

Curs 1

2023/2024

Dispozitive și circuite de microunde pentru radiocomunicații

Disciplina 2023/2024

- 2C/1L (+1), **DCMR (CDM)**
- Minim 7 prezente (curs+laborator)
- Curs - **conf. Radu Damian**
 - Miercuri 08(:**15**)-17, ~~Online~~/**Video (istoric)**, P5
 - E – **50%** din nota
 - **probleme** + (2p prez. curs) + (3 teste) + (bonus activitate)
 - primul test L1: 04.10.2023 (t2 si t3 neanuntate la **curs**)
 - 3pz (C) ≈ +0.5p (**2p** max)
 - **toate materialele permise**

Disciplina 2023/2024

- 2C/1L, **DCMR (CDM)**
- Laborator – **conf. Radu Damian**
 - Miercuri/Joi/Vineri, par/impar, **II.13**
 - L – **25%** din nota
 - ADS, 4 sedinte aplicatii
 - prezenta + **rezultate personale!**
 - P – **25%** din nota
 - ADS, 3 sedinte aplicatii (-1? 21-22.12.2022)
 - tema personala

Documentatie

- <http://rf-opto.etti.tuiasi.ro>

The screenshot shows the homepage of the RF-OPTO website. At the top, there is a banner featuring the university's logo, a globe with 'ETTI' and 'RF-OPTO' text, and a laurel wreath. Below the banner, there are language links for English and Romanian, and a navigation bar with links for Start, Didactic, Master, Colectiv, Cercetare, Studenti, and several sub-links under 'Microunde'.

Dispozitive si circuite de microunde pentru radiocomunicatii

Disciplina: DCMR (2021-2022)

Coordinator Disciplina: conf. dr. Radu-Florin Damian
Cod: DOS412T
Tip Disciplina: DOS; Disciplina Optionala, Disciplina de Specialitate
Credite: 4
An de Studiu: 4, Sem. 7

Activitati

Curs: Cadru Didactic: conf. dr. Radu-Florin Damian, 2 Ore/Saptamana, Sectie Specializare, Orar:
Laborator: Cadru Didactic: conf. dr. Radu-Florin Damian, 1 Ore/Saptamana, Grupa, Orar:

Evaluare

Tip: Examen

A: 50%, (Examen/Colocviu)
B: 25%, (Activitate Seminar/Laborator/Proiect)
D: 25%, (Teme de casa/Lucrari de specialitate)

Note

[Rezultate totale](#)

Prezenta

[Curs](#)
[Laborator](#)

Liste

[Studenti care nu pot intra in examen \(final\)](#)
[Bonus-uri acumulate \(final\)](#)

Documentatie

- RF-OPTO
 - <http://rf-opto.eti.tuiasi.ro> Moodle
- Fotografie
 - de trimis pe rf-opto
 - necesara la laborator/curs
 - bonus activitate 0.5p/1p

Fotografii



Date:

Grupa 5304 (2015/2016)

Specializarea Tehnologii si sisteme de telecomunicatii

Marca 5184

[Trimite email acestui student](#) | [Adauga acest student la lista \(0\)](#)

Detalii curente

Finantare Buget

Bursa Fara Bursa

Observatii



Date:

Grupa 5304 (2015/2016)

Specializarea Tehnologii si sisteme de telecomunicatii

Marca 5184

[Acceseaza ca acest student](#)

Note obtinute

| Disciplina | Tip | Data | Descriere | Nota | Puncte | Obs. |
|------------|----------------|------------|------------------------------------|------|--------|------|
| TW | Tehnologii Web | | | | | |
| | N | 17/01/2014 | Nota Finala | 10 | - | |
| | A | 17/01/2014 | Colegiu Tehnologii Web 2013/2014 | 10 | 7.55 | |
| | B | 17/01/2014 | Laborator Tehnologii Web 2013/2014 | 9 | - | |
| | C | 17/01/2014 | Tema Tehnologii Web 2013/2014 | 9 | - | |

[Trimite email acestui student](#) | [Adauga acest student la lista \(0\)](#)

Detalii curente

Finantare Buget

Bursa Bursa de Studii

Observatii

Fotografii

| Grupa 5403 | | | | | | | | | | | |
|------------|--------------------------|---------|---|-----|---------|---------------------------|---|---|---------|---|--|
| Nr. | Student | Prezent | | Nr. | Student | Prezent | | Nr. | Student | Prezent | |
| 1 | ANGHELUS IONUT-MARCUS | | <input type="checkbox"/> Prezent | | 2 | ANTIGHIN FLORIN-RAZVAN | | Fotografia nu există | | <input type="checkbox"/> Prezent | |
| | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | |
| | | | Nota: 0 | | | | Nota: 0 | | | Nota: 0 | |
| | | | Obs: <input type="text"/> | | | | Obs: <input type="text"/> | | | Obs: <input type="text"/> | |
| 4 | APOSTOL PAVEL-MANUEL | | <input type="checkbox"/> Prezent | | 5 | BALASCA TUDIAN-PETRU | | Fotografia nu există | | <input checked="" type="checkbox"/> Prezent | |
| | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | |
| | | | Nota: 0 | | | | Nota: 0 | | | Nota: 0 | |
| | | | Obs: <input type="text"/> | | | | Obs: <input type="text"/> | | | Obs: <input type="text"/> | |
| 7 | BOTEZAT EMANUEL | | <input type="checkbox"/> Prezent | | 8 | BUTUNOI GEORGE-MADALIN | | Fotografia nu există | | <input type="checkbox"/> Prezent | |
| | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | |
| | | | Nota: 0 | | | | Nota: 0 | | | Nota: 0 | |
| | | | Obs: <input type="text"/> | | | | Obs: <input type="text"/> | | | Obs: <input type="text"/> | |
| 10 | CHIRITOIU CATERINA | | <input type="checkbox"/> Prezent | | 11 | CODOC MARIUS | | <input checked="" type="checkbox"/> Prezent | | <input type="checkbox"/> Prezent | |
| | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | | | Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> | |
| | | | Nota: 0 | | | | Nota: 0 | | | Nota: 0 | |
| | | | Obs: <input type="text"/> | | | | Obs: <input type="text"/> | | | Obs: <input type="text"/> | |

Nr. Student

Prezent

2 ANTIGHIN
FLORIN-RAZVAN

| |
|---|
| <input type="checkbox"/> Prezent |
| Puncte: 0 <input type="button" value="▼"/> <input checked="" type="button" value="▲"/> <input type="button" value="■"/> |
| Nota: 0 |
| Obs: <input type="text"/> |

Fotografia nu există

Adrese email

- Sefii de grupa
 - lista cu adrese de email **utilizate** de toti studentii
 - poate fi @student.etti.tuiasi.ro (@gmail @yahoo etc.)
 - **rdamian@etti.tuiasi.ro**

Acces

- Personalizat (parola), Generic (email)

The screenshot shows a student profile page. On the left is a blurred portrait photo. Below it, a blue button labeled "Acceseaza ca acest student" is circled in red. To the right, under "Date:", there are three fields: "Grupa" (5304 (2015/2016)), "Specializarea" (Tehnologii si sisteme de telecomunicatii), and "Marca" (5184). Below this is a section titled "Note obtinute" with a table:

| Disciplina | Tip | Data | Descriere | Nota | Puncte | Obs. |
|------------|----------------|------------|------------------------------------|------|--------|------|
| TW | Tehnologii Web | | | | | |
| | N | 17/01/2014 | Nota finala | 10 | - | |
| | A | 17/01/2014 | Colocviu Tehnologii Web 2013/2014 | 10 | 7.55 | |
| | B | 17/01/2014 | Laborator Tehnologii Web 2013/2014 | 9 | - | |
| | D | 17/01/2014 | Tema Tehnologii Web 2013/2014 | 9 | - | |

The screenshot shows an identification form. At the top, a blue header says "Identificare" and a instruction "Introduceti numele si adresa de email". Below is a "Nume" field, which is circled in red. A large red arrow points from the "Acceseaza ca acest student" button on the previous screen to this field. Below it is an "E-mail/Parola" field, also circled in red. Further down is a field for "Introduceti codul afisat mai jos" containing the code "ff769c3", which is circled in red. At the bottom is a "Trimite" button.

Online

- acces la **examene** necesita **parola** primita prin email

English | Romana |

Start Didactic Master Colectiv Cercetare **Studenti**

Note Lista Studenti Examene Fotografii

POPESCU GOPO ION

Fotografia nu exista

Date:

| | |
|---------------|--|
| Grupa | 5700 (2019/2020) |
| Specializarea | Inginerie electronica si telecomunicatii |
| Marca | 7000021 |

Acceseaza ca acest student | [Vere acces la licente](#)

Note obtinute

Inca nu a fost notat.

Start Didactic Master Colectiv C

Note **Lista Studenti** Examene Fotografii

Identificare

Introduceti numele si adresa de email utilizata la inscriere

Nume
POPESCU GOPO

E-mail/Parola

Introduceti codul afisat mai jos

4db4457

Trimite

Online

- acces email/parola

Start Didactic Master Colectiv

Note Lista Studenti Examene Fotografii

POPESCU GOPO ION

Fotografia nu există

Date:

| | |
|---------------|-----------------------|
| Grupa | 5700 (2019/2020) |
| Specializarea | Inginerie electronică |
| Marca | 7000021 |

Se acceseaza site-ul **a acest student!**

Start Didactic Master Colectiv

Note Lista Studenti Examene Fotografii

POPESCU GOPO ION

Fotografia nu există

Date:

| | |
|---------------|-------------------------|
| Grupa | 5700 (2019/2020) |
| Specializarea | Inginerie electronica s |
| Marca | 7000021 |

Se acceseaza site-ul **a acest student (inclusiv examene)!**

Parola

■ primita prin **email**

Important message from RF-OPTO Inbox x

Radu-Florin Damian
to me, POPESCU ▾

Romanian ▾ English ▾ Translate message

 Laboratorul de Microunde si Optoelectronica
Facultatea de Electronica, Telecomunicatii si Tehnologia Informatiei
Universitatea Tehnica "Gh. Asachi" Iasi

In atentia: POPESCU GOPO ION
Parola pentru a accesa examenele pe server-ul rf-opto este
Parola: [REDACTED]

Identificati-vă pe [server](#), cu parola, cat mai rapid, pentru confirmare.

