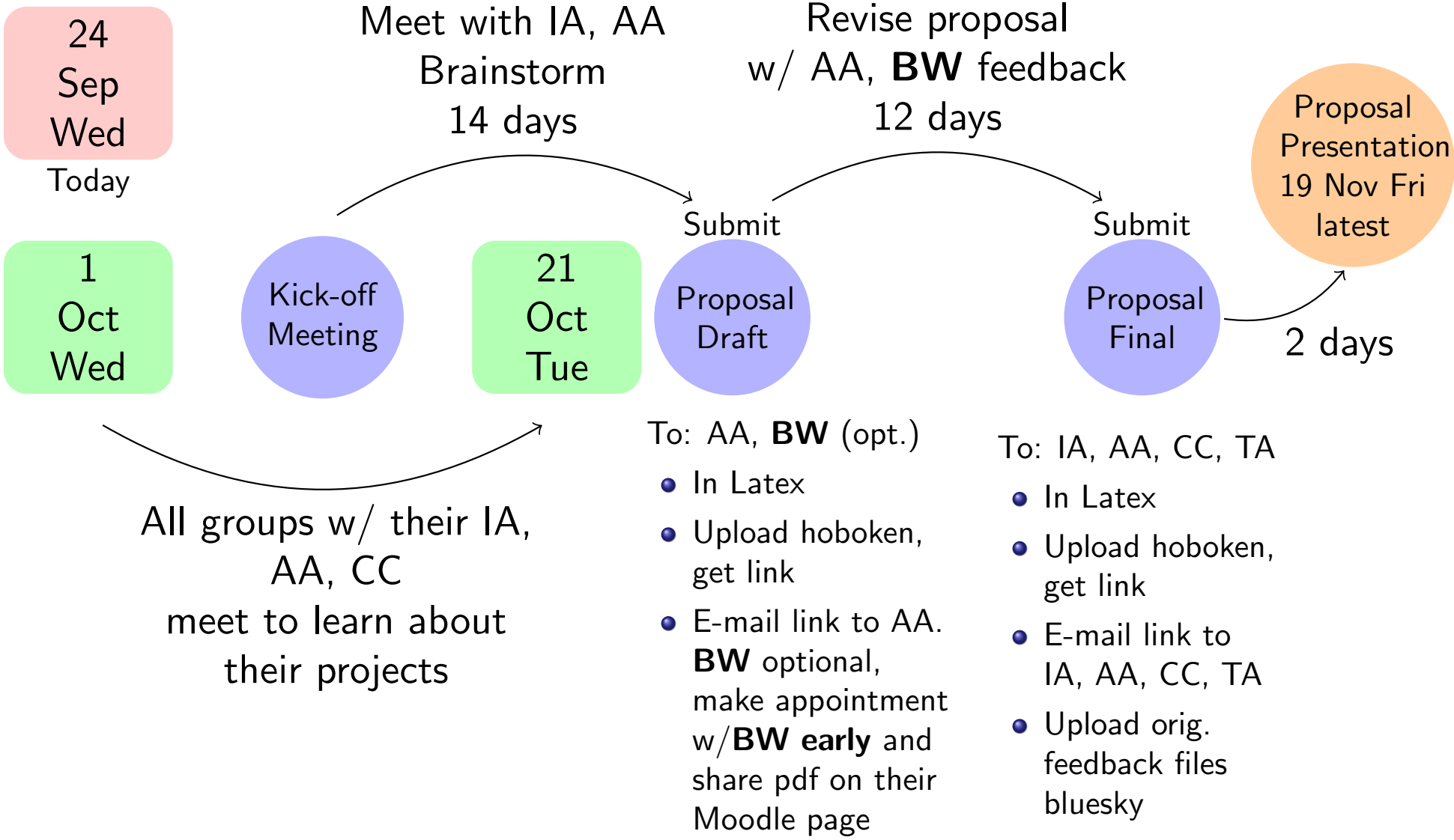
24
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Meet with IA, AA
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Revise proposal
w/ AA, **BW** feedback
12 days
Proposal
Presentation
