IE477 - IE 478 Systems Design

GENERAL INFORMATION AND SCHEDULE

Course Coordinators:

Dr. Savaş Dayanık

Dr. Nesim Erkip

Dr. Emre Uzun

Administrative Coordinator:

Yeşim Gülseren

Teaching Assistants:

Yunus Emre Çakır

Kaan Çakıroğlu

Aslı Eroğlu

Characteristics

- This is the capstone project course series
  - Different than other courses in the curriculum
  - Design a system to solve a real-life problem
  - Analysis – Synthesis
- Communication
- Team work
  - Group Members
  - Industrial Advisor
  - Academic Advisor
  - Course Coordinator

Industrial Project

- Solve a real-life problem and implement the proposed solutions
  - Supply chain management
  - Inventory management
  - Distribution logistics
  - Production planning, scheduling and control
  - Forecasting
  - Energy or health applications
  - Financial engineering, cost control, etc.

Explanations – CAPSTONE

- Currently, your strength is “engineering education”
  - Engineer – numbers, facts, abstraction, measurement
- Your current background – All required courses are finished + electives + current courses
  - Any diversion from above requires more effort
- **Capstone** – Bring together all your previous knowledge + methods of inquiries + critical thinking + ability to learn and apply + ...

Explanations – CAPSTONE

- IE Capstone Project – more specifically
  - Prerequisites: IE 303, IE 325, IE 375 and *others*
  - Text Books for all courses – First thing to read
  - ~ 60% of the your work can be handled
  - References in the text book – a good start to go further
- Get support + advice from current TA's of other courses – Source: Course web pages
- Designing a system means a preparation to **repeatedly implement** the proposed approach over time, under almost all conditions

Industrial Project

- The following steps will be taken:
  - **Analyze/collect system data** to understand the system and the problem
  - Define the scope of the project and the solution approach
  - **Access information** and do **literature survey**
  - Formulate the problem - a model or models
  - **Verify** the models using appropriate software
  - **Validate** the models and do benchmarking
  - Implement the proposed system via a **pilot study**