Memorati acest mesaj intr-un loc sigur, pentru utilizare ulterioara

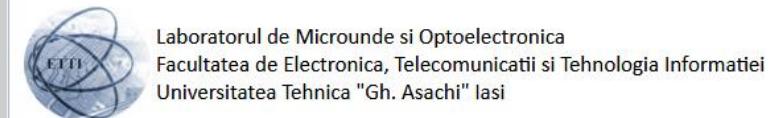
Attention: POPESCU GOPO ION
The password to access the exams on the rf-opto server is
Password: [REDACTED]

Login to the [server](#), with this password, as soon as possible, for confirmation.

Save this message in a safe place for later use

Reply Reply all Forward

Subject: Important message from RF-OPTO Correspondents
From: Me <rdamian@etti.tuiasi.ro> ★
Subject: **Important message from RF-OPTO** [REDACTED]
To: [REDACTED] POPESCU GOPO ION
Cc: Me <rdamian@etti.tuiasi.ro> ★



In atentia: POPESCU GOPO ION
Parola pentru a accesa examenele pe server-ul **rf-opto** este
Parola: [REDACTED]

Identificati-vă pe [server](#), cu parola, cat mai rapid, pentru confirmare.

Memorati acest mesaj intr-un loc sigur, pentru utilizare ulterioara

Attention: POPESCU GOPO ION
The password to access the exams on the **rf-opto** server is
Password: [REDACTED]

Login to the [server](#), with this password, as soon as possible, for confirmation.

Save this message in a safe place for later use

Manual examen online

- Aplicatia de examen online utilizata intens la:
 - ~~curs (prezenta)~~
 - laborator (rezultate)
 - proiect (predare)
 - ~~examen~~

Materials

Other data

[Manual examen on-line \(pdf, 2.65 MB, ro, !\[\]\(b3131996c2d47980618867ba93d92313_img.jpg\)](#)

[Simulare Examen \(video\) \(mp4, 65.12 MB, ro, !\[\]\(0678d1887db22e3f6b52fe38cd7e7b5b_img.jpg\)](#)

Examen online

- intotdeauna **contratimp**
 - perioada lungă (predare proiect/rezultate laborator)
 - ~~perioada scurtă (teste: 15min, examen: 2h)~~

Start Didactic Master Colectiv Cercetare **Studenti**

Note Lista Studenti **Examene** Fotografii

Anunț
17:28 (29/04/2020)

Material suport
17:30 (29/04/2020)

Subiecte
17:32 (29/04/2020)

Rezultate
17:35 (29/04/2020)

Finalizare
17:45 (29/04/2020)

Confirmare
17:45 (30/04/2020)

Ormaritorul interval de timp in.
01 m 08 s
[Reincarca acum](#)

Anunț

In acest examen se verifica diverse actiuni ale studentilor pentru examen

Ora pe server

Roate examenele sunt bazate pe fusul orar al server-ului (ar putea sa fie diferit de timpul local). Pentru referinta ora pe server este acum:

29/04/2020 17:28:51

MOTTO

- “Universitatea nu e pentru mase locul de unde emana cunoasterea, ci un obstacol intre individ si diploma pe care i-a harazit-o destinul”
- “Universitatea fiind ceva care se interpune in mod imoral intre individ si dreptul lui natural de a fi diplomat, individul are obligatia morala sa triumfe asupra universitatii prin orice mijloace”
 - Sursa citat: Internet, user: “un student batran si plesuv”

Examen

- subiecte individuale

- Note

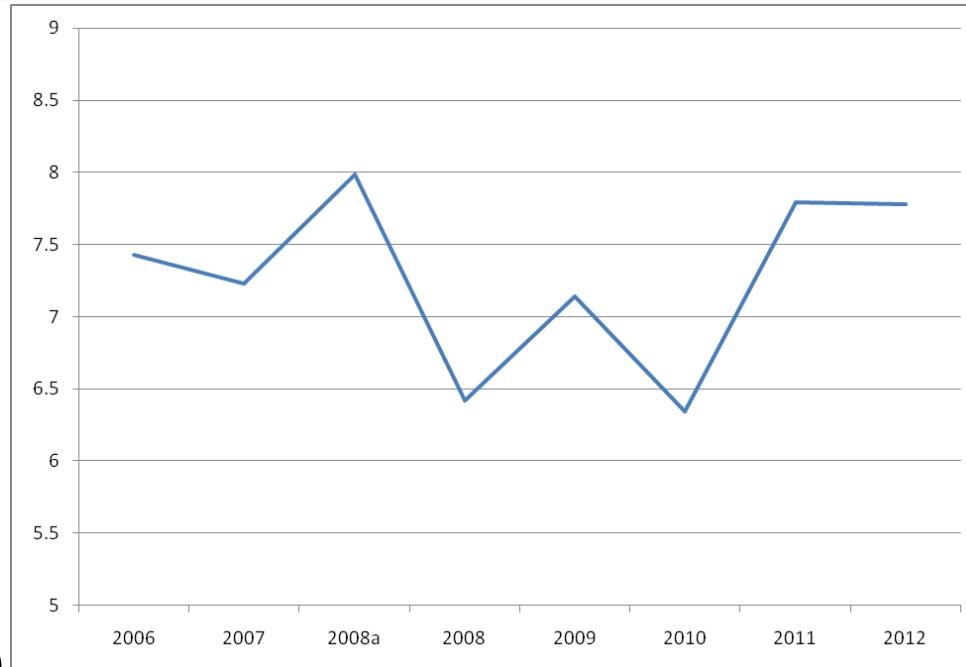
- 2006: 7.43
- 2007: 7.23
- 2008: 7.98
- 2008: 6.42
- 2009: 7.14
- 2010: 6.34
- 2011: 7.79
- 2012: 7.77

- La prima aplicare (neanuntata)

- 50% din studenti au parasit examenul in primele 10 minute
- 50% din cei ramasi nu au promovat
- promovabilitate totala 25%, rata contestatiilor: 0%

- Urmatoarele examinari (anuntate)

- rata contestatiilor: 0%



Examen



Note

■ 2017/2018

Start **Didactic** Master Colectiv Cercetare Studenti Admin

[Microunde](#) Comunicatii Optice Optoelectronica Internet Antene Practica Retele Soft didactic

Dispozitive si circuite de microunde pentru radiocomunicatii

Disciplina: DCMR (2017-2018)

Coordinator Disciplina: conf. dr. Radu-Florin Damian

Cod: DOS412T

Tip Disciplina: DOS; Disciplina Optionala, Disciplina de Specialitate

Credite: 4

An de Studiu: 4, Sem. 7

Activitati

Curs: Cadru Didactic: conf. dr. Radu-Florin Damian, 2 Ore/Saptamana, Sectie Specializare, Orar:

Laborator: Cadru Didactic: conf. dr. Radu-Florin Damian, 1 Ore/Saptamana, Grupa, Orar:

Evaluare

Tip: Examen

A: 50%, (Examen/Colocviu)

B: 25%, (Activitate Seminar/Laborator/Proiect)

D: 25%, (Teme de casa/Lucrari de specialitate)

Note

[Rezultate totale](#)

Prezenta

Curs
Laborator

Liste

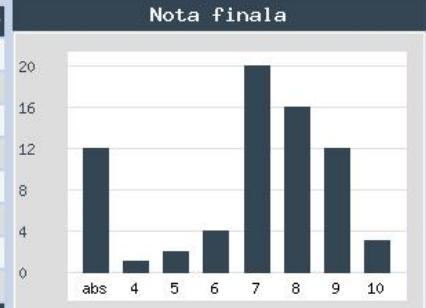
Bonus-uri acumulate (final)

Studenti care nu pot intra in examen

Statistici

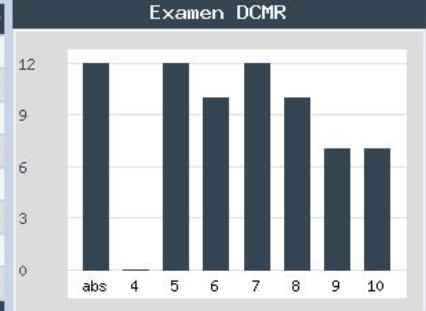
Nota. Numar

| | |
|--------------|-----------|
| abs | 12 |
| 4 | 1 |
| 5 | 2 |
| 6 | 4 |
| 7 | 20 |
| 8 | 16 |
| 9 | 12 |
| 10 | 3 |
| TOTAL | 70 |



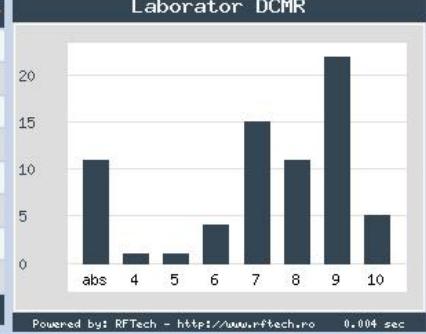
Exam. Numar

| | |
|--------------|-----------|
| abs | 12 |
| 4 | 0 |
| 5 | 12 |
| 6 | 10 |
| 7 | 12 |
| 8 | 10 |
| 9 | 7 |
| 10 | 7 |
| TOTAL | 70 |