19 Nov Fri
latest
1
Oct
Wed
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21
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Submit
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Final
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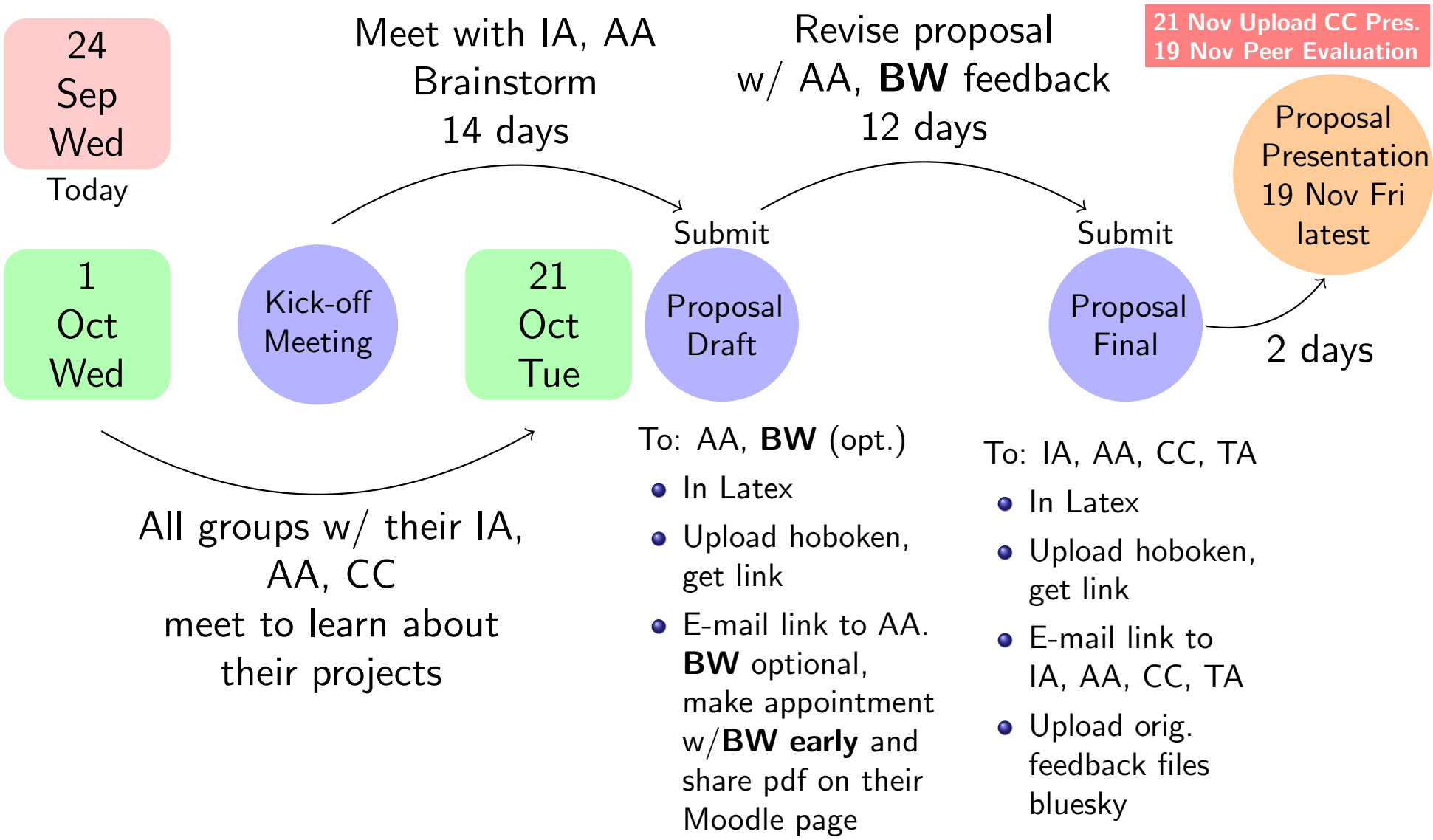
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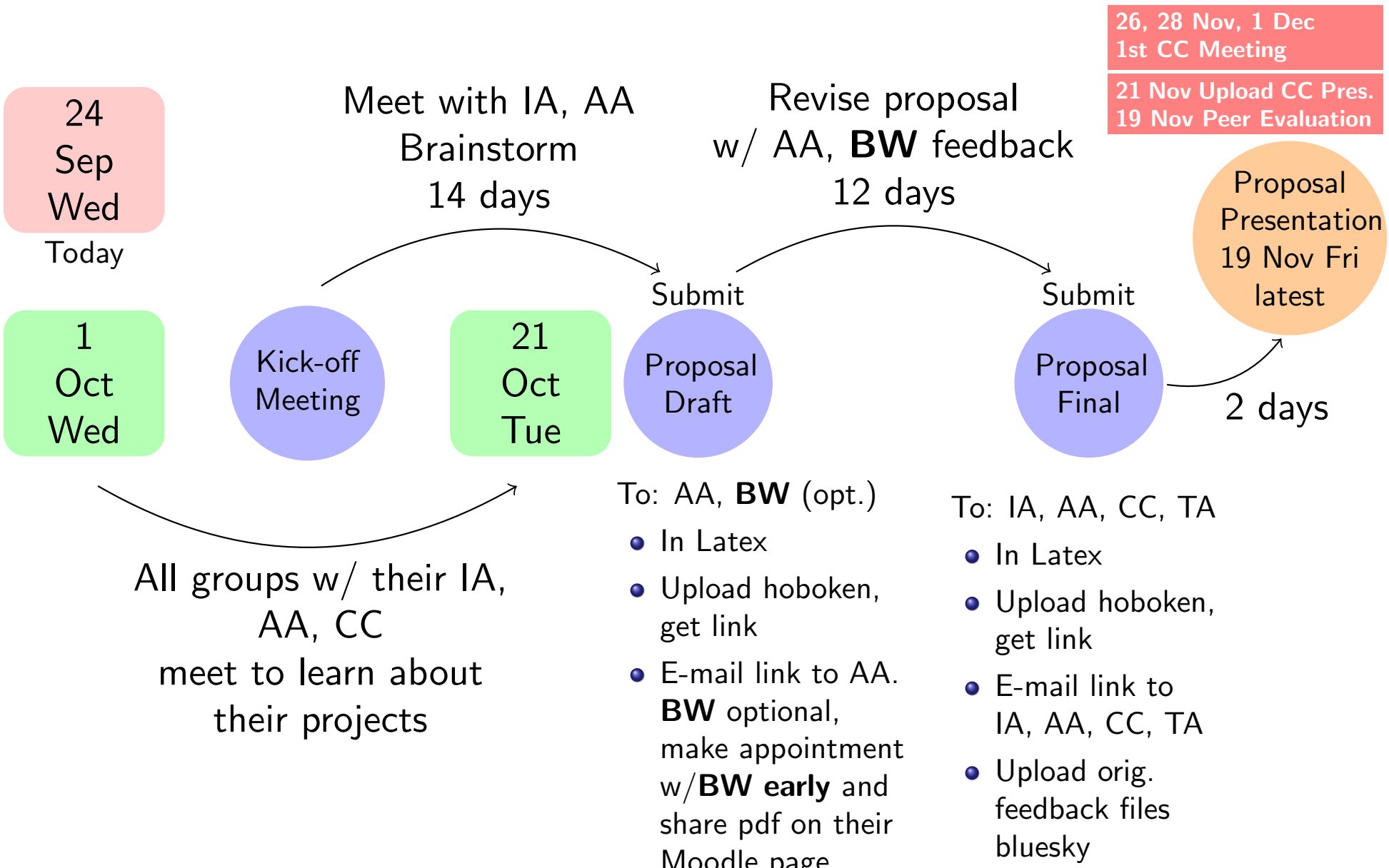
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PROJECT PROPOSAL