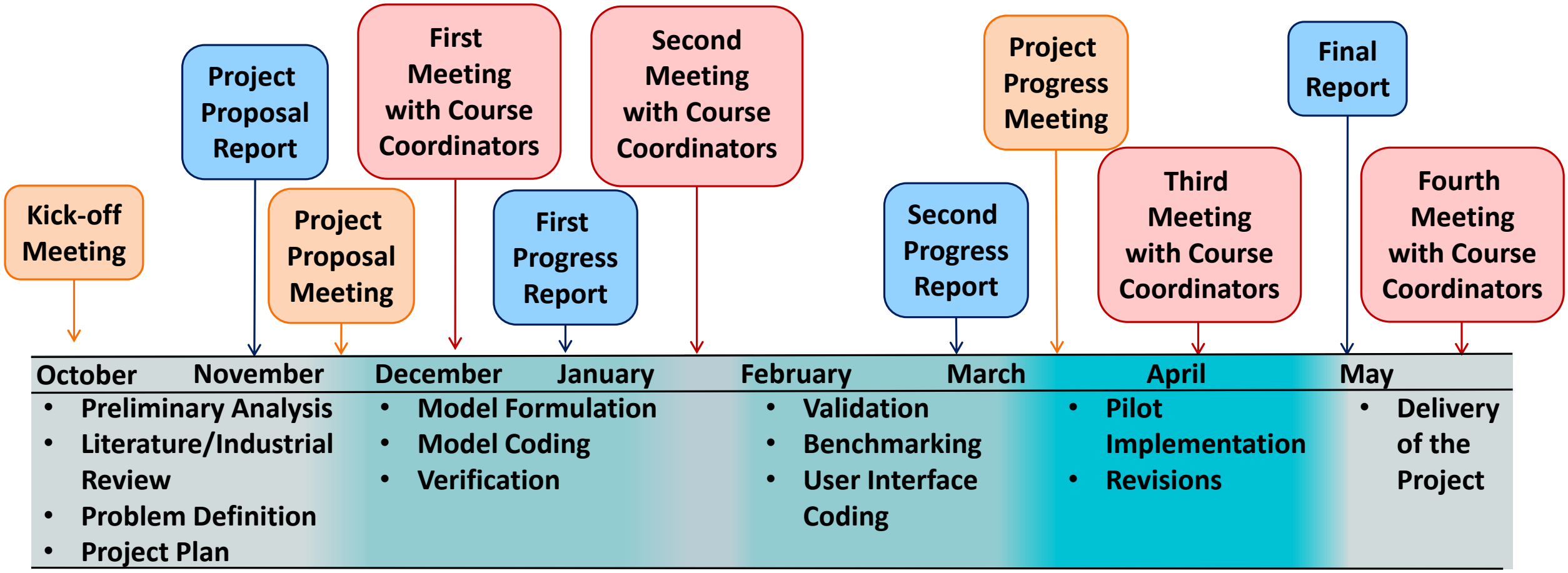
Industrial Project

- You will also learn:
  - Effectively use **group work**
  - Prepare **reports and presentations** to explain ideas
  - Practice **professional and ethical responsibilities**

Ethical and Professional Responsibility

- Projects are important for the reputation of Bilkent IE Department
  - Companies are your potential employers or partners in the future
- Ethical and Professional Responsibility:
  - Your commitment to signed agreements – non-disclosure of data, information + any additional requirements by the company
  - Your responsibility to carry-out oral and written promises made
  - Your manner and behavior while communicating within the group, with advisors and coordinators, etc – be formal
  - Any information source or material from literature should be cited
  - Technical results should be clear and reproducible
- Any violation by any group will affect all of us, our reputation and value of your Bilkent University diploma

Roadmap


Kick-off Meeting
Project Proposal Report
Project Proposal Meeting
First Meeting with Course Coordinators
First Progress Report
Second Meeting with Course Coordinators
Second Progress Report
Project Progress Meeting
Third Meeting with Course Coordinators
Final Report
Fourth Meeting with Course Coordinators
October
November
December
January
February
March
April
May
• Preliminary Analysis
• Literature/Industrial Review
• Problem Definition
• Project Plan
• Model Formulation
• Model Coding
• Verification
• Validation
• Benchmarking
• User Interface Coding
• Pilot Implementation
• Revisions
• Delivery of the Project

Requirements

- Kick-off Meeting Early to Mid October
- Project Proposal Report Late October to Early November
- Project Proposal Meeting and Presentation Early to Mid November
- First Meeting with Course Coordinators Nov 24 – Nov 29
- First Progress Report Report Due December 20
- Second Meeting with Course Coordinators January 8, January 9

- Second Progress Report Report Due Early March
- Project Progress Meeting and Presentation Mid to Late March
- Third Meeting with Course Coordinators Mid April
- Final Report Report Due Mid May
- Fourth Meeting with Course Coordinators Late May

Project Proposal Report (Late Oct to Early Nov)

- Complaints and symptoms from the company
- Required outcomes,expectations: Deliverables
- Project constraints and limitations

Definition and Scope of the Problem - CONSENSUS

Go beyond the initial description!!

Main project activites: Workpackages, Timetable

First Meeting with Course Coordinators (Nov 24 - 29)

- You will prepare a presentation video and upload it by Nov 21
  - A short version of the proposal presentation to course coordinators
- In the meeting you will be asked questions about the project and your proposal
  - To enable coordination between projects

First Progress Report and Second Meeting with Course Coordinators

- Brief definition of the Problem
- Literature Review
  - Previous studies in the scientific literature
  - Similar Studies in the industry
- Proposed Methodolgy
- Model Development and Verification
- Timetable
- You will upload a video by Jan 3. However you will also present LIVE during the meeting.

Important

- All documents related to reports, meetings and presentations are available on the course web page.
  - You are advised to take a look at these documents well in advance to plan ahead.
  - Each student is responsible from the material posted on the course web page – hence you are expected to read and understand.

- Check our web-site frequently for announcements/updates. courses.ie.bilkent.edu.tr/ie477

Important

- You will find a report template on course web site.
  - We will use the LaTeX template for all reports

Important

- **Attendance** to all of the workshops and seminars is **mandatory** from the beginning of the semester!
- **Punctuality** is very important!
  - *"If you're early, you're on time. If you're on time, you're late."* — **Lik Hock Yap Ivan**
  - *"Better three hours too soon than a minute too late"* — **W. Sheakespeare**
  - *"Never leave to be on time to be on time."* — **Brian Spellman**

  Hence;
  - **Submit all of your requirements on time.**
  - Be ready for any meeting at least 10 minutes before the scheduled time.

