UGC, Please Do The Math

New undergraduate curriculum on mathematics is neither up to date with advances in the subject nor does it do justice to the serious mathematics of ancient India

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The undergraduate curriculum of Indian universities is going through a significant overhaul, in which a battered system is sought to be replaced by one whose packaging is colourful and glossy. The outer box is covered with slogans in bold: "learning outcome based", "goal-oriented", "application-based learning", "interdisciplinary relevance", "designed to empower students".

Students who study this curriculum for four years are promised to be fit for careers in education, research, software, banking, insurance, policy or anything else that takes their fancy. It is implicit in these declarations that earlier systems have not delivered on these fronts.

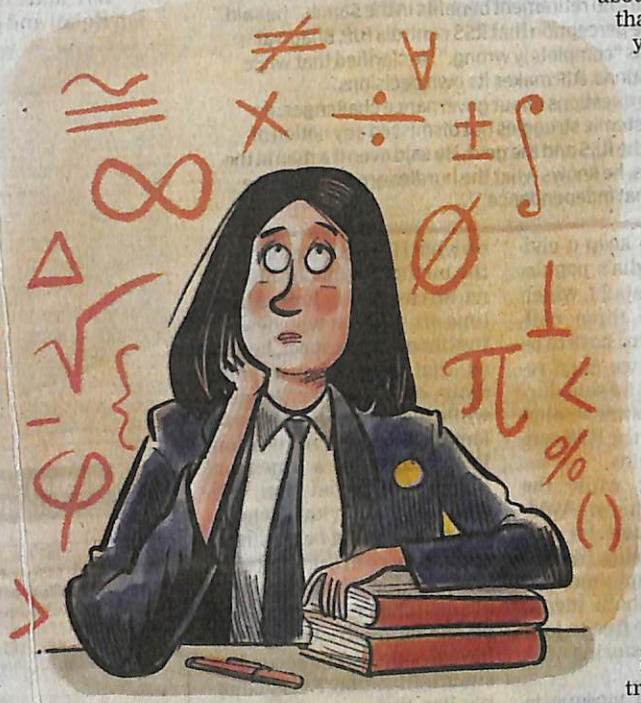
There is no review of the earlier goals and achievements and thus it is implied that there were none worth noting. This is surprising to those of us who were fortunate to study in an affordable and good Indian institution and later found that our education was at par with the best in the world.

Just this week, University Grants Commission has released the draft curricula for a host of subjects. I shall focus on the one for Mathematics, which seems to have been given the same close attention that was earlier bestowed on History.

For context, let us recall that the National Education Policy of 2020 extended the three-year undergraduate programmes to four years. The extra year was intended to make the student fit for a wider variety of career options, especially for going directly into jobs or into PhD programmes, without the necessity of a Master's degree. Indeed, the possibility of going directly for a PhD in US has been one of the key benefits that has been highlighted by NEP proponents.

How does the actual curriculum fare when tested against these goals? The core or compulsory part of the curriculum turns out to be quite old-fashioned. It has courses on analytic geometry and mechanics that were considered obsolete 30 years ago, and whose prescribed textbooks were first published in years like 1910 and 1922!

Such inclusions result in less space for more relevant mathematics. The core portion short-changes both the 'pure mathematics' that is needed for research and the 'applied mathematics' that takes a student towards a job in industry. For example, probability and statistics get a single course, as do algebra and real analysis, while programming and numerical methods are missing. The arrangement of the courses, especially the late placement of the crucial course on real analysis, ensures that the emphasis will be on memorising methods rather than on understanding them.



Uday Deb

The extolled 'learning objectives' turn out to be a bit of a sham. They are at best summaries of the syllabi and often they are entirely meaningless. The only objective given for studying complex analysis is "to prepare the students to take up courses on Advanced Complex Analysis". Shall we laugh, or cry?

One would hope that the faults of the core curriculum would be compensated by a good choice of elective courses that would help the student specialise in a desired direction. While some of the missing core courses do show up as electives, the obsession with promoting 'Indian Knowledge Systems' comes into play here.

The required diversity is sacrificed to give over one-third of the slots to courses on Indian mathematics, mostly of ancient times. It is quite possible that a graduating student would know a fair bit about ancient Indian mathematics but very little about modern mathematics, where their education would end at about the late 19th or early 20th century. The truth is that tomorrow's students will be worse off after four years than earlier ones were after three.

The syllabi of the courses on Indian mathematics do not suggest that the topic would be studied with due regard to the concerns of history, such as reliability of sources, communication between cultures, or the interaction with social structures. Instead, the syllabi are lists of methods to be learnt, which will surely become drudgery.

At least two courses promote so-called 'Vedic mathematics', which is a creation of the mid-20th century and has no relation with the serious mathematics of earlier Indians. It is a collection of tricks for speeding up certain elementary calculations. It can be a fun activity in middle school but is entirely out of place in a university curriculum.

While students of mathematics are being deprived of a serious study of their subject, non-mathematicians who wish to benefit from mathematics are also bereft. They are provided with courses bearing names such as "Mathematics for Life Sciences" and "Mathematics for Meditation". It is claimed that most of these can be studied by anyone having "a basic knowledge of mathematics". Either this description stretches facts, or these courses will be mathematically trivial.

It is notable that the Mathematics curriculum document omits the affiliations of the committee members, except for the chair. One of them is associated with books on 'Vedic mathematics' and these are included in the recommended texts. It is clear that the committee has been selected and encouraged to promote 'Indian Knowledge Systems' rather than mathematics and has delivered on this goal. While we may glory in our mathematical past, we have to fear for its future.

The writer is professor of mathematics at Shiv Nadar University. Views are personal