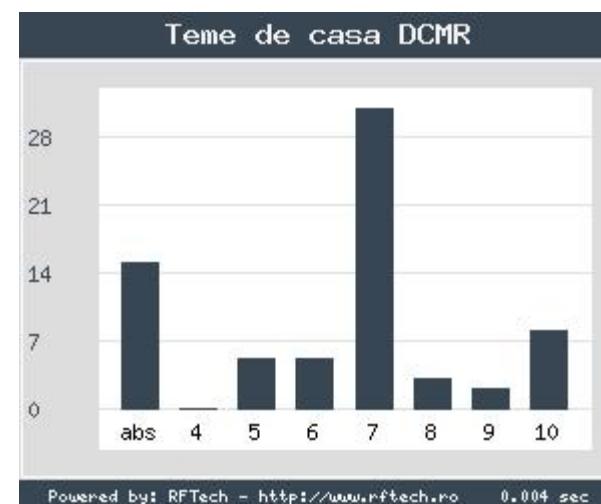
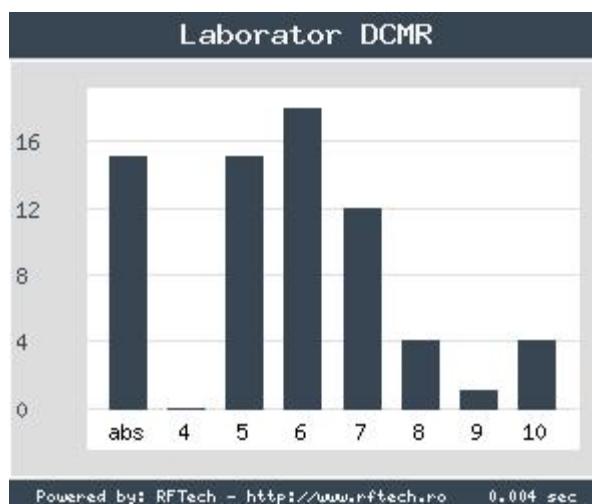
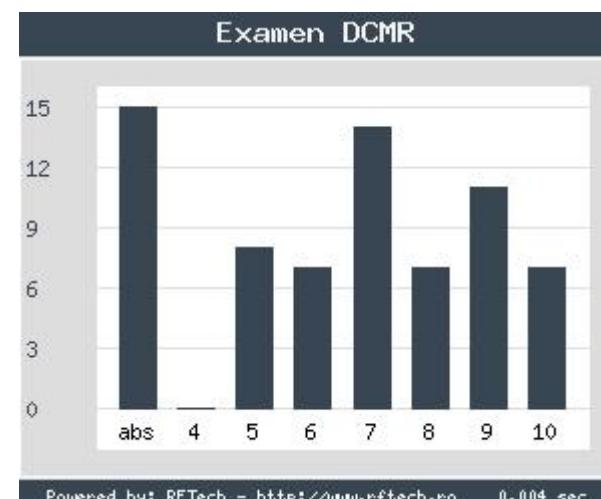
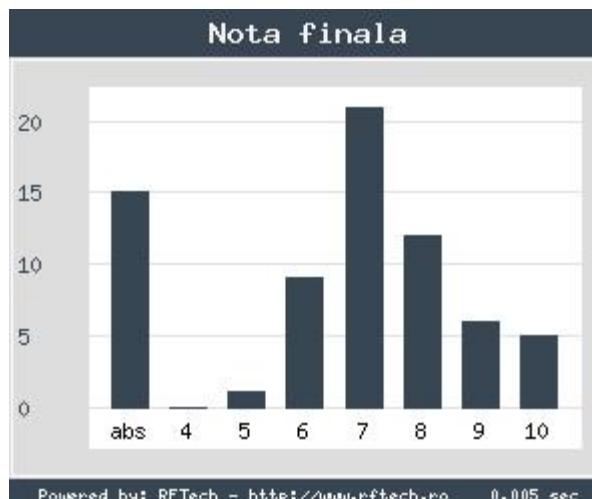
Labo. Numar

| | |
|--------------|-----------|
| abs | 11 |
| 4 | 1 |
| 5 | 1 |
| 6 | 4 |
| 7 | 15 |
| 8 | 11 |
| 9 | 22 |
| 10 | 5 |
| TOTAL | 70 |



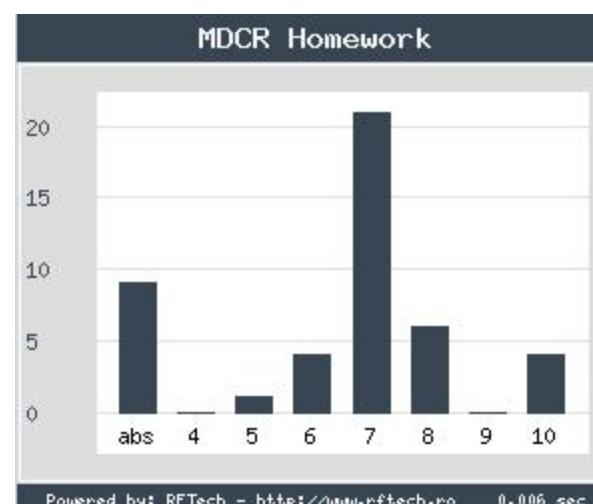
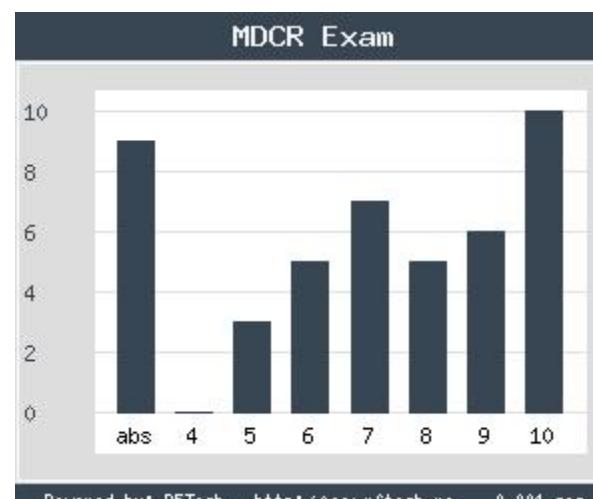
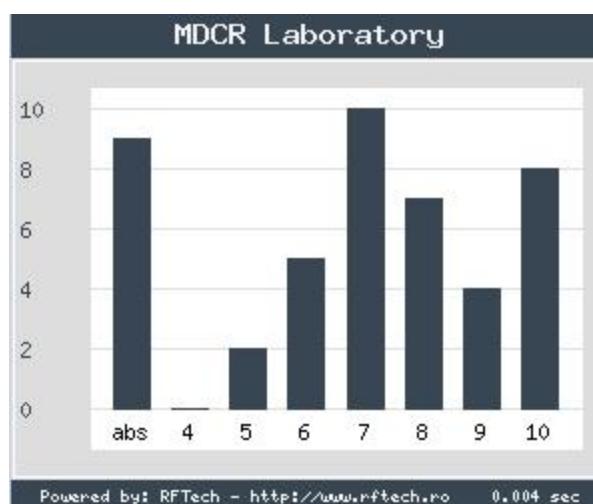
Note

■ 2019/2020



Note

■ 2019/2020 - eng



Prezenta, Liste

D: 15%, (Teme de casa/Lucrari de specialitate)

Note

[Rezultate totale](#)

Prezenta

[Curs](#)
[Laborator](#)

Liste

[Studenti care nu pot intra in examen](#)
[Bonus-uri acumulate](#)

Materiale

- Prezenta
- Minim 7 prezente
- Bonus
- Teme proiect
- etc.

Bonus

| Grupa | Prezente curs | B. prezenta | B. activitate | B. foto | B. T1 | B. T2 | B. T3 | Total Bonus | Obs. |
|--------------|----------------------|--------------------|----------------------|----------------|--------------|--------------|--------------|--------------------|-------------|
| 5408 | 2 | 0 | 0 | 1 | 0.5 | 0 | 0.1 | 1.6 | - |
| 5408 | 15.5 | 2 | 1.6 | 1 | 0 | 0.2 | 0.3 | 5.1 | - |
| 5408 | 2.1 | 0 | 0 | 1 | | | | 1 | - |
| 5408 | 11 | 1.5 | 0 | 0 | 0.25 | 0 | 0 | 1.75 | - |
| 5408 | 5 | 0.5 | 0 | 1 | 0.75 | 0.2 | 0 | 2.45 | - |
| 5408 | 8.875 | 1 | 0.4 | 1 | 0.85 | 0.1 | | 3.35 | - |
| 5408 | 0 | 0 | 0 | 1 | | | | 1 | - |
| 5408 | 0 | 0 | 0 | 1 | | | | 1 | - |
| 5408 | 14.5 | 2 | 0.6 | 1 | 0.63 | 0.2 | 0 | 4.43 | - |
| 5408 | 6.65 | 1 | 0 | 1 | 0.13 | 0 | 0.1 | 2.23 | - |
| 5408 | 9.2 | 1.5 | 0 | 1 | 0 | | 0 | 2.5 | - |
| 5408 | 7.8 | 1 | 0 | 1 | 0.5 | 0 | 0.2 | 2.7 | - |
| 5408 | 3 | 0.5 | 0 | 1 | | | 0 | 1.5 | - |
| 5408 | 1.6 | 0 | 0 | 1 | 0 | | | 1 | - |
| 5408 | 4.5 | 0.5 | 0 | 1 | 0.48 | | | 1.98 | - |
| 5408 | 8 | 1 | 0.05 | 1 | 0.38 | 0 | 0 | 2.43 | - |
| 5408 | 1 | 0 | 0 | 1 | | | | 1 | - |
| 5408 | 15.5 | 2 | 0.8 | 1 | 0 | 0.1 | 0.1 | 4 | - |
| 5408 | 10.5 | 1.5 | 0 | 1 | | | 0 | 2.5 | - |

Istoric

Alte informatii

[Online Exam manual \(pdf, 2.56 MB, en, !\[\]\(0271f7a0ac0c29ba1f8ceccd44fa7f94_img.jpg\)](#)

[Exam Simulation \(video\) \(mp4, 41.96 MB, en, !\[\]\(eb3ff164f79f6658783ec1f6462fa176_img.jpg\)](#)

[Important Agilent Application Notes \(rar, 2.36 MB, ro, !\[\]\(8a290070f8f4fe66461b1fbc567fb9b1_img.jpg\)](#)

Ani anterioiri

2020-2021

2019-2020

2018-2019

2017-2018

2016-2017

Mai mult...

