BERITA ACARA PENGAJARAN
SEMESTER GENAP 2022/2023
PROGRAM STUDI TEKNIK INDUSTRI

NAMA DOSEN : NATAYA CHAROONSRI RIZANI, ST, MT
MATA KULIAH : PENELITIAN OPERASIONAL 2
SKS/SEMESTER : 3
HARI/JAM : SENIN, 10.00-12.30
KELAS/RUANG : A/ ONLINE

NO	TANGGAL	MATERI PENGAJARAN	Jumlah Mhs	TANDA TANGAN
1	24/3/23	METODE JARINGAN	2	
2	31/3/23	METODE JARINGAN (2)	2	
3	7/4/23	PROGRAMA DINAMIS-DETERMINISTIK	2	
4	14/4/23	PROGRAMA DINAMIS-DETERMINISTIK (2)	2	
5	21/4/23	MODEL STOKASTIK	2	
6	05/05/23	RANTAI MARKOV	2	
7	12/05/23	MODEL ANTRIAN	2	
8		UTS		
9	2/6/2023	Decision Tree	2	
10	9/6/2023	AHP	2	
11	16/6/2023	AHP-Pairwise comparison	2	
12	23/6/2023	Normalisasi	2	
13	7/7/2023	Uji Konsistensi	2	
14	14/7/2023	AHP with Excel	2	
15	21/7/2023	AHP with Excel (2)	2	
16	22/7/2023	Studi Kasus	2	

Mengetahui
Kepala Program Studi Teknik Industri

Ir. Sumiyanto, MT

Dosen Yang Bersangkutan

Nataya Charoonsri Rizani, ST., MT

DAFTAR NILAI

SEMESTER GENAP REGULER TAHUN 2022/2023

Program Studi : Teknik Industri S1
Matakuliah : Penelitian Operasional-2
Kelas / Peserta : A
Perkuliahan : Kampus ISTN Bumi Srengseng Indah
Dosen : Nataya Charoonsri Rizani, ST. MT.

No	NIM	N A M A	ABSEN	TUGAS	UTS	UAS	MODEL	PRESENTASI	NA	HURUF
			10%	**20%**	**30%**	**40%**	**0%**	**0%**		
1	20230002	**Andrea Seviandi**	100	70	88	80	0	0	82.4	**A**
2	21230002	**Paksi Satriabudi**	100	75	85	75	0	0	80.5	**A**
3	21230003	**Tarcisius Yodris Bryan Matutina**	100	75	86	75	0	0	80.8	**A**

Rekapitulasi Nilai							
A	3	B+	0	C+	0	D+	0
A-	0	B	0	C	0	D	0
		B-	0	C-	0	E	0

Jakarta,31 July 2023

Dosen Pengajar

Nataya Charoonsri Rizani, ST. MT.

YAYASAN PERGURUAN CIKINI
INSTITUT SAINS DAN TEKNOLOGI NASIONAL

Jl. Moh. Kahfi II, Bhumi Srengseng Indah, Jagakarsa, Jakarta Selatan 12640
Telp. 021-7270090 (hunting), Fax. 021-7866955, hp: 081291030024
Email : humas@istn.ac.id Website : www.istn.ac.id

SURAT PENUGASAN TENAGA PENDIDIK

Nomor : 03 / 03.1 – Gsi/ III/ 2023

SEMESTER GENAP TAHUN AKADEMIK 2022/2023

Nama	: **Nataya Charoonsri Rizani.ST.MT**	**Status Pegawai**	: **Tetap**		
NIK	: **231420003**	**Program Studi**	: **Teknik Industri S1**		
JabatanAkademik	: Lektor				

