



IE477 - IE 478 Systems Design

GENERAL INFORMATION AND SCHEDULE

Course Coordinators:

Dr. Savaş Dayanık

Dr. Selin Kocaman

Dr. Emre Uzun

Administrative Coordinator:

Yeşim Gülseren

Teaching Assistants:

Atahan Bayır

Yunus Emre Çakır

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
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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
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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

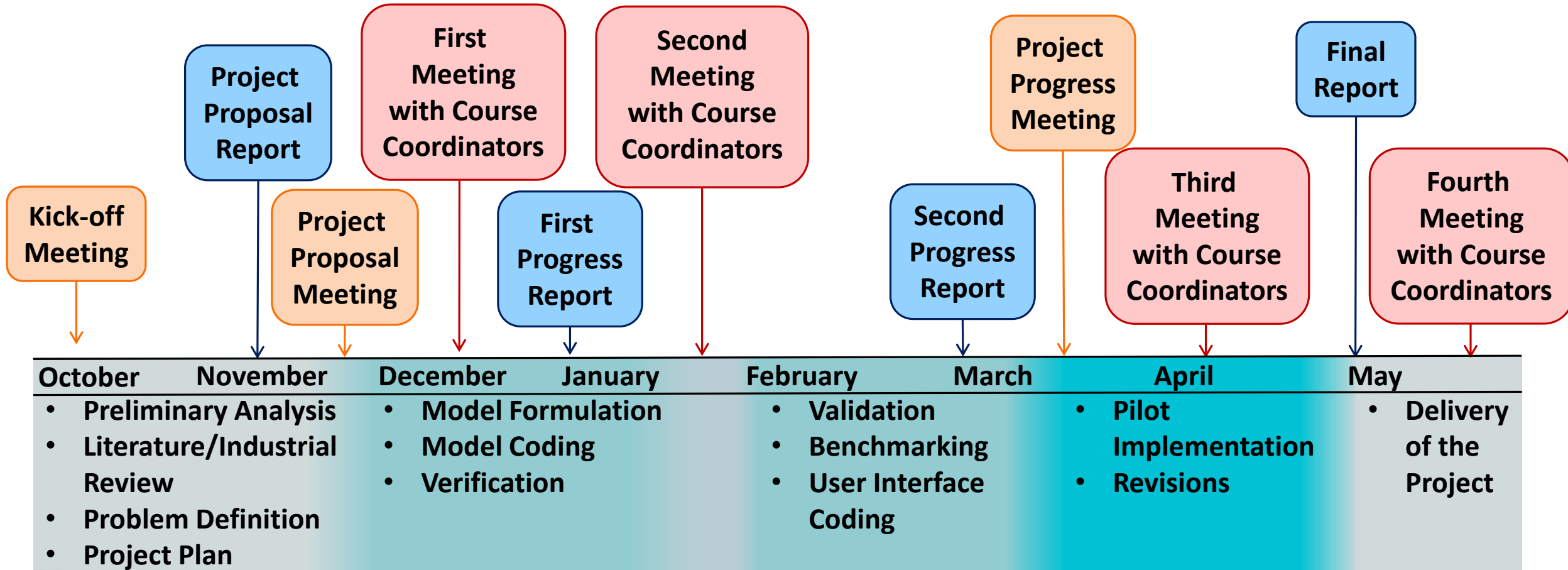
- You will also learn:
 - Effectively use **group work**
 - Prepare **reports and presentations** to explain ideas
 - Practice **professional and ethical responsibilities**



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
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Roadmap





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 23 – Nov 28
 - First Progress Report Report Due December 23
 - Second Meeting with Course Coordinators January 10, January 11
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- Second Progress Report Report Due March 3
 - Project Progress Meeting and Presentation Mid to Late March
 - Third Meeting with Course Coordinators April 12 – April 17
 - Final Report Report Due May 15
 - Fourth Meeting with Course Coordinators Late May
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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 activities: Workpackages, Timetable



First Meeting with Course Coordinators (Nov 23 - 28)

- 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 5. However you will also present LIVE during the meeting.
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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.
- 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 $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ 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
 - No excuse for any **part time job** you may have.
 - You have to perform all of your duties that are assigned to you in your group.
 - You have to attend all meetings with your advisors and coordinators!
 - You cannot be assigned to an IE 477 - IE 478 project received from a company where you work part-time or do internship.



