Theme paper for syllabus revision: M.Sc. in Bioinformatics

Introduction

Any good university strives to make the syllabus of its academic programs relevant and contemporary. This is particularly true of a relatively young and emerging discipline like Bioinformatics. The M.Sc. program in bioinformatics has been started from the academic year 2002-03. The syllabus initially drafted in 2002 was subsequently revised twice. The latest revision was effected in June 2006 and is currently being taught to the first year M.Sc. students admitted in July 2006. Every time the syllabus of the different courses was revised, the Bioinformatics Center made sure to take into account the opinion of the teachers who taught the courses, improvements suggested by experts in the field , emerging needs in the associated industry as well as feedback from the students. This approach has definitely contributed to the elevation of the curriculum to standards comparable to that of reputed universities outside India.
This time also we have undertaken to revise the syllabus of our M.Sc. courses with the same spirit and philosophy.

Objectives of the course :

1. To design remedial courses in biology and mathematics to students coming from the mathematics and biology streams respectively in the bachelor's degree.

2. To equip the students with the requisite background in areas of modern biology (biochemistry, cell biology, genetics and molecular biology) and computer science (programming languages, databases, algorithms, graphics, data mining, data security etc.).

3. To launch the students into core areas of Bioinformatics like multiple sequence alignment, phylogenetic trees, genomics, proteomics etc.

4. To explore the students to applied areas of Bioinformatics like drug design, metabolic pathway engineering etc.

5. To provide practical experience to students by giving them an opportunity to pursue project work in an identified area of Bioinformatics.

6. In short the objective is to balance the Practical with theory and blend the contemporary teaching with the basic knowledge. As the subject is interdisciplinary and ever evolving the team of experts and the faculties (members of BOS) always try to optimize the syllabus keeping the students ability and performance in mind.

Reorientation of the present syllabus and proposed improvements

The present syllabus is the product of several revisions in the past, which endeavored to achieve the objectives outlined above. Considering the fact that the syllabus currently being followed in the Center is the product of revision only one year back, the changes/modifications expected to be introduced are only a few. Nevertheless, we ourselves have noticed a couple of lacunae, which are indicated below, and efforts will be made to eliminate them.

1. While the guidelines given by the university stipulate a maximum of 40 credits out of the total of 100 for laboratory courses, more hands-on experience is necessary for the students in a subject like bioinformatics and hence we would like to increase the practical component up to 50 credits. In the existing syllabus, the total credits are prescribed for several T+P courses (BIM 103, 106, 107, 108,109(onlyP) 203, 204, 205,206,207&208(onlyP), 301, 302,303, 306, 307 ,308(onlyP)and 401), but the credits have not been specified for the theory and practical components. While the 16 credits assigned for project work in the previous syllabus (BIM 310P: 4 credits and BIM 405P: 12 credits) were identified as lab work, it is shown as a theory course (BIM 404T:16 credits) in the current syllabus. These discrepancies should be corrected now.
   Hence mentioning separately the credits for **Practicals it will produce in total : 50 credits.**

2. In the feedback collected in December 2006, the students have opined that certain courses like BIM 102T (Basic Mathematics, 2 credits) and BIM 105T (Genetic Information Flow and Processing, 3 credits) are very exhaustive. There is also a suggestion from the students that mostly parasite biology is being taught in BIM 304T (Parasite Bioinformatics, 2 credits) and what little parasite bioinformatics is taught is a repetition of what is taught in BIM 303T (Comparative Genomics and Proteomics). Expert opinion would be sought on these matters and changes be made if necessary for shortening the BIM 102T and re-organizing the BIM304 and BIM303 T.
3. In addition to involving the academicians in syllabus revision, it is also important that the syllabus be given a vocational bias and in this regard it might be pertinent to seek the views of the industry while framing the curriculum. The staffs from the organizations like Persistent Systems Ltd, Astrazeneca R&D & Jubilant Biosys, which have been recruiting the products of our Center on a regular basis, are on our visiting teachers list and they do suggest to modify/elaborate certain part of our curriculum so that it gets the benefit from both academia and industry. Under their guidance “Genome to Drug & Vaccine” (BIM302), “Chemoinformatics” (BIM 203) and “Metabolomes & Metabolic Pathway Engineering” (BIM402) courses have been developed and emphasized.

4. The course named Emerging Area in Bioinformatics (2 credit) provides the faculties a means to cultivate the new idea and technology in the Bioinformatics teaching of the students. More innovative ideas could be explored to make the students oriented towards the new invention/techniques and exploratory ideas.

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The following table identifies the focal areas of biology, information technology and their interface, which would provide wholesome exposure of Bioinformatics to the students at the M.Sc. level.

Course	Practical skills/ applications
1. Biochemistry, Genetics cell biology, molecular biology, structural biology	Pre-requisites for students to gain the necessary background in biology
2. Concepts in computing, Database Systems, Programming in C, Perl and object oriented languages, computer graphics, Data structures, data mining, data integration and security	Provides the students with the concepts in computer fundamentals and programming and the necessary tools for data retrieval and analysis.
3. Chemoinformatics, Taxonomy and phylogeny, Immunoinformatics, Parasite Bioinformatics, comparative genomics and proteomics	Explore students to core areas in Bioinformatics
4. Genome to drug and vaccine, metabolic pathway engineering.	Deal with applications of Bioinformatics
5. Advanced Techniques, emerging areas in Bioinformatics and seminars	Enable the student to keep abreast of latest developments in Bioinformatics
6. Project work	Gives an opportunity to the student to apply the knowledge gained in the above courses for carrying out a short research project.