DEPARTAMENTO DE **CIENCIAS**
*Sección **QUÍMICA***
Grupo de investigación en
MODIFICACIÓN DE MATERIALES

CLASE MAGISTRAL (VIRTUAL)

"Fundamentals of Time-Donain NMR (TD-NMR) and Data Processing"

Dr. Tiago Moraes
Profesor
Universidad de Sao Paulo, Brasil

Fecha : Viernes, 12 de junio de 2026
Hora : 8:00 am - 12:00 p.m.

https://meet.google.com/gaz-cdoq-odx

DESCRIPTON: This course covers the theoretical and practical fundamentals of Time-Domain Nuclear Magnetic Resonance (TD-NMR), a widely used technique for fast, non-destructive, and sensitive analysis of material properties. Topics include nuclear spin behavior in magnetic fields, relaxation mechanisms, and signal acquisition (FID, CPMG, IR, Spin Echo, MSE), as well as an overview of low-field instrumentation and its differences from high-field systems. Key experimental parameters, such as T_1 and T_2 relaxation times, pulse sequences, and data acquisition strategies, will be discussed, along with fundamental approaches to data processing and interpretation, including Inverse Laplace Transform (ILT) and fitting methods. The objective of the course is to enable participants to understand TD-NMR principles, select appropriate methods, process data, and interpret results for research and practical applications.

PROGRAM: **1.** Basic TD-NMR theory **2.** NMR principles: spin, precession, polarization, T_1 and T_2 relaxation; **3.** Instrumentation: magnet, probe, transmitter, receiver; **4.** Pulse NMR: FID, CPMG, IR and relaxation measurements; **5.** Industrial applications of time-domain NMR; **6.** Calibration and data analysis basics; **7.** TD-NMR for semi-solid and solid materials (MSE pulse sequence); **8.** Applications in food, agriculture, and petroleum; **9.** Signal processing: Fourier Transform (FT) and Inverse Laplace Transform (ILT); **10.** Practical session: data processing using OriginLab.

REFERENCES: [1] Blümich, B., Haber-Pohlmeier, S., Zia, W.; Compact NMR, ISBN: 9783110266283, 2014. Blümich, B.: Introduction to compact NMR: A review of methods, TrAC-Trend. Anal. Chem., 83, 2-11, 2016. https://doi.org/10.1016/j.trac.2015.12.012 [2] Moraes, T.B.; Colnago, L.A.; Noninvasive Analyses of Food Products Using Low-field Time-domain NMR: A Review of Relaxometry Methods, Brazilian Journal of Physics, v.52, 43 (2022). https://link.springer.com/article/10.1007/s13538-022-01055-1 [3] Moraes, T.B. et al.; An open-access WebApp for inverse Laplace transform analysis of time-domain nuclear magnetic resonance signals, Magnetic Resonance, Vol. 7, p. 39-51, 2026. https://doi.org/ 10.5194/mr-7-39-2026

PROYECTO: DEVELANDO LA REOLOGÍA DE LA GOMA XANTANA RETICULADA EN SOLUCIÓN POR ESPECTROSCOPÍA DE RMN EN ALTA RESOLUCIÓN Y EN EL DOMINIO DEL TIEMPO (CONTRATO N° PE501094368-2025)