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.

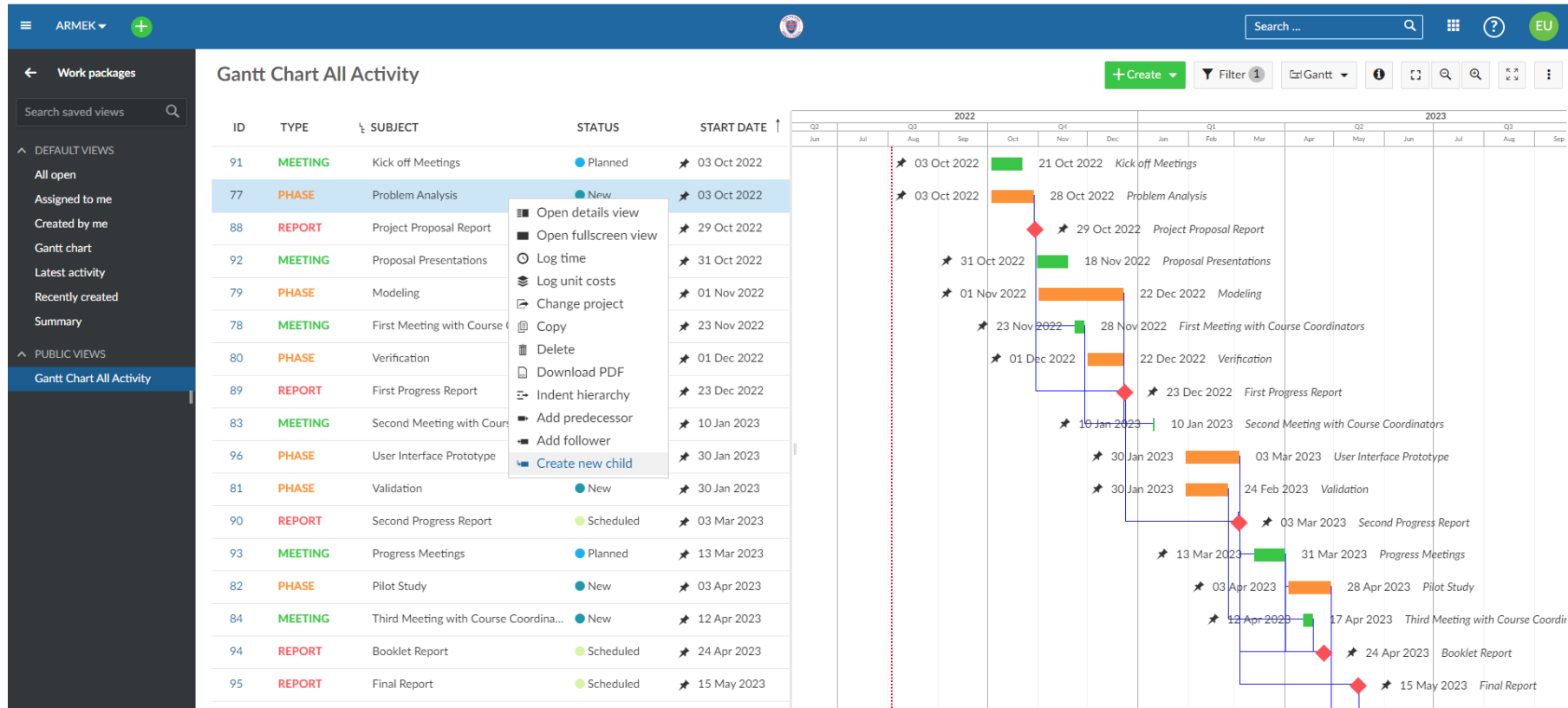


Project Management

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

Project Management

- Starting this year 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 16 (Today):** Introduction and General Schedule, Team Formation
 - **Sep 23:** “Capstone Project – How to approach?”, Details on Industrial Projects
 - **Sep 30:** Details on Administrative Processes
 - **Dec 2:** General Feedback on Progress