Important

- Time to devote to the project is **significantly more** than a regular course
  - Too much course load is not desired

- Part-time Jobs, Internships
  - IE 477 – IE 478 Systems Design Disclosure of Internship and Part-Time Work Form - Last Revised on August 10, 2023
  - Summarize: No excuses for not being a full-time student.
    - You have to attend all meetings with your advisors and coordinators!
  - Prevent a potential CONFLICT OF INTEREST. Ask us if needed.

Upload / Naming Principles

- You will upload a lot of documents to the links provided.
- Your **file names** must contain your 4-5 character project **short-code** along with its purpose:
  - Example from previous years:
    - Arçelik Bolu Pişirici Cihazlar Fab: ARBOL
    - BSH Ev Aletleri: BSHE
    - ETİ Talep Tahmin: ETIT
    - DHL Depo İyileştirme: DHLD
  - File name could be: ARBOL-ProposalReport

Writing Principles

- Please state your
  - **Project Short Code**
  - **Team number**
  - **Project title**
  - **Names of the team members** (always in alphabetical order of the last names)
  - **Academic and industrial advisors**

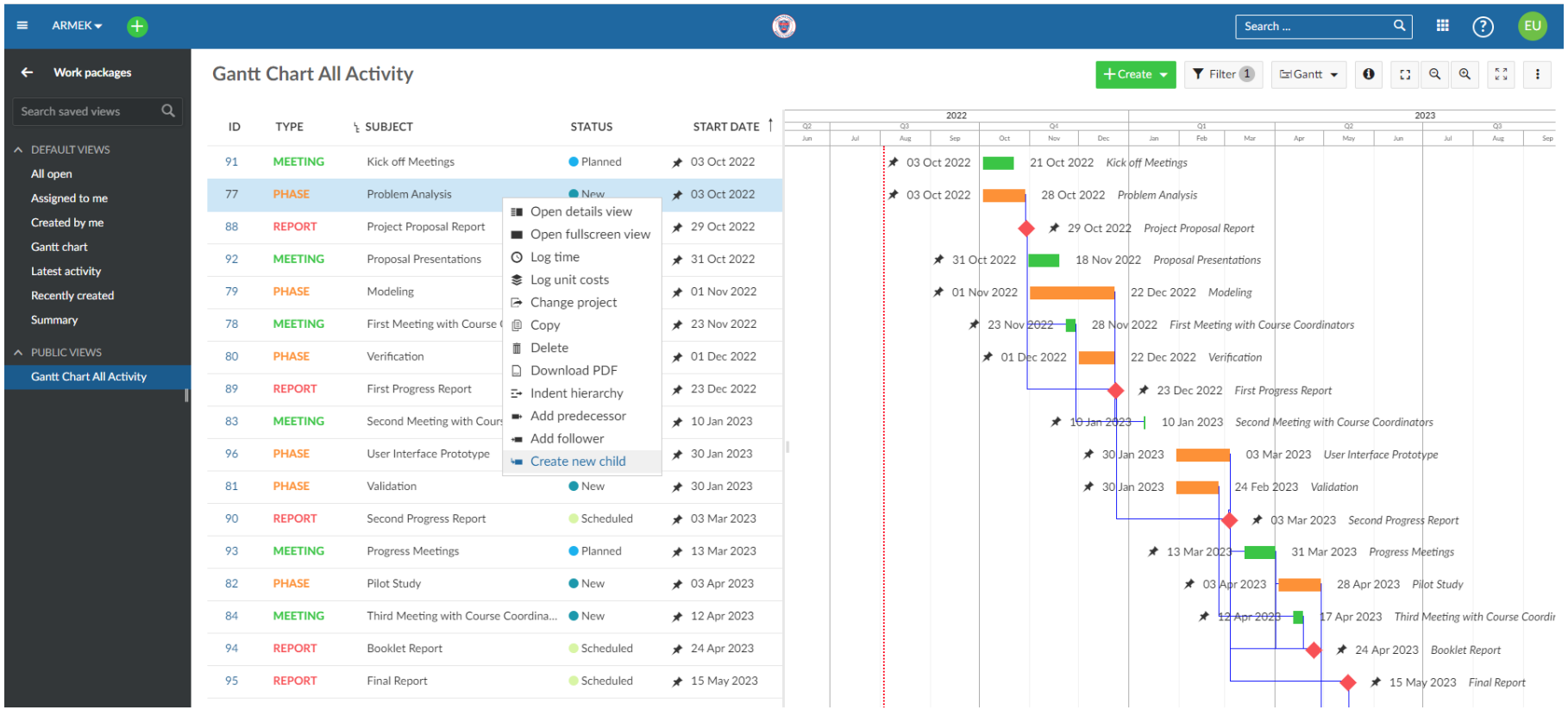
  in all of the written documents that you submit.