Dispozitive si circuite de microunde pentru radiocomunicatii

Disciplina: DCMR (2020-2021)

Coordinator Disciplina: conf. dr. Radu-Florin Damian

Cod: DOS412T

Tip Disciplina: DOS; Disciplina Optionala, Disciplina de Specialitate

Credite: 4

An de Studiu: 4, Sem. 7

Activitati

Curs: Cadru Didactic: conf. dr. Radu-Florin Damian, 2 Ore/Saptamana, Sectie Specializare, Orar:

Laborator: Cadru Didactic: conf. dr. Radu-Florin Damian, 1 Ore/Saptamana, Grupa, Orar:

C 2017 Oportunitate de angajare

- Angajare **temporara** disponibila
- Salarizare lunara echivalentă **12800 lei/luna**

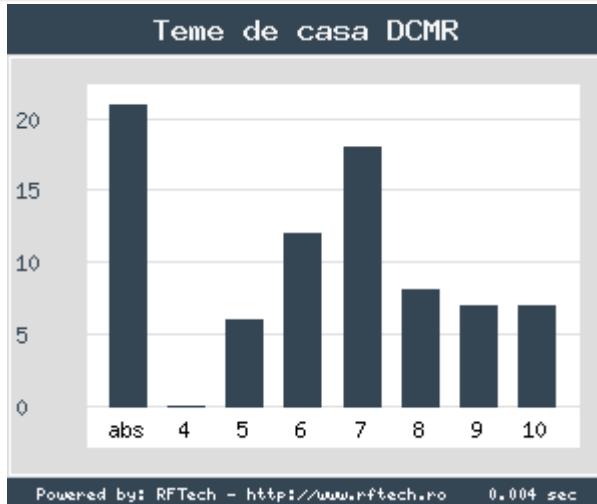
C 2017 Oportunitate de angajare

- Extrase din evaluările calitative ale studenților (2017):
 - “70% dintre studenți au plătit un student de an mai mare să le facă proiectul, între 30 și 50 de lei”
- Calcul
 - $50 \text{ stud} \times 70\% \times 40 \text{ lei} = 1400 \text{ lei}$
 - $50 \text{ stud} \times 70\% \times 30 \text{ min} = 17.5 \text{ h}$
 - $1 \text{ luna} = 4 \text{ sapt} \times 5 \text{ zile} \times 8 \text{ h} = 160 \text{ h}$

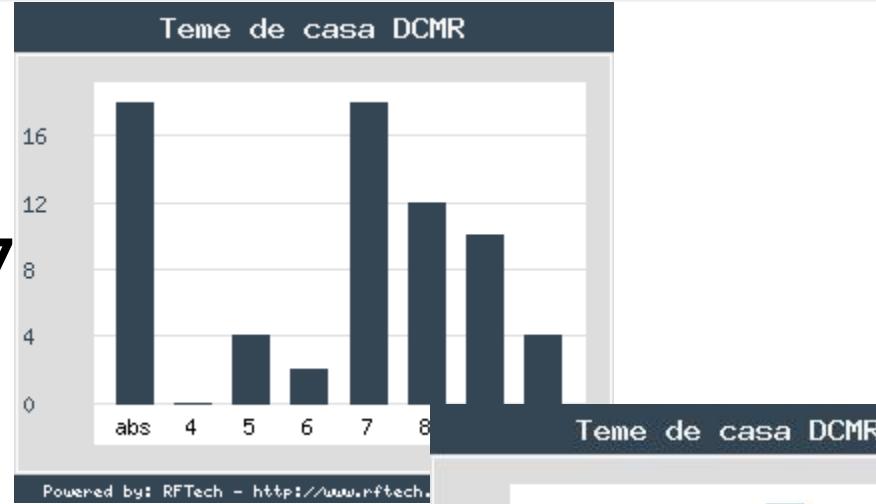
$$\frac{1400 \text{ lei}}{17.5 \text{ h}} = \frac{12800 \text{ lei}}{160 \text{ h}} = \frac{12800 \text{ lei}}{1 \text{ luna}}$$

Efect? – factorul “andrei”