Bidang	PerincianKegiatan	Tempat	Jam/ Minggu	Kredit (sks)	Keterangan
I PENDIDIKAN DAN PENGAJARAN	MENGAJAR DI KELAS (KULIAH/RESPONSI DAN LABORATORIUM)				
	1. Ergonomi & Pernc.Sist.Kerja 2	Industri S1	10:00-11:40,Selasa	2	Reguler
	2 Ergonomi & Pernc.Sist.Kerja 2	Industri S1	16:00_17:40, Jumat	2	K
	3.Manajemen Kelayakan (P)	Industri S1	07:30-10:00,Rabu	3	Reguler
	4.Perenc.dan.Pengembangan Produk	Industri S1	08:00_09:40,Selasa	2	Reguler
	5.Penelitian Oprasional-2	Industri S1	10,00-12,30, Senin	3	Reguler
	6.. Penelitian Oprasional-2	Industri S1	18.00-19:-40, Jumat	3	K
	7.Perenc.dan Pengembangan Produk	Industri S1	08:00-09:40, Selasa	2	Reguler
	8. Perenc.dan Pengembangan Produk	Industri S1	17:00-18:-40, Kamis	2	K
	9.Membimbing Tugas Akhir			1	
	10.Menguji Tugas Akhir			1	
II PENELITIAN					
	2. Penulisan Karya Ilmiah			1	
II PENGABDIAN DAN MASYARAKAT					
	2. Memberikan Penyuluhan / Penelitian / Ceramah kepada Masyarakat			1	
IV UNSUR-UNSUR PENUNJANG					
	2. Berperan serta aktif dalam pertemuan ilmiah/ seminar			1	
	Jumlah Total			24	

Kepada yang bersangkutan akan diberikan gaji/honorarium sesuai dengan peraturan penggajian yang berlaku di Institut Sains danTeknologi Nasional Penugasan ini berlaku tanggal 01 Maret 2023 sampai dengan 31 Agustus 2023.

Jakarta, 28 Maret 2023
Dekan,

FAKULTAS TEKNOLOGI INDUSTRI ISTN

Musfirah Cahya F.T.Dr.M.SI.S.Si)

Tembusan :
1.Direktur Akademik - ISTN
2.Direktur Non Akademik - ISTN
3.Ka. Biro SumberDayaManusia - ISTN
4.Kepala Program StudiFak. ....
5.Arsip

The Analytic Hierarchy Process (AHP)

- Founded by Saaty in 1980.
- It is a popular and widely used method for multi-criteria decision making.
- Allows the use of qualitative, as well as quantitative criteria in evaluation.
- Wide range of applications exists:
  - Selecting a car for purchasing
  - Deciding upon a place to visit for vacation
  - Deciding upon an MBA program after graduation.

AHP-General Idea

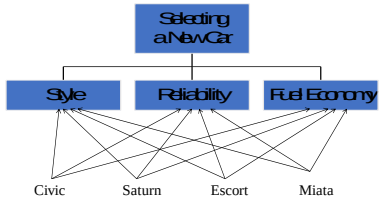
- Develop an hierarchy of decision criteria and define the alternative courses of actions.
- AHP algorithm is basically composed of two steps:
  1. Determine the relative weights of the decision criteria
  2. Determine the relative rankings (priorities) of alternatives

! Both qualitative and quantitative information can be compared by using informed judgments to derive weights and priorities.

Example: Car Selection

- Objective
  - Selecting a car
- Criteria
  - Style, Reliability, Fuel-economy Cost?
- Alternatives
  - Civic Coupe, Saturn Coupe, Ford Escort, Mazda Miata

Hierarchy tree



Alternative courses of action

Ranking of Criteria and Alternatives

- Pairwise comparisons are made with the grades ranging from 1-9.
- A basic, but very reasonable assumption for comparing alternatives:

  If attribute A is absolutely more important than attribute B and is rated at 9, then B must be absolutely less important than A and is graded as 1/9.
- These pairwise comparisons are carried out for all factors to be considered, usually not more than 7, and the matrix is completed.

Ranking Scale for Criteria and Alternatives

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favour one over the other.
5	Much more important	Experience and judgement strongly favour one over the other.
7	Very much more important	Experience and judgement very strongly favour one over the other. Its importance is demonstrated in practice.
9	Absolutely more important.	The evidence favouring one over the other is of the highest possible validity.
2,4,6,8	Intermediate values	When compromise is needed

Ranking of criteria

	Style	Reliability	Fuel Economy
Style	1	1/2	3
Reliability	2	1	4
Fuel Economy	1/3	1/4	1

Ranking of priorities

- Consider [Ax = λ_{max}x] where
  - A is the comparison matrix of size n×n, for n criteria, also called the priority matrix.
  - x is the Eigenvector of size n×1, also called the priority vector.
  - λ_{max} is the Eigenvalue, $\lambda_{max} \in \Re > n$.
- To find the ranking of priorities, namely the Eigen Vector X:
  1) Normalize the column entries by dividing each entry by the sum of the column.
  2) Take the overall row averages.