Project Management

- **Project Plan**
  - Tasks, phases, milestones, etc.
- **Time plan**
  - Deadlines, due dates, deliverables
- **Resource Allocation**
  - Team work
- **Coordination**

Project Management

- We will use an online Project Management Software



Project Management

- Project Management System
  - All project related tasks, task assignments, outcomes will be posted
  - Each student must have a **task** in each **phase** of the project
  - All meetings with your IA and AA (meeting agenda and minutes)
  - Your CC, AA and IA will have access to this system to monitor your progress
- More details available on the course web page

General Meetings

- This semester there are 4 general meetings scheduled*:
  - **Sep 15 (Today):** Introduction and General Schedule, Team Formation
  - **Sep 22:** “Capstone Project – How to approach?”, Details on Industrial Projects
  - **Sep 29:** Details on Administrative Processes

  - **Dec 1:** General Feedback on Progress
  - **Dec 8:** Teamwork and Presentation Skills Workshop

* Subject to change

Capstone Projects Assessment Criteria

- System design:
  - **Model development and validation:** The proposed model can be an optimization, statistical, database, marketing or simulation model.
  - **Consideration of alternatives:** Extent to which the team demonstrated critical thinking in the design process.
  - **Scenario / what if analysis:** Model usage for changing environments.
  - **Creativity:** Extent to which the team developed a novel solution to the design problem while still achieving a functional design.
  - **Technical competencies:** Extent to which and validity of the technical aspects have been used properly, including methods, tools and techniques.

Capstone Projects Assessment Criteria

- Success of the design:
  - **Attainment of project deliverables:** Extent to which the goals of the project and end-user specifications have been met.
  - **Benchmarking:** A comparison of the current and proposed systems should be provided along with a cost/benefit analysis.
  - **Implementation and system integration:** Extent to which the proposed system is successfully implemented and integrated into the existing system. (If not applicable a detailed implementation plan and a pilot study should be provided.)
  - **End-user evaluation and assessment:** A written statement from the industrial advisor(s) evaluating the project.
  - **Impact on the organization:** Effect of the proposed system on the organization in large (financial impact, affect on company's operational policies, etc.).
  - **Global and societal impact:** Consideration

Grading

- Grading is based on evaluations on:
  - **Reports**
    - Project Proposal Report
    - First Progress Report
  - **Meetings and Presentations**
    - Proposal Presentation
    - First Meeting with Course Coordinators
    - Second Meeting with Course Coordinators
  - **Group dynamics**
    - Academic/Industrial Advisor Individual Evaluation
    - Peer Evaluation

Grading

- You will not see individual grades for these evaluations
  - **Feedback** during the semesters
  - **Letter grades** at the end of each semester

- What might land you on a lower letter grade?
  - Not participating to key parts of the project
  - Not providing a satisfactory answer to questions about your project
  - Not attending to meetings
  - Not submitting required documents on time

Effect of Peer Evaluation

Grup AA	Student A	Student B	Student C	Student D	Student E	Student F	Student G	AVG.
Student A		5	5	5	5	5	5	5.00
Student B	5		5	5	5	5	5	5.00
Student C	5	5		5	5	5	5	5.00
Student D	5	5	5		5	5	5	5.00
Student E	5	5	5	5		5	5	5.00
Student F	5	5	5	5	5		5	5.00
Student G	5	5	5	5	5	5		5.00