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    - split in work packages
    - timetable for when to start and finish
    - who are responsible for each work package
    - use built-in Gantt chart of project management system on bluesky

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- Agreeable by IA, AA, CC, the group
  - meet regularly with IA and AA
  - keep minutes of the meeting:
    - what are new actions to be taken?
    - who is responsible for each task?
    - use project management system on bluesky

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  - modeling, LP, production planning, scheduling,
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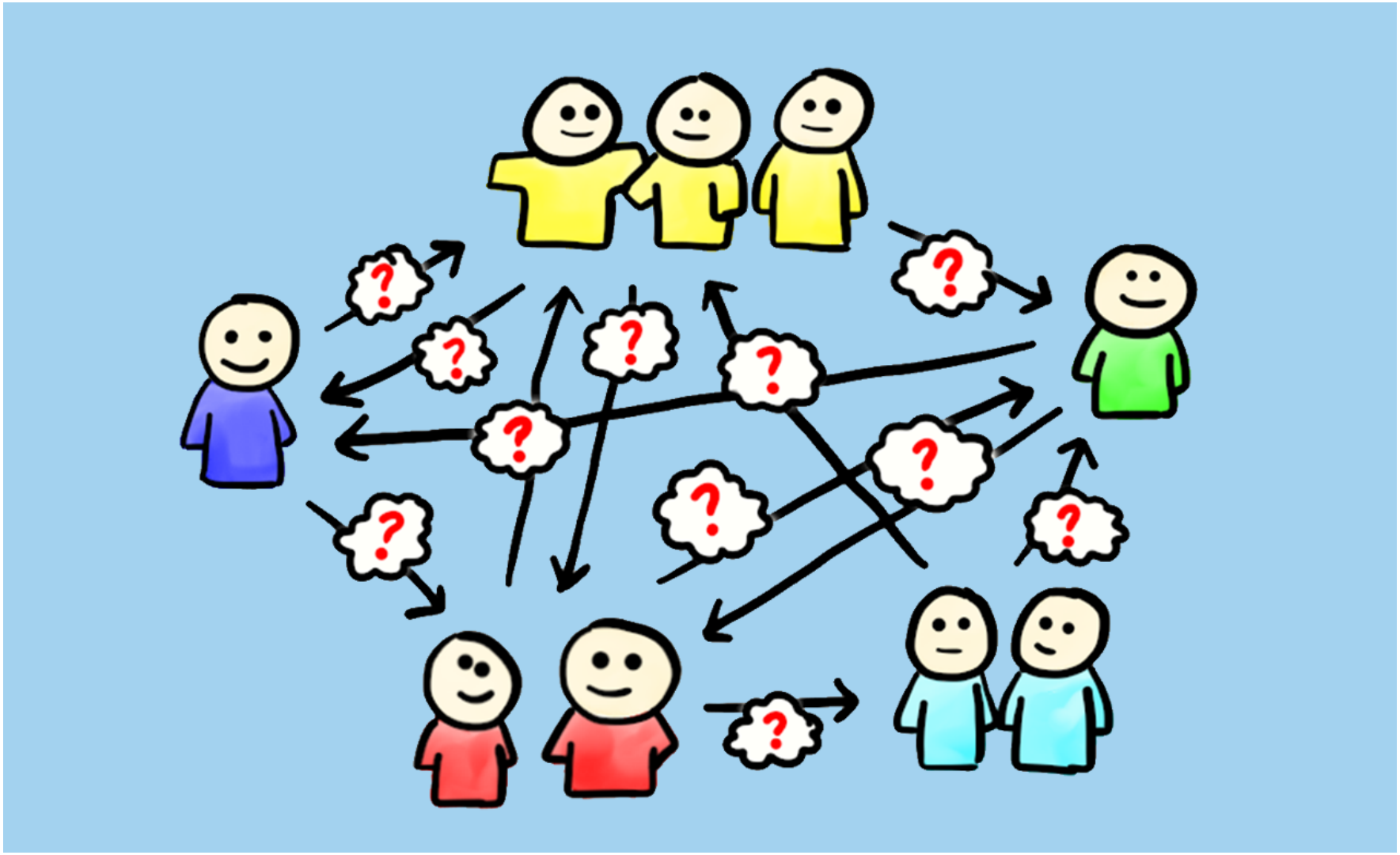
- Critical thinking
  - can the real problem be different than what company described?
  - where are the bottlenecks?
  - can there be a solution approach better than what IA, AA, CC may suggest?
  - are the assumptions realistic?
  - are all of important constraints stated?
  - can you solve LP, MIP in acceptable time? do you need a heuristic?



