SUBJECT PROGRAM

I. IDENTIFICATION OF THE SUBJECT.

Subject: **Scientific Computing**		Acronym: **INF-285**	Approval date: 05/04/2021 (CC.DD. Agreement 009/2021)		
UTFSM credits: **3**	Prerequisites: **MAT-024 INF-221**	Exam: **Does not have.**	Faculty		
SCT Credits: **5**			**Computer Science Department**		
Weekly Lecture Hours: **2.3**	Assistantship: **Yes, there is.**	Laboratory: **None.**	Semester in which it is taught		
			Odd	Pair	Both **x**
Formative axis: **Engineering Sciences – Computer Science for complex problems in industry**					
Total time dedicated to the subject: **134.5 chronological hours**					

Description of the subject.

In this subject the student acquires conceptual and technical knowledge and skills of significant importance such as: analysis, synthesis, computational problem solving and critical evaluation of computational results.

In addition, the student develops systemic thinking and modeling skills for problem solving at a professional level, with a high commitment to quality, based on current technological resources and effectively communicating their ideas.

Entry requirements.

- Apply elements of linear algebra.
- Apply the C language.
- Apply mathematical concepts such as: algebra, differential equations, among others.
- Mastery of technical English.

Contribution to the graduation profile.

Specific competence:

- Apply theoretical and algorithmic foundations to develop efficient ways to solve computational problems.

Transversal skills stamp:

- **Social Responsibility and Ethics:** acts in accordance with the principles inherent to his profession, keeping in mind a supportive conduct, committing to and respecting individuals, the environment and society, in coherence with the testamentary legacy of Don Federico Santa María Carrera.
- **Commitment to quality:** the student executes professional activities with excellence, which allows him or her to face the challenges that arise, guided by continuous learning, systematic self-assessment and a culture of quality.
- **Problem solving:** solves complex problems, analyzing and evaluating effective and efficient solutions, based on their impact on the organization, people and the environment.
- **Effective Communication:** Effectively communicate their ideas orally and in writing.

Learning outcomes.

- **Analyzes** engineering problems, **selecting** the type of mathematical structure that best represents it.
- **It proposes** a resolution algorithm for the problem, **solving it** using the corresponding numerical techniques or methods.
- **Analyzes** the results of a numerical method, **verifying** its theoretical and numerical properties.

- **Analyzes** computational methods, **verifying** their validity and reliability in known results.

Thematic contents.

- Linear Algebra Review.
- Floating point standard and loss of importance.
- Finding zeros in 1D nonlinear equations.
- Systems of linear and nonlinear equations, classical and advanced methods.
- 1D interpolation.
- Least squares and GMRes.
- Numerical integration.
- Ordinary differential equations.

Teaching and learning methodology.

- Expository classes by the teacher
- Experience-based learning
- Collaborative learning
- Problem-based learning

Evaluation and grading of the subject (Adjusted to Institutional Regulations-Regulation No. 1)

Approval requirements and qualification	It will be evaluated through 3 exams and at most 5 tasks (NT). The final grade will be obtained in the following way: $\mathbf{NF = 0.75\ \ NC + 0.25NT}$, the grade $= \sqrt[3]{\left(\frac{C_1+C_2}{\ }\right)}$ of the competition k for $k =$ _____# where $NCC_{\$}$, $C_{\%}$ is 1: 3 , $NT =$ $* H(NPT - 55)$, $H(x) = \begin{cases} 0, & x < 0 \\ 1, & x \geq 0 \end{cases}$ # NPT is the function step, NPT $= \frac{}{n-1}\left(\sum_{\ )\in T)}^{\ \&\ /\#} - \min_{i \in TP,} T_i$ I , TP is the set with the integer identifiers of the published tasks and n is the cardinality of TP.

Resources for learning. ● Virtual platform.

Bibliography.

Guide text	Timothy Sauer. (2017). Numerical Analysis. United States: Pearson. Numerical Analysis, Third Edition, Timothy Sauer, Pearson, 2017, ISBN 10: 9780134696454.
Complementary or optional	Numerical Linear Algebra, Lloyd N. Trefethen and David Bau, III, SIAM, 1997, ISBN: 0898713617. Numerical Mathematics, Alfio Quarteroni, Riccardo Sacco, Fausto Saleri, Springer, Text in Applied Mathematics 37, 2000, ISBN: 0387989595. Applied Numerical Linear Algebra, James W. Demmel, SIAM, 1997, SIAM, ISBN: 0898713897. Computing platform of the Department of Informatics.

CALCULATION OF NUMBER OF HOURS OF DEDICATION - (SCT-Chile) - SUBJECT SUMMARY TABLE.

ACTIVITY	Number of hours of dedication		
	Number of hours per week	Number of weeks	Total number of hours
PRESENCE			
Lecture or theoretical classes	23	17	39.1
Assistantship/Exercises	1.1	14	15.4
Industrial visits (field)			
Laboratories/Workshop			
Exams	3	3	9
Controls			
NO PRESENCE			
Assistantship			
Mandatory tasks	5	4	twenty
Personal study (individual or group)	3	17	51
Others (projects)			
TOTAL (HOURS)[1]			**135**
Total number of TRANSFERABLE CREDITS[2]			**5**

[1]Teaching hours are considered 35 minutes – Rector's Decree 325/2020.

[2]Credit equivalence is considered SCT=27 hours – Rector's Decree 324/2020.