Effect of Peer Evaluation

Grup BB	Student A	Student B	Student C	Student D	Student E	Student F	Student G	AVG.
Student A		1	5	2	5	5	3	3.50
Student B	1		1	4	1	1	3	1.83
Student C	5	2		2	5	5	3	3.67
Student D	1	5	1		3	2	5	2.83
Student E	1	3	3	3		5	3	3.00
Student F	2	3	3	4	5		3	3.33
Student G	1	5	1	4	1	1		2.17

Effect of Peer Evaluation

Effect of Peer Evaluation

Grading

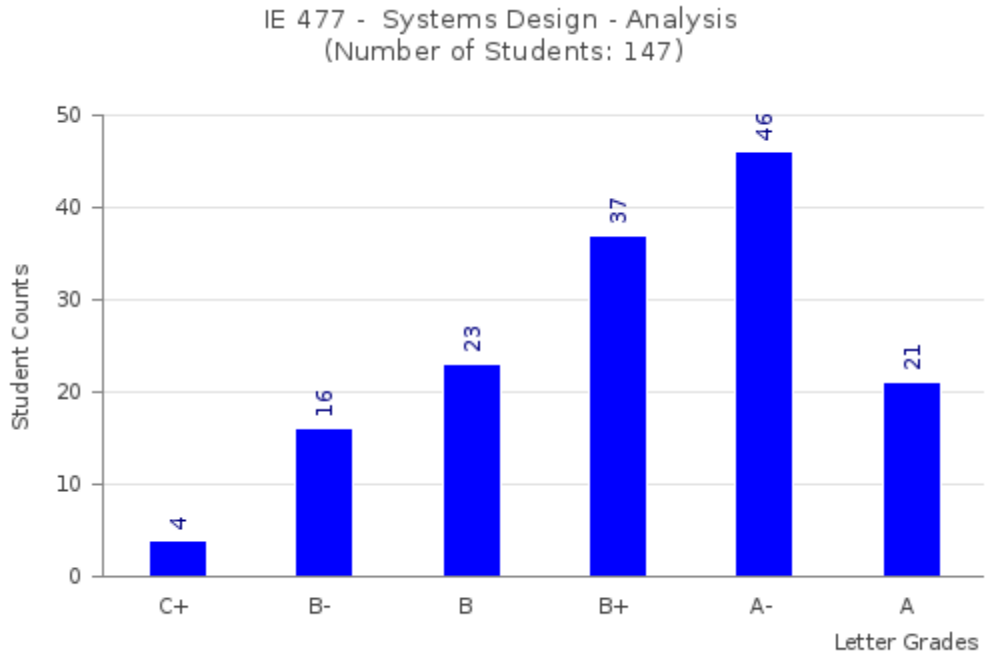
- Last year there are:
  - **6** groups (Fall Semester)
  - **11** groups (Spring Semester)

  received different grades among the group members
- For example: Four members B+, one member C+, one member C