* 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.
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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
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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
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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
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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

STUDENT F: We are the teachers

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

Abstract

Peer evaluation is a process in which students evaluate each other's work. It is a common practice in many educational institutions. The purpose of this study is to investigate the effect of peer evaluation on students' learning outcomes. The study was conducted in a large university in Turkey. The participants were 100 students who were enrolled in a course. They were divided into two groups: a control group and an experimental group. The control group did not receive any peer evaluation, while the experimental group received peer evaluation. The results of the study showed that the experimental group had significantly higher learning outcomes than the control group. This suggests that peer evaluation has a positive effect on students' learning outcomes. The study also found that students who received peer evaluation were more motivated and engaged in their learning. This suggests that peer evaluation can also have a positive effect on students' motivation and engagement. The study has some limitations, such as the small sample size and the lack of a long-term follow-up. Future research should address these limitations and investigate the long-term effects of peer evaluation on students' learning outcomes.

Effect of Peer Evaluation

Abstract

Students in a general chemistry course were assigned to groups and given a peer evaluation form. The results of the peer evaluation were compared with the results of the final exam. The results showed that the peer evaluation scores were significantly higher than the final exam scores. This suggests that peer evaluation is a useful tool for assessing student learning. The results also showed that the peer evaluation scores were significantly higher than the final exam scores. This suggests that peer evaluation is a useful tool for assessing student learning.



Grading

- Last year there are:
 - **5** groups (Fall Semester)
 - **7** groups (Spring Semester)received different grades among the group members
- Example: Six members B-, one member D



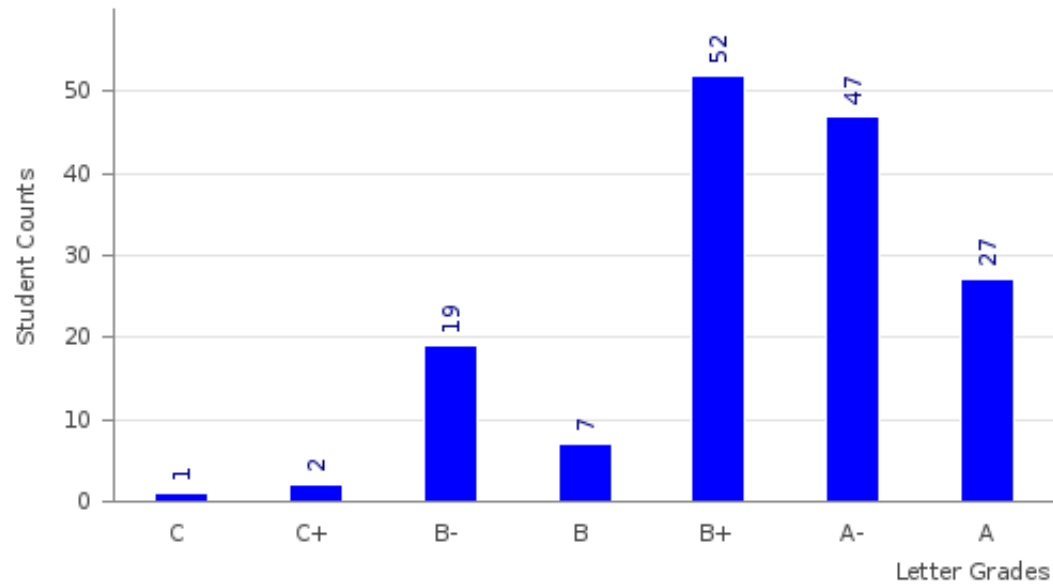
Grading

- 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!
 - If you do not complete the missing work within the time limit, this grade will be replaced with an F