15/6



16/7



17/8



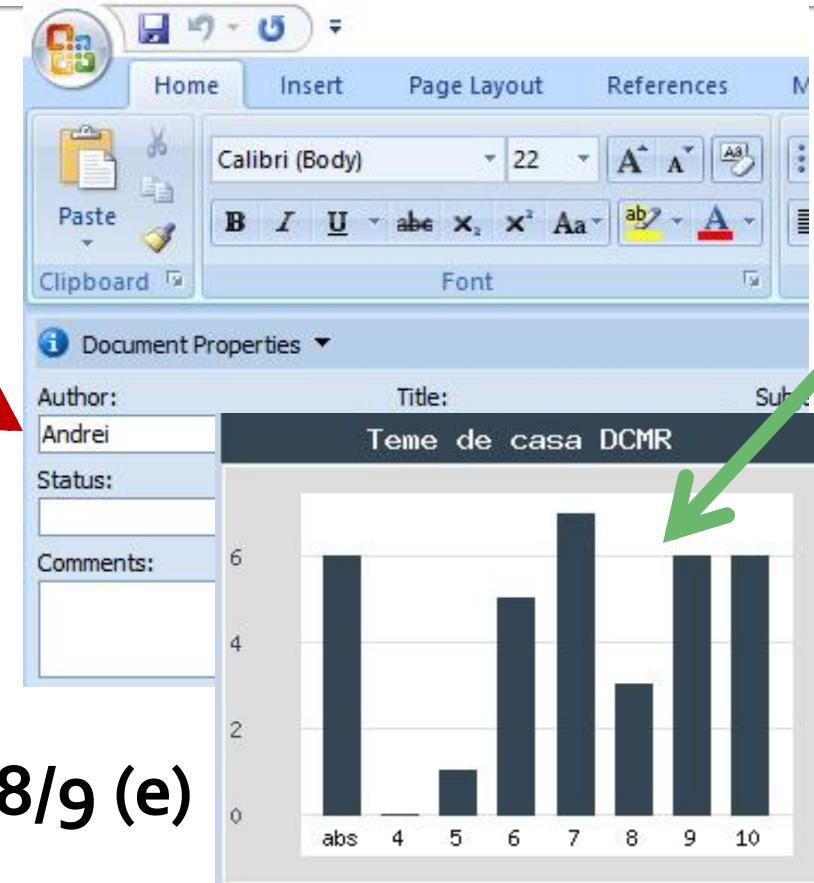
18/9

Proiect 2019/2020

- factorul "andrei" = $-2p$



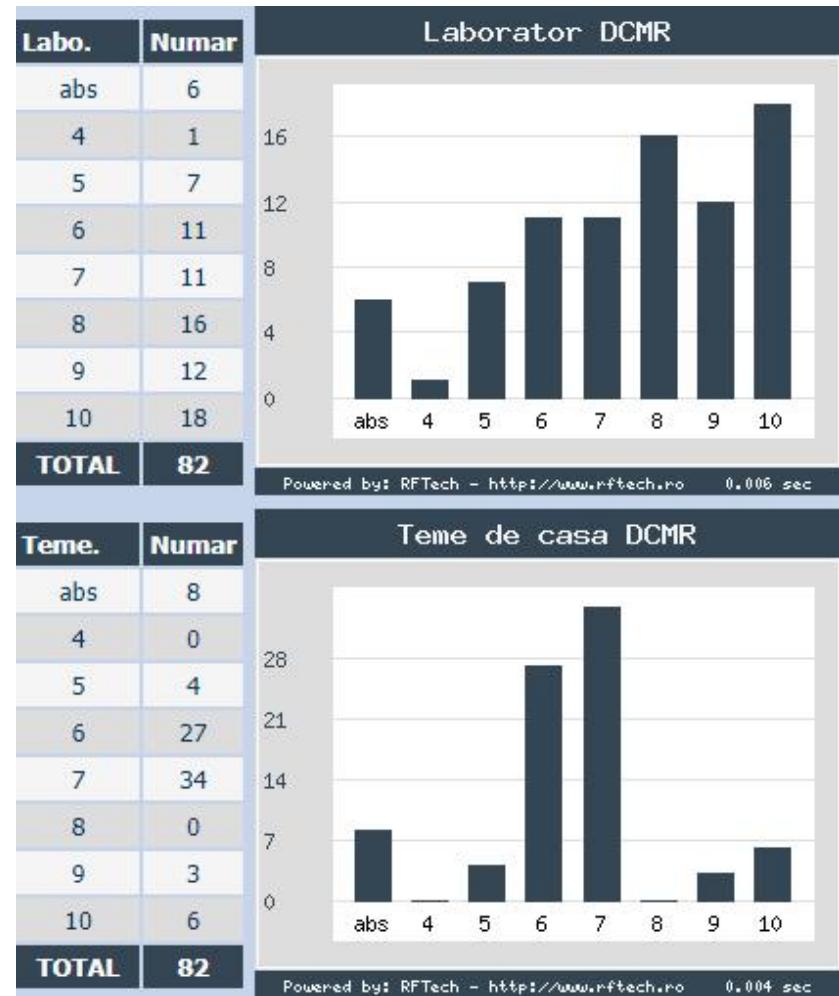
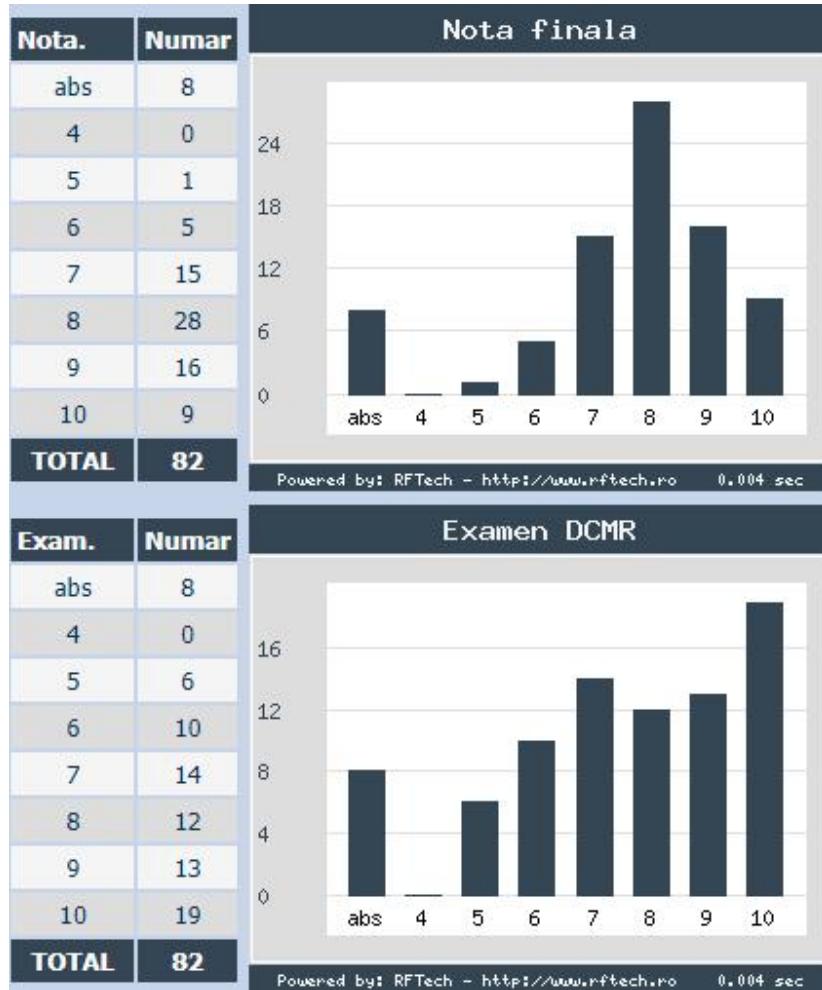
2018/9



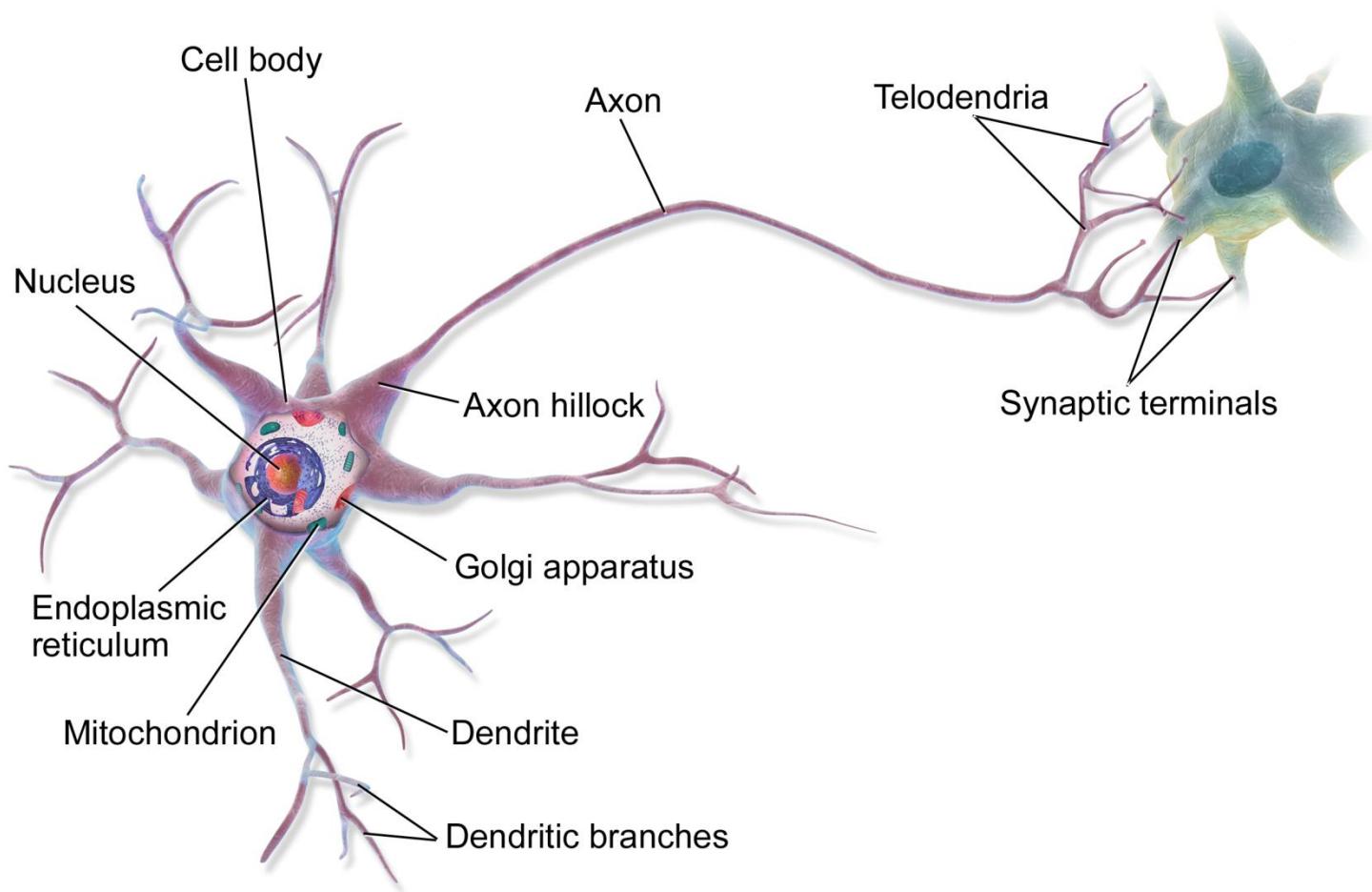
2018/9 (e)