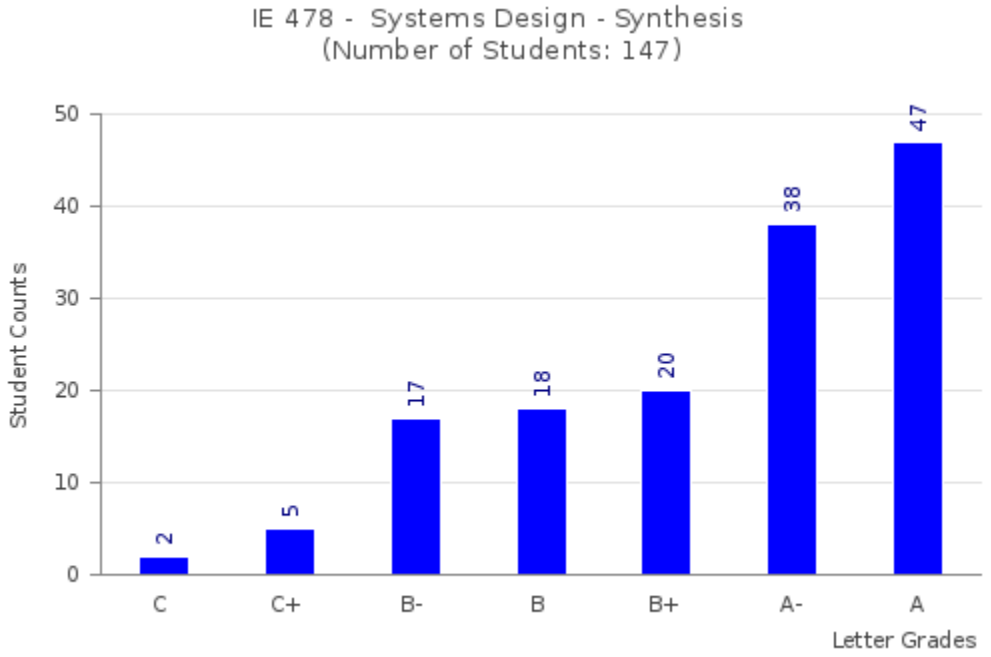
Grading

- If we observe that you have not accomplished the goals to be reached by the end of this semester, you may receive an **I (Incomplete)** as a group!
- The important dates for incomplete grades:
  - Announcing the groups with incomplete grades (e-mail) – January 9, 2024 Evening time
  - Groups with incomplete grades return their work – January 23, 2024 4pm
  - If you do not complete the missing work within the time limit, this grade will be replaced with an F
  - In Fall 2022, **3 groups** received Incomplete grade.

Grading



Benefit of the doubt



The “Real” Grade

Administrative Coordinator: **Yeşim Gülseren**

Üniversite-Sanayi İşbirliği Mezuniyet Projeleri Koordinatörü

Destek Verilen Çalışmalar

- İş dünyası ile iletişim
- Projelere hazırlık ve bilgilendirme
- Proje yönetimi, koordinasyon
- Projelerin mali, idari ve yasal süreçleri
- İç iletişim ve motivasyon
- Seyahat organizasyonu
- Fuar, kitap ve etkinlik organizasyonu
- Kariyer planlama
- Girişimcilik
- Sektör tanıtım etkinlikleri

Rektörlük Binası 3. Kat
No : 308
yesime@bilkent.edu.tr

Grants and Competitions

- INFORMS Undergraduate Operations Research Prize (June 30, 2022, USA)
- YA/EM Student Competition
- TÜBİTAK 2241-A Sanayi Odaklı Lisans Bitirme Tezi Destekleme Programı

Projects Booklet

Project Fair and Competition 2023

- We are planning to organize
  - 22nd Industrial Engineering Project Fair and Competition
  - Industrial Projects 2024 Book

