2.[a] Impact Teaching(page-2-)/Research(page-3-onwards)

http://aravamudhan-s.ucoz.com/saravamudhan44/ugc_inno_proposal_m.html

3. Specify objectives and goal to be achieved, wilh its impact on teaching, research or both.

As specified in the (may be found enclosed) Attached Additional Sheet AAS # 1

CLICK HERE to download AAS#1

AAS #1

Magnetic Resonance Phenomena provides a unique context for understanding the application of Quantum Mechanical Formalisms with the spin Hamiltonians and the spin-state wave functions since the early descriptions of the phenomena can be introduced with classical vector pictures and equations obtainable from the considerations of motions of classical bodies and magnets. The specific reasons - as to where and why the quantum mechanical descriptions become inevitable - throw a great deal of light into the realms of applicability of quantum and classical descriptions.

The mathematical prerequisites are much more elementary than what the students usually contend it to be and it is necessary, at least in the case of students who specifically seem to hold the bias of not opting for mathematics, but opt for subjects which do not titled explicitly in mathematical terms. This trend leads them invariably to the ordeal of trying to use much less straightforward approach while having to apply mathematical procedures, which learnt, as a revision of elementary level mathematics would be much simpler.

*This required **elementary revision,** (even though a few talented teachers can venture into), **finds obviously, a description** as follows. That, it is a strange way of handling the subject matter and not many in such contexts seem capable of supporting since magnetic resonance itself is a much more recent and advanced technique which is being encapsulated for application without having to learn too much about the phenomena and its descriptions. This usefulness makes the students not well appreciate what they are not able to use of this technique. Hence an exclusive effort of the sort of innovative program is worth giving a try at the North Eastern Hill University , Shillong*

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AAS #4

*This is an effort in trying to illustrate that what is being considered as a stringent requirement and formidable. For the students with **insufficient background it can possibly be made simpler, and show that what is required is a simple revision of elementary aspects** already taught at lower levels but are not covered at all the intermediate levels with the required emphasis on revision since the main title gets importance only at relatively higher level of the Curriculum.*

During the process of implementing this project, particularly *because of the experiences gained while trying to appoint a staff in the project*, the necessity as described below could be discerned. It was found necessary to work out a durable curricular content for a graduate programs, that would be appropriate and compatible with the average student level, so as to impart a capability to gain the technical know-how for using the Magnetic Resonance Spectroscopy at such a rate that is commensurate with the rapidly advancing technological provisions for the utilization. A considerable progress has been made in this direction, and the course-curricular structure drafted out by this PI under the frame work of the INNOVATIVE PROGRAMME of the University Grants Commission has been reviewed by an Expert committee of the UGC and found adequate for a PG level course on Magnetic Resonance Spectroscopic Technique.

"Magnetic Resonance Phenomena provides a unique context for understanding the application of Quantum Mechanical Formalisms with the spin Hamiltonians and the spin-state wave functions since the early descriptions of the phenomena can be introduced with classical vector pictures and equations obtainable from the considerations of motions of classical bodies and magnets"

1) By Spin-Hamiltonian, the operator form of the Classical angular momentum vectors are to be appreciated. Thus, it is necessary to reemphasize the Classical Vector description and the QM Operator analogues while introducing the Vector Model of the atom while dealing with the atomic structure descriptions in the early stages of QM courses. Most of what is required in the Chemical context (as different in the spectroscopy discussions, Magnetic resonance in particular) is the single spin description of what is coupling of angular moments and what really is meant by interacting angular moments (spin-spin or spin-orbit). By making out a definition from the conventional way the term interaction results in consequences, it must be made clear to the learners that an interaction of the Spin and orbital angular momentum arises because of the inevitably associated magnetic moments related to the angular moments. In addition, the quantization rules are stipulated only in terms of the magnitudes and components of angular moments. The simple fact that the angular momentum magnitudes are related to the associated magnetic moments by well-defined rules, most of is that the angular moments are related to their associated magnetic moments by universal constants of proportionality. Thus, it becomes possible to describe interactions in terms of the angular moments taking for granted the relations available to relate the angular moments with the magnetic moments. This aspect deserves a much greater emphasis in curriculum stipulations and course contents than what is prevailing particularly at the Bachelor's degree levels if not in School curriculum. A persistent effort can bring about a perceptible change in quality when it comes to grasping advances in chemistry, which owes a lot to the way the roles of angular momentum is employed for interpretations. In the context of general chemistry, the single spin descriptions with due importance for not only the conventional z-components, but also what should be the disposition of x, y components with regard to interacting and non-interacting angular moments (Contents of NSC12 http://aravamudhan-s.ucoz.com/symposia_2009_2010.html display Sheets 8 to 12 http://aravamudhan-s.ucoz.com/NSC12_Aravamudhan.doc). Whenever the energy of interactions (for coupled angular moments) is expressed, it should be emphasized that the associated magnetic moment interaction should be evident.

2) As for as spectroscopic discussions are concerned, there must be considerations of ensemble of angular moments / spins, the Magnetization for example as a result of the individual spin moments, and the time evolution of the ensemble property with due awareness of what happens at the individual spin / orbital moment level has to be included to make the subject matter easier at the higher educational levels. Trying to build up the teaching materials from this elementary level while teaching advanced spectroscopic aspects invariably leaves the delivery of the material partial only at several stages, and this causes impediments in the progress both to the teacher and the taught. This led to a conclusion at some stages that leaving the use of the advanced technique to what only gets to know from the prevailing state of the art in particular research group, rather than motivating the users to avail the full potential. This has been resulting in the conflicts that was encountered while teaching chemistry effectively and required an out-of-the-way innovative approach for preparing and teaching materials to find an alternate effective ways, whenever an opportunity enabled the displaying of such materials. This amounted to, at a certain stage, teaching of the subject matter redundant or unnecessary exercise, thus pointing out the importance of trying to find ways and means for effective percolation of the essential requirements to the much earlier stages of education. At the higher levels, such a background can be consolidated by pointing out the advances as mere consequences of the elementary aspects. It gives also ample time while teaching, at advanced levels, to show how the technological progress has aided the understanding of the basic science to the extent of making possible otherwise not so easy experiments.

The current advances in spectroscopic techniques, to be grasped, require ever-growing awareness that experiments are carried out on bulk materials and inferences are as if it is all a reflection of only the presence of a single molecule. The technology has furnished such sensitivity enhancements and expanding for greater details, that this fact about the single-molecule to bulk material and the converse of it must be adequately stressed in the early education levels that it does not require much emphatic mention at the higher levels. Then, curriculum content can be delivered much more effectively as the students' progress from one stage to higher stages. The mention of the state of theory, that mostly it is on isolated molecular procedures unless further developments provide for including the influence of the near neighbors and the bulk continuum. Once again due importance must be attached to the fact that discreteness and continuum within matter gets only a qualitative demarcation; setting quantitative boundary conditions requires a careful assessment of what gets included, and what does not for consideration.