Note 2021/2022

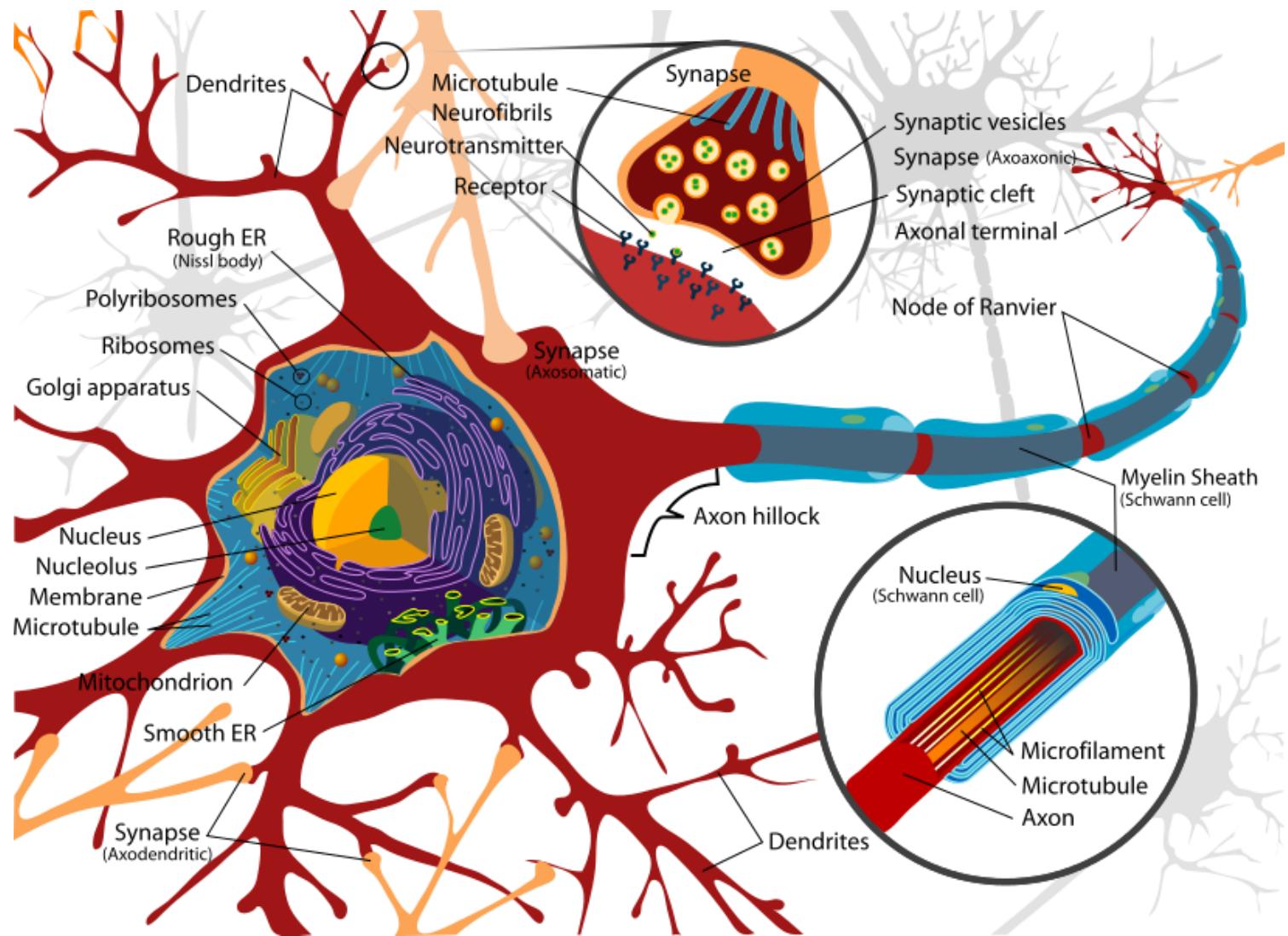
■ 2021/2022 - ro



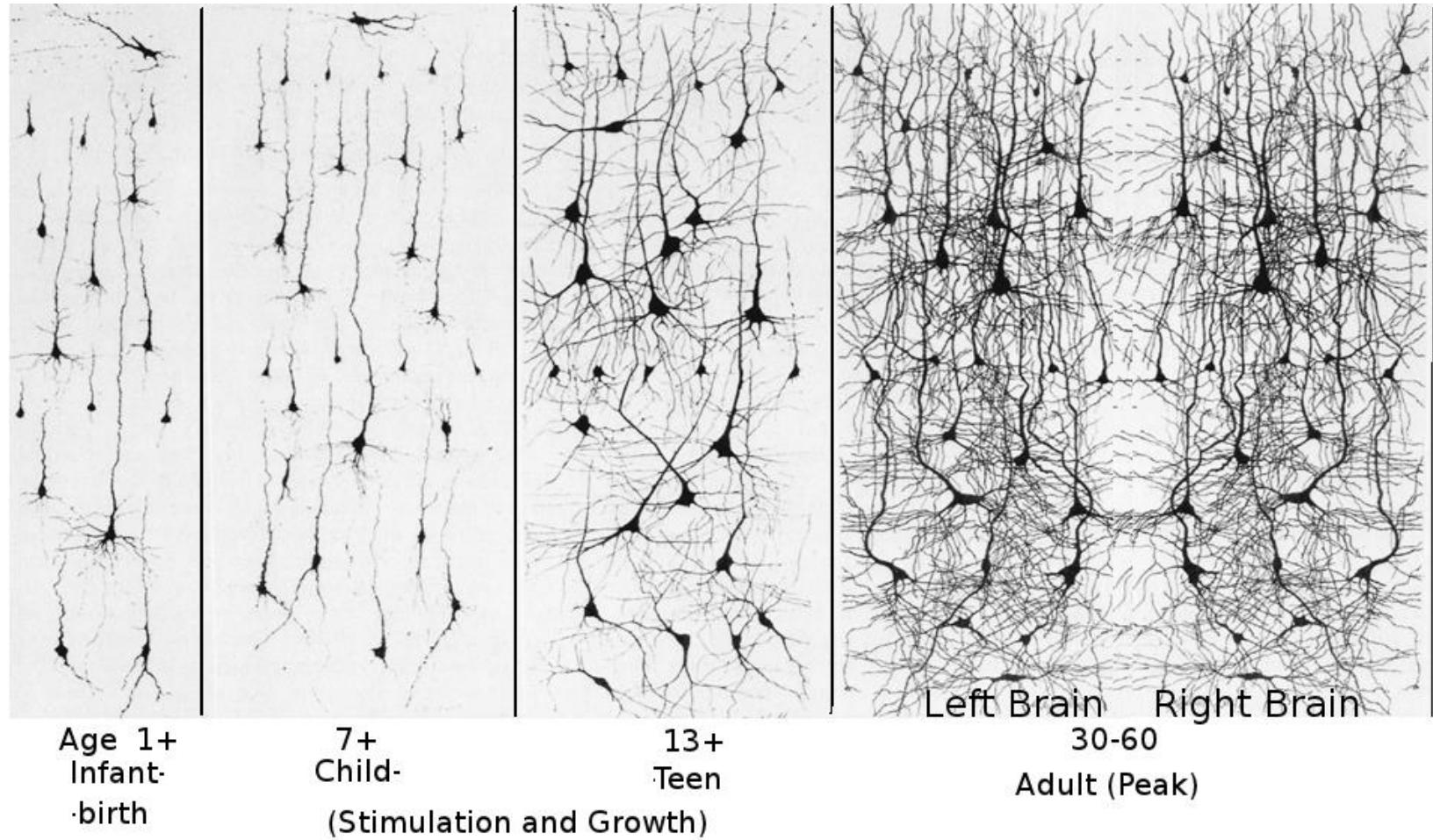
Scop curs 1



Scop curs 2



Scop curs 3

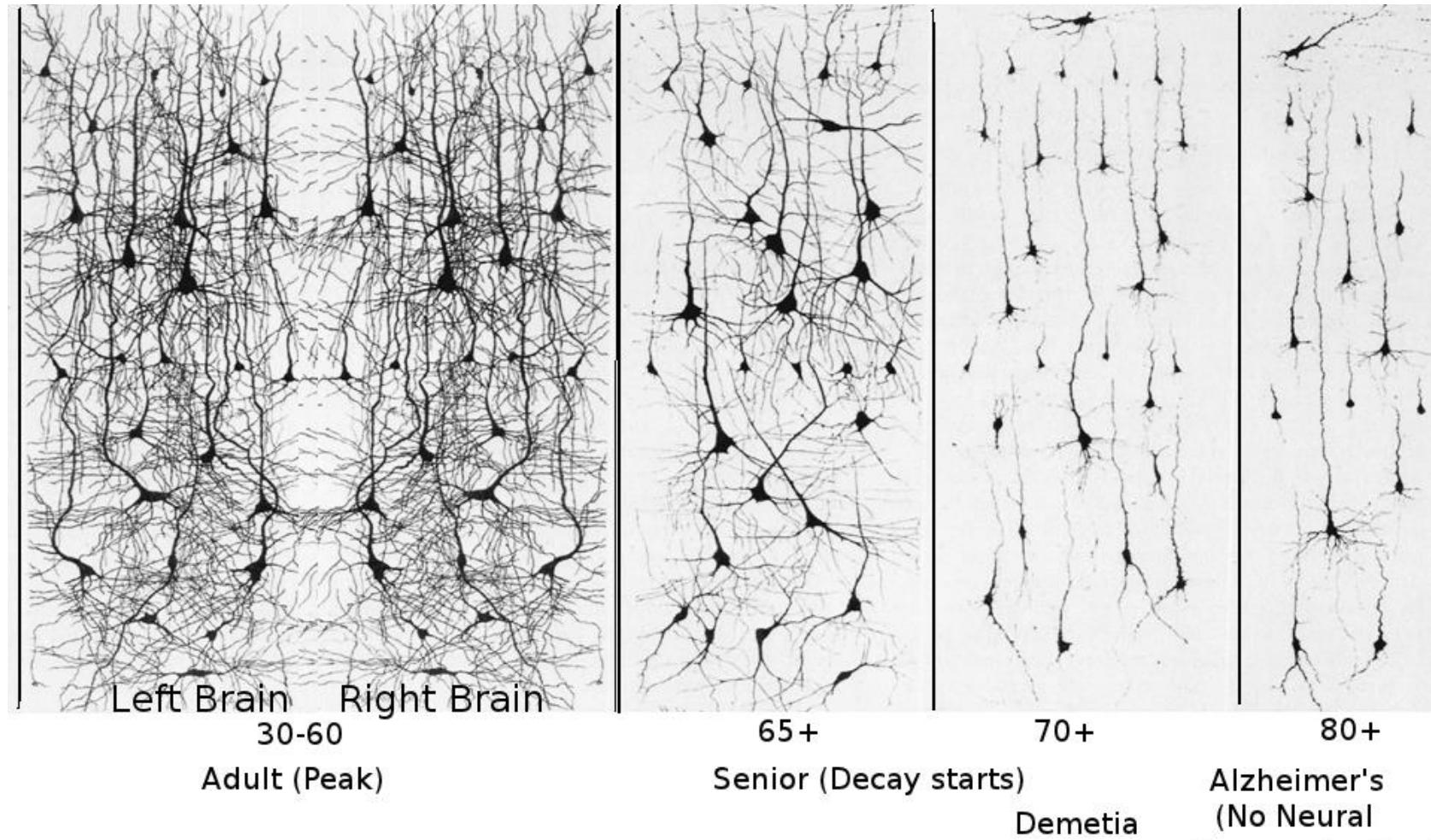


Scop curs 4



**Sinapse
“ingineră”**

Termen



Cuprins

- Linii de transmisie
- Adaptarea de impedanță
- Cuploare direcționale
- Divizoare de putere
- Amplificatoare de microunde
- Filtre de microunde
- Oscilatoare de microunde ?