?? Roles and Expectations ??

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- helps not lose sight of correct problem
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CP:
- always available accessible
- punctual in passing messages
- kind

We can dismiss CP if s/he does not fulfill the expectations.

Roles and expectations, continued

Yeşim Gülseren
University-Industry Collaboration
Student Projects Coordinator

- Seeking projects from companies
- Communication with industrial advisors
- Overseeing project budgets and ensuring their proper use
- Enforcement of non-disclosure agreements
- Organizing course seminars (e.g., project management, teamwork)
- Approval of legitimate project budget spending requests
- Mentoring students on patent applications and entrepreneurship
- Guidance for students to apply for TÜBİTAK student grants
- Support for project fair organization
- Career advise for students after graduation

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  - plot 101 series
  - are they alike?

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Benchmarking

- performance measure
  - fill rate
  - cost/profit
  - multiple?
- compare proposed & current system
- how? simulation? pilot study

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- contains major constraints, factors, interactions, tradeoffs
- *All models are wrong, but some are useful* (G. Box)

More available on course page Verification and Validation

Fall semester: get ready for 2nd CC meeting on 7-8 Jan 2026

Verification ≡ Internal Validation

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- performance measure
  - fill rate
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- April 24, 2026: DELIVERY

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Rest of May: reports, CC meetings, fair

Expectations

By the end of Fall semester, we expect to see a solution method

- **scalable to the actual size** of the problem faced
  - scalable in input size
    - number of products
    - number of machines
    - number of planning periods, etc.
  - scalable in running time
    - $<$ 30 minutes for what-if analysis
    - $<$ over-night for weekly planning
    - $<$ a day for monthly planning
  - check the requirements with the IA.
- implemetable using only **open source tools**
  - companies cannot afford, e.g., CPLEX, Gurobi
  - academic / student licenses are not allowed in the final product
- gone through **well documented verification process**

The details must be in the **first progress report due 24 Dec 2025**. Should be presented in **7-8 Jan 2026 CC meetings** (video ready on Jan 2nd, 2026).

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- before writing proposal report go to course homepage and read
  - IE 477 – General Tips on Writing Reports (1 page)
  - IE 477 – Suggested Contents for Proposal Report (3 pages)

  For the upcoming reports (first progress report in fall, second progress, final, and booklet reports in spring) go to Information on Reports page.

Presentations

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  - General Tips on Presentations and Meetings
  - Information on Preparing Presentation Video

Follow the roadmap on course page

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  - Use project management system
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    - Before: write agenda, share it, ask invitees for additions of new agenda items
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- do not forget to fill the peer evaluation forms. If you fail, then your grade will be lower.


DATA

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- no-disclosure agreements (NDA) take time to process:
  - finalize agreement content (Yeşim Hanım)
  - sign in person
  - send to company in mail (not enough to email scanned copies)
  - company signs at its own time of convenience – can take long time on its own.

  Start right after kick-off meeting.

PROJECTS

Received 23 projects.

Rank them all with no ties.

Submit preferences by 23:59 tonight.

Projects

- A101, Arçelik/Beko (3), Emeklilik Gözetim (2), Eti, Hayat Finans, Nesco, Roketsan, Supply Chain Wizards, Türk Traktör
  - Inventory management
  - Production planning
  - Route planning
  - Scheduling
  - Forecasting
  - Process improvement
  - Finance
- New companies
  - Türkiye İş Bankası / İstanbul
    - condition-based maintenance planning
    - data-driven decision making
  - Kaptın Kaptın / İstanbul
    - customised promotion and campaign planning
    - data-driven e-commerce
  - Karel Elektronik / Ankara
    - production planning
  - Limak (2) / Ankara
    - Warehouse management
    - Stock replenishment
    - Weigh station traffic management

Projects continued

- Mavi Giyim / İstanbul
  - demand forecasting
  - replenishment
- Teknopar Endüstriyel Otomasyon/ Ankara
  - production planning
  - scheduling
- TeklifimGelsin / Ankara
  - credit scoring, prediction of credit approval probabilities
  - data science
- Tepe Kurumsal Çözümler / İstanbul
  - customer experience management
  - consulting