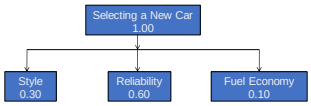
$$A=\begin{bmatrix}1 & 0.5 & 3\\ 2 & 1 & 4\\ 0.33 & 0.25 & 1.0\end{bmatrix} \xrightarrow{\text{Normalized Column Sums}} \begin{bmatrix}0.30 & 0.29 & 0.38\\ 0.60 & 0.57 & 0.50\\ 0.10 & 0.14 & 0.13\end{bmatrix} \xrightarrow{\text{Row averages}} X=\begin{bmatrix}0.30\\ 0.60\\ 0.10\end{bmatrix}$$

Column sums 3.33 1.75 8.00 1.00 1.00 1.00

Priority vector

Criteria weights

- Style .30
- Reliability .60
- Fuel Economy .10



Checking for Consistency

- The next stage is to calculate a Consistency Ratio (CR) to measure how consistent the judgments have been relative to large samples of purely random judgments.
- AHP evaluations are based on the aasumption that the decision maker is rational, i.e., if A is preferred to B and B is preferred to C, then A is preferred to C.
- If the CR is greater than 0.1 the judgments are untrustworthy because they are too close for comfort to randomness and the exercise is valueless or must be repeated.

Calculation of Consistency Ratio

- The next stage is to calculate λ_{max} so as to lead to the Consistency Index and the Consistency Ratio.
- Consider [Ax = λ_{max} x] where x is the Eigenvector.

$$\underset{A}{\begin{bmatrix}1 & 0.5 & 3\\ 2 & 1 & 4\\ 0.333 & 0.25 & 1.0\end{bmatrix}} \underset{x}{\begin{bmatrix}0.30\\ 0.60\\ 0.10\end{bmatrix}} = \underset{Ax}{\begin{bmatrix}0.90\\ 1.60\\ 0.35\end{bmatrix}} = \lambda_{max} \underset{x}{\begin{bmatrix}0.30\\ 0.60\\ 0.10\end{bmatrix}}$$

λmax=average{0.90/0.30, 1.60/0.6, 0.35/0.10}=3.06

- Consistency index , CI is found by

CI=(λmax-n)/(n-1)=(3.06-3)/(3-1)= 0.03

Consistency Ratio

- The final step is to calculate the Consistency Ratio, CR by using the table below, derived from Saaty's book. The upper row is the order of the random matrix, and the lower row is the corresponding index of consistency for random judgments.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Each of the numbers in this table is the average of CI's derived from a sample of randomly selected reciprocal matrices of AHP method.

An inconsistency of 10% or less implies that the adjustment is small as compared to the actual values of the eigenvector entries.
A CR as high as, say, 90% would mean that the pairwise judgments are just about random and are completely untrustworthy! In this case, comparisons should be repeated.

In the above example: CR=CI/0.58=0.03/0.58=0.05
0.05<0.1, so the evaluations are consistent!

Ranking alternatives

Style	Civic	Saturn	Escort	Miata	Priority vector
Civic	1	1/4	4	1/6	0.13
Saturn	4	1	4	1/4	0.24
Escort	1/4	1/4	1	1/5	0.07
Miata	6	4	5	1	0.56

Reliability	Civic	Saturn	Escort	Miata	
Civic	1	2	5	1	0.38
Saturn	1/2	1	3	2	0.29
Escort	1/5	1/3	1	1/4	0.07
Miata	1	1/2	4	1	0.26

Ranking alternatives

		Miles/gallon	Normalized
Fuel Economy	Civic	34	.30
	Saturn	27	.24
	Escort	24	.21
	Miata	28	.25
		113	1.0

! Since fuel economy is a quantitative measure, fuel consumption ratios can be used to determine the relative ranking of alternatives; however this is not obligatory. Pairwise comparisons may still be used in some cases.