Bibliografie

- <http://rf-opto.eti.tuiasi.ro>
- Irinel Casian-Botez: "Microunde vol. 1: Proiectarea de circuit", Ed. TEHNOPRES, 2008
- David Pozar, Microwave Engineering, Wiley; 4th edition , 2011, ISBN : 978-1-118-29813-8 (E), ISBN : 978-0-470-63155-3 (P)

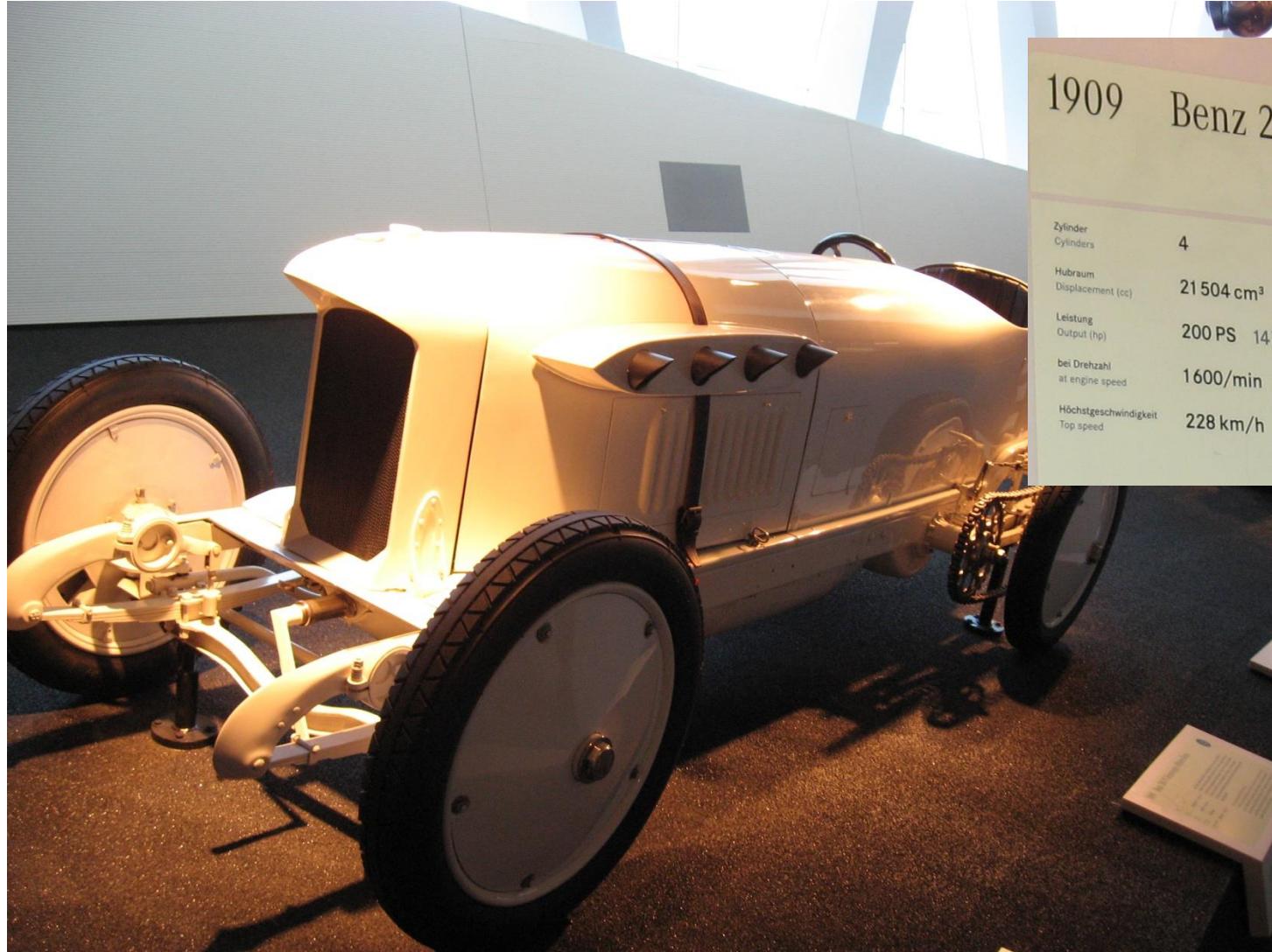
~1930



~1930



1909



1909 Benz 200 PS Rennwagen »Blitzer«

| | |
|------------------------------------|----------------------------------|
| Zylinder Cylinders | 4 |
| Hubraum Displacement (cc) | 21504 cm ³ 1312 cu in |
| Leistung Output (hp) | 200 PS 147 kW |
| bei Drehzahl at engine speed | 1600/min |
| Höchstgeschwindigkeit Top speed | 228 km/h 142 mph |

Der »Blitzen-Benz« ist 1909 der erste 200 km/h fährt. Seine größten Erfolge sind mit 228 km/h über die Sankt-Burman mit 228 km/h über die Saar ist damit das schnellste Fahrzeug jede Eisenbahn.

Benz »Lightning Benz« 200 hp rac...
In 1909 the Lightning Benz ...

1930-1950



Tehnologie

> 2010

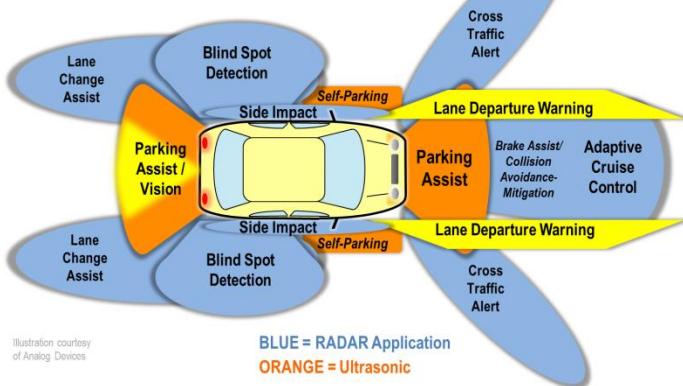


Illustration courtesy of Analog Devices.

