Subject **SURP on Time-Dependent Schroedinger Equation**
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Dear Waqar, Samyak, and Siddhant,

A warm welcome to the SURP project on the time-dependent Schroedinger equation (TDSE).

There are various types of problems one can attack in this broad field. For example, the following freely downloadable papers discuss the numerical solutions of the TDSE for some well-known systems:

http://www.scielo.org.mx/pdf/rmfe/v54n2/v54n2a3.pdf

https://www.diva-portal.org/smash/get/diva2:935561/FULLTEXT01.pdf

https://www.scd.stfc.ac.uk/SiteAssets/Pages/Solving-the-TDSE/Solving%20the%20TDSE%20.pdf

https://arxiv.org/pdf/quant-ph/0009015.pdf

If you wish, you can start with the first paper, and write python (or whatever language you are comfortable with) programs corresponding to the theory discussed there.

Then there are is another approach based upon time-evolution operator using which also we can solve the TDSE for various systems. You can read about the time evolution operator from some Qmech textbook, or from my handwritten notes:

http://home.iitb.ac.in/%7Eshukla/quant_chap4.pdf

You need to read pages 28-32 of these notes. Based upon this method, one can handle systems with time-periodic Hamiltonians, employing the so-called Floquet approach outlined in this paper:

https://arxiv.org/pdf/1510.09042.pdf

But read this paper only after building your background on time-evolution operators.

I expect weekly updates from you in which you can summarize what you learned in that week. If needed we can also meet on zoom etc. to clarify issues. If you are able to read and understand these papers during SURP, we can think of extending the outlined approaches to research-level problems.

Talking of research, once you have the right background, try to learn about Landau-Zener Hamiltonian by doing an internet literature survey.

By the way, you can find my scanned Qmech-1 notes on the URL:

http://home.iitb.ac.in/%7Eshukla/qm1_syllabus.xhtml

You can use them also to build your background if needed.

best wishes

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