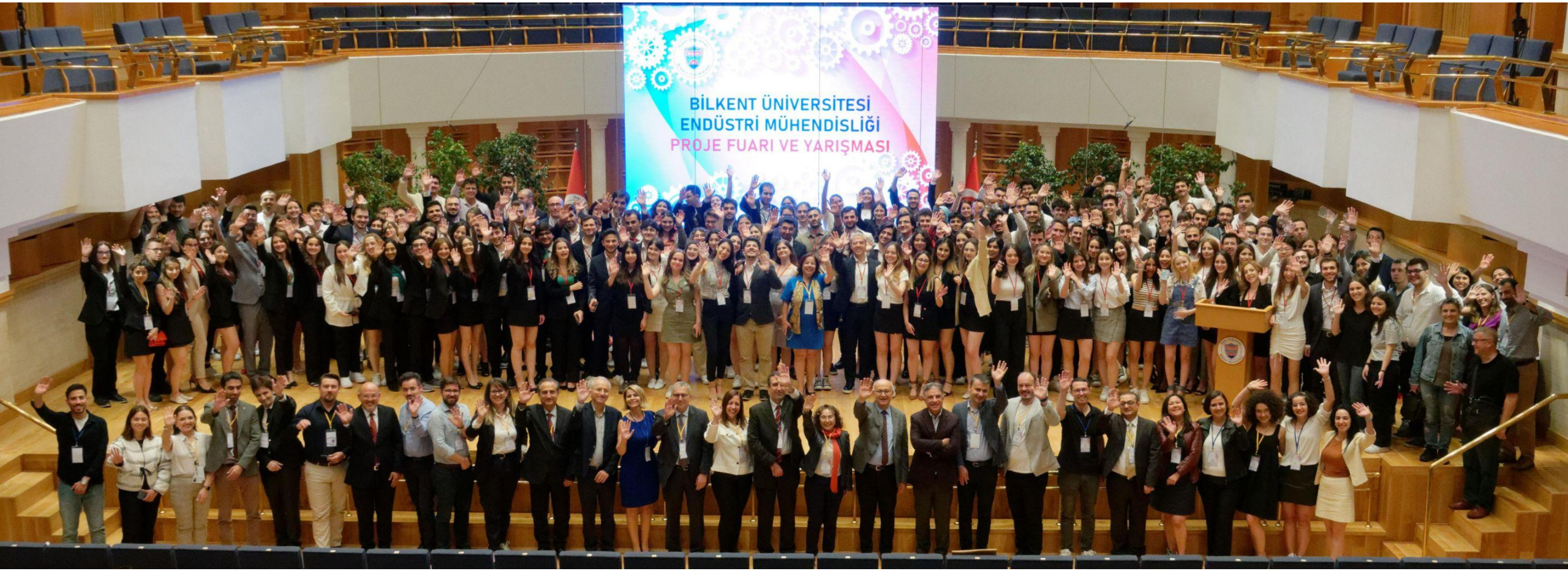
Project Fair and Competition 2017

Project Fair and Competition 2018

Project Fair and Competition 2019

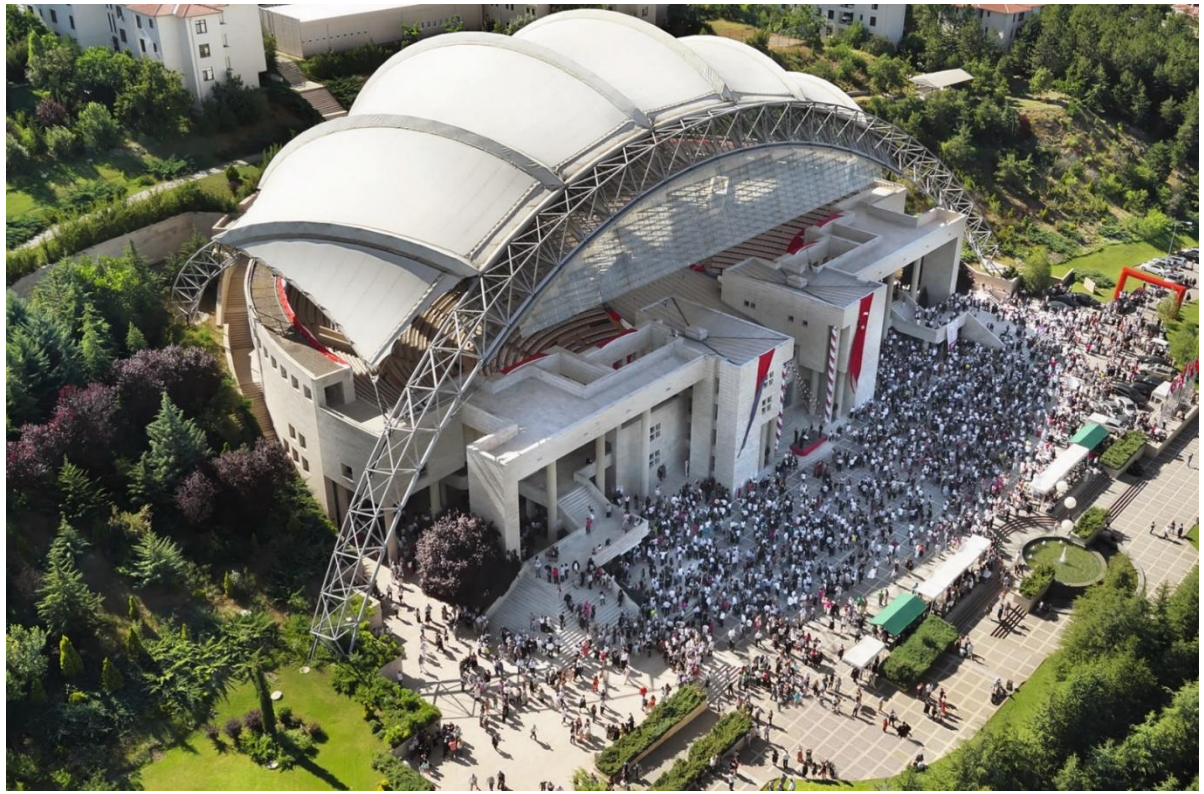
Project Fair and Competition 2022

Project Fair and Competition 2023



Project Fair and Competition 2024

Tuesday, June 4th, 2024 (Location TBA)