< 1950



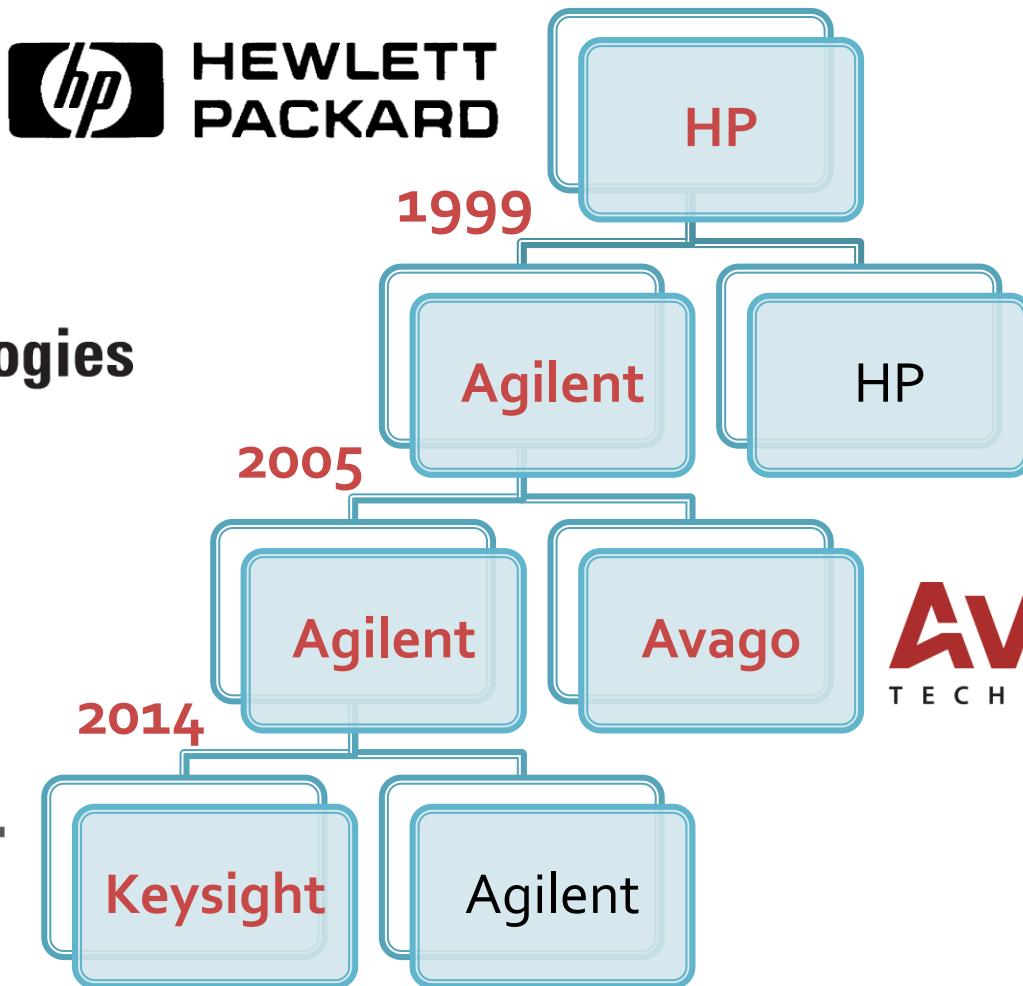
Tehnologie

| | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| $1 \times 1 = 1$ | $2 \times 1 = 2$ | $3 \times 1 = 3$ | $4 \times 1 = 4$ | $5 \times 1 = 5$ |
| $1 \times 2 = 2$ | $2 \times 2 = 4$ | $3 \times 2 = 6$ | $4 \times 2 = 8$ | $5 \times 2 = 10$ |
| $1 \times 3 = 3$ | $2 \times 3 = 6$ | $3 \times 3 = 9$ | $4 \times 3 = 12$ | $5 \times 3 = 15$ |
| $1 \times 4 = 4$ | $2 \times 4 = 8$ | $3 \times 4 = 12$ | $4 \times 4 = 16$ | $5 \times 4 = 20$ |
| $1 \times 5 = 5$ | $2 \times 5 = 10$ | $3 \times 5 = 15$ | $4 \times 5 = 20$ | $5 \times 5 = 25$ |
| $1 \times 6 = 6$ | $2 \times 6 = 12$ | $3 \times 6 = 18$ | $4 \times 6 = 24$ | $5 \times 6 = 30$ |
| $1 \times 7 = 7$ | $2 \times 7 = 14$ | $3 \times 7 = 21$ | $4 \times 7 = 28$ | $5 \times 7 = 35$ |
| $1 \times 8 = 8$ | $2 \times 8 = 16$ | $3 \times 8 = 24$ | $4 \times 8 = 32$ | $5 \times 8 = 40$ |
| $1 \times 9 = 9$ | $2 \times 9 = 18$ | $3 \times 9 = 27$ | $4 \times 9 = 36$ | $5 \times 9 = 45$ |
| $1 \times 10 = 10$ | $2 \times 10 = 20$ | $3 \times 10 = 30$ | $4 \times 10 = 40$ | $5 \times 10 = 50$ |
| | | | | |
| $6 \times 1 = 6$ | $7 \times 1 = 7$ | $8 \times 1 = 8$ | $9 \times 1 = 9$ | $10 \times 1 = 10$ |
| $6 \times 2 = 12$ | $7 \times 2 = 14$ | $8 \times 2 = 16$ | $9 \times 2 = 18$ | $10 \times 2 = 20$ |
| $6 \times 3 = 18$ | $7 \times 3 = 21$ | $8 \times 3 = 24$ | $9 \times 3 = 27$ | $10 \times 3 = 30$ |
| $6 \times 4 = 24$ | $7 \times 4 = 28$ | $8 \times 4 = 32$ | $9 \times 4 = 36$ | $10 \times 4 = 40$ |
| $6 \times 5 = 30$ | $7 \times 5 = 35$ | $8 \times 5 = 45$ | $9 \times 5 = 45$ | $10 \times 5 = 50$ |
| $6 \times 6 = 36$ | $7 \times 6 = 42$ | $8 \times 6 = 48$ | $9 \times 6 = 54$ | $10 \times 6 = 60$ |
| $6 \times 7 = 42$ | $7 \times 7 = 49$ | $8 \times 7 = 56$ | $9 \times 7 = 63$ | $10 \times 7 = 70$ |
| $6 \times 8 = 48$ | $7 \times 8 = 56$ | $8 \times 8 = 64$ | $9 \times 8 = 72$ | $10 \times 8 = 80$ |
| $6 \times 9 = 54$ | $7 \times 9 = 63$ | $8 \times 9 = 72$ | $9 \times 9 = 81$ | $10 \times 9 = 90$ |
| $6 \times 10 = 60$ | $7 \times 10 = 70$ | $8 \times 10 = 80$ | $9 \times 10 = 90$ | $10 \times 10 = 100$ |

2x1 = 2
2x2 = 4
2x3 = 6
2x4 = 8
2x5 = 10
2x6 = 12
2x7 = 14
2x8 = 16
2x9 = 18
2x10 = 20



Agilent Technologies



AVAGO
TECHNOLOGIES

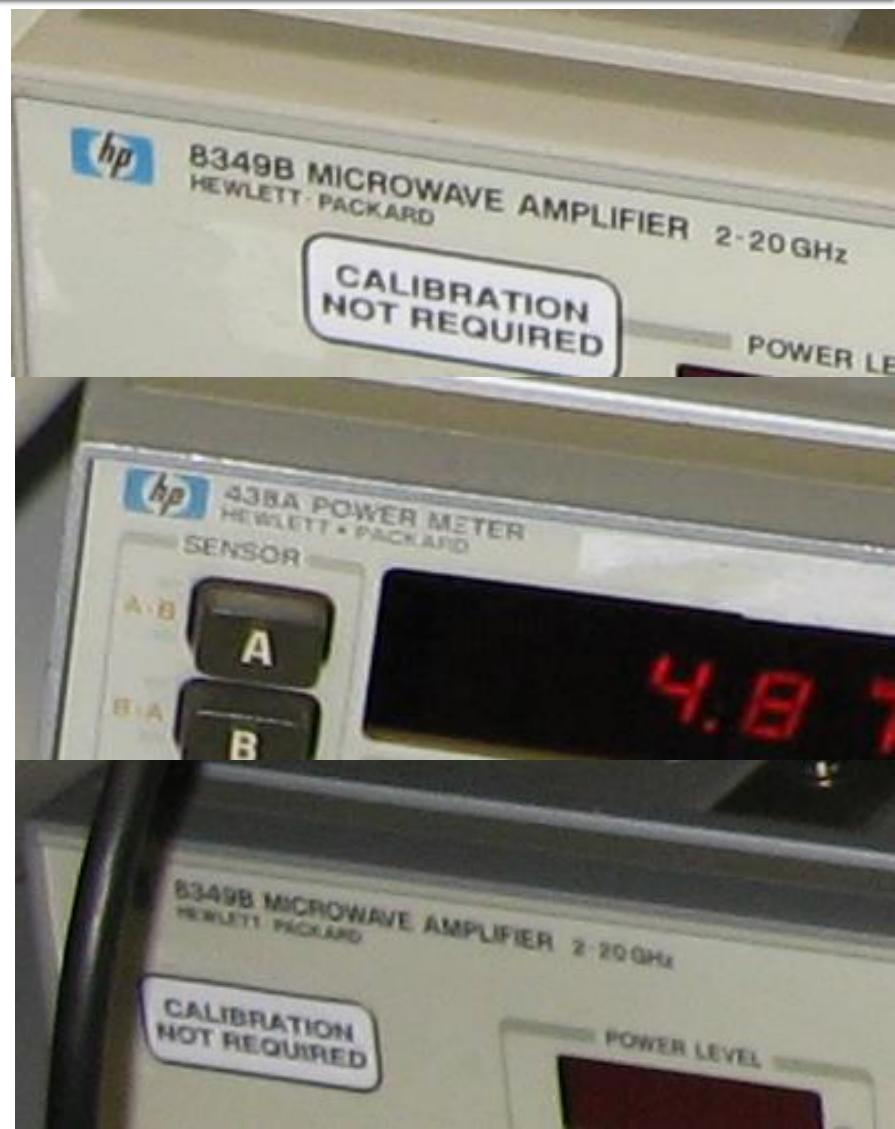


KEYSIGHT
TECHNOLOGIES

NPL, Londra



NPL, Londra



Examen: Reprezentare logaritmică

$$\text{dB} = 10 \cdot \log_{10} (P_2 / P_1)$$

$$0 \text{ dB} = 1$$

$$+0.1 \text{ dB} = 1.023 (+2.3\%)$$

$$+3 \text{ dB} = 2$$

$$+5 \text{ dB} = 3$$

$$+10 \text{ dB} = 10$$

$$-3 \text{ dB} = 0.5$$

$$-10 \text{ dB} = 0.1$$

$$-20 \text{ dB} = 0.01$$

$$-30 \text{ dB} = 0.001$$

$$\text{dBm} = 10 \cdot \log_{10} (P / 1 \text{ mW})$$

$$0 \text{ dBm} = 1 \text{ mW}$$

$$3 \text{ dBm} = 2 \text{ mW}$$

$$5 \text{ dBm} = 3 \text{ mW}$$

$$10 \text{ dBm} = 10 \text{ mW}$$

$$20 \text{ dBm} = 100 \text{ mW}$$

$$-3 \text{ dBm} = 0.5 \text{ mW}$$

$$-10 \text{ dBm} = 100 \mu\text{W}$$

$$-20 \text{ dBm} = 1 \mu\text{W}$$

$$-30 \text{ dBm} = 1 \text{ nW}$$

$$[\text{dBm}] + [\text{dB}] = [\text{dBm}]$$

$$[\text{dBm}/\text{Hz}] + [\text{dB}] = [\text{dBm}/\text{Hz}]$$

$$[x] + [\text{dB}] = [x]$$

Calculul atenuarii/amplificării

$$\text{Pierderi/Castig} = \frac{P_{out}}{P_{in}}$$

$$\text{Pierderi[dB]} = [-] 10 \cdot \log_{10} \left(\frac{P_{out}}{P_{in}} \right)$$

$$\text{Pierderi[dB]} = [-] 10 \cdot \log_{10} \left(\frac{P_{out}}{P_0} \cdot \frac{P_0}{P_{in}} \right) = [-] 10 \cdot \left[\log_{10} \left(\frac{P_{out}}{P_0} \right) - \log_{10} \left(\frac{P_{in}}{P_0} \right) \right]$$

$$\text{Pierderi[dB]} = [-] (P_{out} [\text{dBm}] - P_{in} [\text{dBm}])$$



=



-



Contact

- Laboratorul de microunde si optoelectronica
- <http://rf-opto.etti.tuiasi.ro>
- rdamian@etti.tuiasi.ro