

Grade FZ (taken from IE102 Syllabus) – You have to hand in all the homework assignments. Otherwise, you receive an FZ.

IE102 Fall 2019 Homework III - Due:23.10.19, Wednesday, 17:00

IMPORTANT: READ BEFORE YOU START WORKING ON THE HOMEWORK

Information on Homework II

- Homework III is 1%. Make sure that you review course material before you start. Cite sources used if any.
- Homework assignment will be conducted in groups of 2. We randomly form the groups. You can find your group member and his/her contact information in the e-mail. **If you cannot reach your group member by all means, indicate this on the cover page of your submission.**
- Grading Policy: The grading scale for each question is 2 points (correct), 1 point (partially correct), and 0 (no effort or no submission).
- Academic Dishonesty (taken from IE102 Course Information): **Academic misconduct is not tolerated, and violations will be treated in accordance with the university policy.** For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- Submission Information: An assignment submission box will be placed in front of office **EA327** on the morning of the submission date and will be removed at the time of the deadline. You need to put your assignment in the designated box before the submission deadline. **Submission via e-mail is NOT accepted.**

Contact TA Aysu Özel if you have questions related to this HW: aysu.ozel@bilkent.edu.tr

Question 1:

Suppose you are going to buy a new PC and you have three alternatives in mind. In choosing which PC to buy, you may consider the following criteria: (1) Price, (2) RAM, (3) Graphics Processing Unit (GPU) and (4) Processor. The table below present the scale range and type used for each measure and data for each alternative respectively.

<u>Measure</u>	<u>Range</u>	<u>Weight</u>
Price	5,000 – 25,000 TL (less is preferred)	0.4
RAM	1 - 8 GB (least preferred) 2 - 16 GB 3 - 32 GB (most preferred)	0.2
GPU	1 - GTX1050 (least preferred) 2 - GTX1060 3 - GTX1070 4 - GTX1080 5 - RTX2080 (most preferred)	0.3
Processor	1 - Intel Core i9 (most preferred) 2 - Intel Core i7 3 - Intel Core i5 (least preferred)	0.1

Measure	Alternative 1	Alternative 2	Alternative 3
Price	5,500 TL	7,500 TL	25,000 TL
RAM	8 GB	16 GB	32 GB
GPU	GTX1050	GTX1060	RTX2080
Processor	Intel Core i5	Intel Core i7	Intel Core i9

Which PC will you buy by utilizing given information? Find out using MCDM methods that you learnt in class. Round fractional results to the **nearest 3** decimal places.

Question 2:

Mr. White, would like to buy a secondhand car and he is trying to decide the best one among several alternatives. The following table contains relevant criteria, related performance measures and corresponding least & most preferred values.

Criterion	Measures	Least Preferred	Most Preferred
Aesthetics	Interior Condition	1 (Poor)	5 (Excellent)
	Exterior Condition	1 (Poor)	5 (Excellent)
Reliability	Mileage (kilometers)	250,000 km	50,000 km
	Service Network	1 (Sparse)	5 (Widespread)
Total Cost	Purchase Price (\$)	\$70,000	\$10,000
	Fuel Consumption (liters/100km)	10	4
	Maintenance Cost (\$/year)	\$750	\$200
Accessories	Trunk Volume (liters)	150	600
	Cruise Control	0 (Not available)	1 (Available)

He has done extensive analysis and come up with final three alternatives as candidates for his next car. The collected data is shown below.

	Alternative 1	Alternative 2	Alternative 3
Interior Condition	4	3	5
Exterior Condition	2	4	3
Mileage (kilometers)	150,000 km	190,000 km	165,000 km
Service Network	4	3	3
Purchase Price (\$)	\$35,000	\$25,000	\$60,000
Fuel Consumption (liters/100km)	6	7	9
Maintenance Cost (\$/year)	\$400	\$270	\$600
Trunk Volume (liters)	220	350	500
Cruise Control	0	0	1

- a) Rescale each measure to “Common Units” from 0 to 1, with 0 the worst and 1 the best. Create the version of with common units and fill the table below. Show your calculations. Make explanations if necessary. Round fractional results to the **nearest 3** decimal places.
- b) Mr. Cooper has difficulty on deciding criteria weights. There are two criteria that he could not come up with a weight value. Suppose that the criteria weights are determined as follows:

Interior Condi- tion	Exterior Condi- tion	Milea ge	Service Network	Purchase Price	Fuel Consump- tion	Mainte- nance Cost	Trunk Volume	Cruise Control
0.13	0.10	0.20	0.15	k	$0.2 - k$	0.09	0.07	0.06

Calculate the total weighted score for the alternatives in terms of k . Show your calculations. Round fractional results to the **nearest 3** decimal places.

- c) Determine the range of k that makes *Alternative 2 the best one*. Round fractional results to the **nearest 3** decimal places.
- d) Determine the range of k that makes *Alternative 3 the worst one*. Round fractional results to the **nearest 3** decimal places.