Next Steps…


Groups Formed
Projects Announced
Project Preferences Submitted
Projects Assigned
Advisors and Coordinators Assigned

Group Formation

- All groups will have 7 students*
- Different skills
  - Leader, consensus builder, problem solver, contributor, assisting
  - Report writing (Turkish/English)
  - Presentation (Turkish/English)
  - At least 2 members good in coding
- Projects may require company visits (Leave two half-days off as a group)

Group Formation

- Each group will have a contact person
  - Not necessarily the group leader
  - Reserve time slots for coordinator meetings
  - Receive links to upload documents
  - Make travel arrangements with Yeşim Gülseren
  - Must be available to respond to calls, emails, texts promptly

Group Formation

- For information on team dynamics follow announcements on https://courses.ie.bilkent.edu.tr/ie477
- For each team, fill out the “Team Information Form” via the link sent to you online **until 17:00 TODAY!**
  - Names, e-mail addresses, elective courses, summer trainings, strongest and weakest skills.
  - **ONE SUBMISSION PER GROUP.**
- Each team should have a project contact person
- **Students with no groups:**
  - **Inform TAs via ie477@ie.bilkent.edu.tr**

Project Assignments

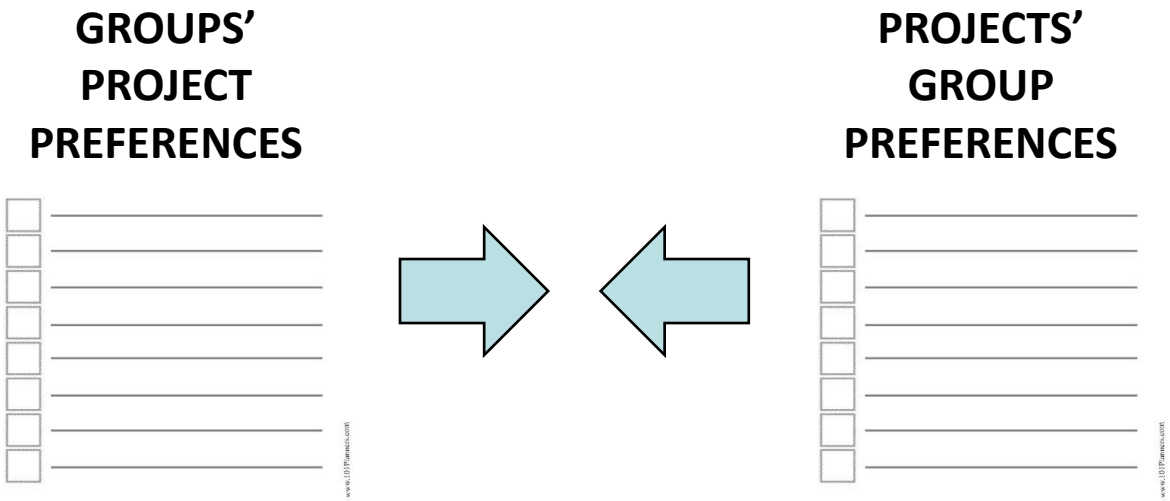
- **Project List** will be announced by early next week.

- Each team is going to send their rankings of the projects and a single page cover letter until **September 23 Friday by 17:00**
  - Wait for the meeting next week to finalize your list.

- Fill the required online form (to be provided on the course web page.)

Project Assignments

- We will use a version of **Nobel Prize Winning Algorithm** by Shapley and Roth



- See course web page for a detailed explanation on the algorithm

Project Assignments

- Groups:
  - Rank all projects based on how much you wish to get assigned.
- Projects:
  - Rank all groups (information form)
- Basis is the same as the original algorithm. However, we may consider additional constraints imposed by the companies (such as at most one project), as well as others.
- Applied to assign projects to groups in the last six years.

Example

Group A	Group B	Group C
Project Y	Project Z	Project Z
Project X	Project X	Project X
Project Z	Project Y	Project Y

Project Z
Group A
Group C
Group B

People

- All groups will be assigned:
  - Academic advisor
  - Industrial advisor
  - Course coordinator
  - Other interested faculty members
  - Teaching assistant
- Administrative coordinator