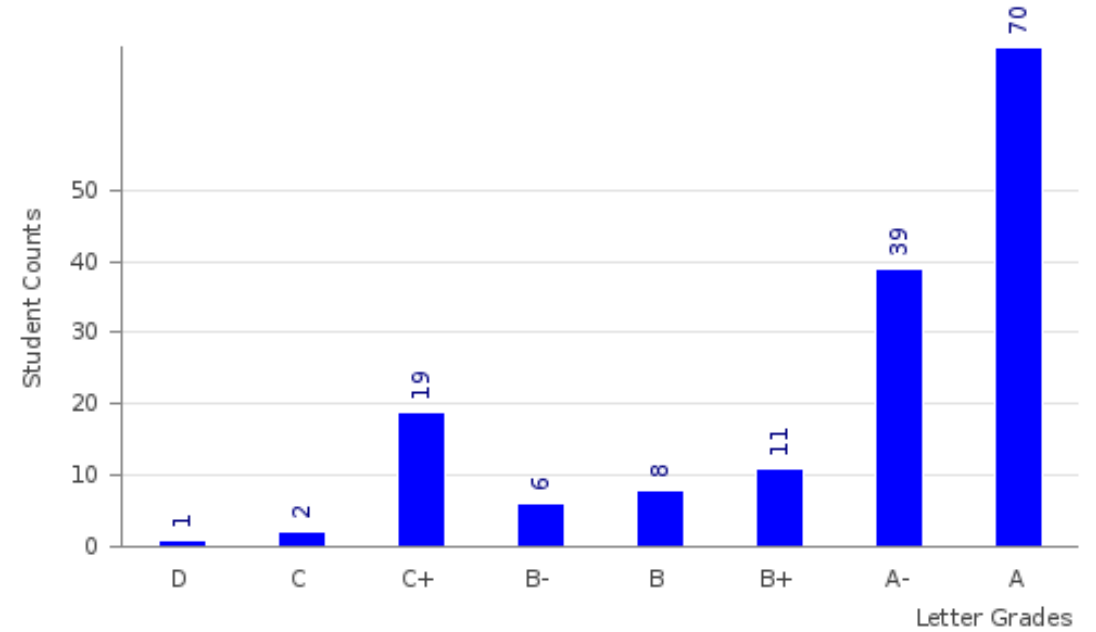
Grading

IE 477 - Production Systems Design-Synthesis
(Number of Students: 155)



Benefit of the doubt

IE 478 - Systems Design - Synthesis
(Number of Students: 156)



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
 - 21st Industrial Engineering Project Fair and Competition
 - Industrial Projects 2023 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

Thursday, June 1st, 2023 at Bilkent ODEON





Next Steps...





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

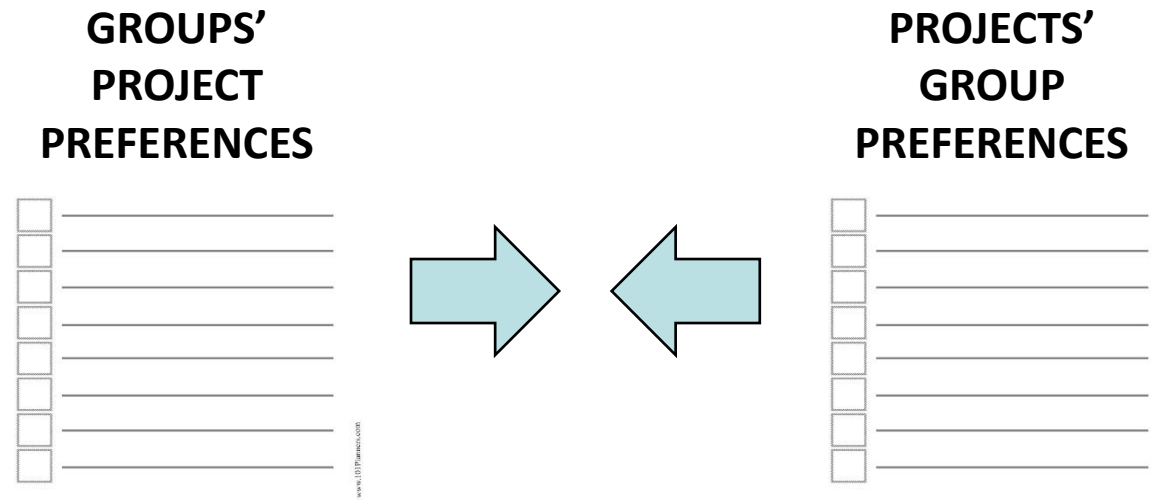


Project Assignments

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



People

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