Department of Mathematics

I. I. T. Bombay

FINAL DRAFT OF
THE PROPOSAL FOR B.TECH. IN MATHEMATICS AND COMPUTING

CONVENER: *A. R. SHASTRI*

3RD DECEMBER 2007

Contents

REVISED ON: 7TH MARCH 2008 AFTER UGPC FEEDBACK AND MEETINGS WITH THE DEAN AP

1. Introduction/Preamble

A committee consisting of the following members was appointed by the Head, Department of Mathematics on **14th August 2006,** to prepare a proposal to start **B.Tech./M.Tech./M. Sc. integrated** programmes in **Mathematics and Computing** :

1. Prof A. R. Shastri (Convener),
2. Prof. S. B. Patkar (Member),
3. Prof. Milind Sohoni (Member),
4. Prof. G. K. Srinivasan (Member),
5. Prof. K. Sureshkumar (Member)

Subsequently, on 4th May 2007, the following two members were included in order to facilitate its functioning:

6. Prof. M. K. Srinivasan
7. Prof. T. J. Puthenpurakkal.

The terms and references

The committee should take into account the following points:

1. optimal use of resources,
2. better focus and cohesiveness, and
3. proper sequencing of courses.

Several rounds of meetings, presentations to DUGC and to the Department Faculty have been held to discuss all aspects of this proposal including the title of the proposal.

In the DFM meeting held on 4th May 2007, it was decided that the department should concentrate on offering only the **B.Tech. programme in Mathematics and Computing.** Subsequently, the committee was directed to prepare proposal only for the B. Tech. Programme. The present form of the proposal incorporates the suggestions by DUGC as approved/modified by the DFM held on 19th Nov. 2007.

2. Justification for introducing new Programme

The use of mathematics is ever increasing day-by-day in every applied science. So is the complexity of mathematical theories and results that are being used so that often people who have to use mathematics find it more and more difficult to keep their knowledge of mathematics up-to-date. On the other hand, mathematicians per se, are often unaware/unwilling or unable to cope with the applications. As a consequence, there is a growing need of mathematicians who are well exposed to select applied areas such as engineering, finance and natural bio-sciences.

The proposed B.Tech. program aims to produce such experts who can play fruitful role in industries as well as in academia.

Thematically similar programmes have been introduced at several foreign universities as well as sisterly concerns in India. We are somewhat late in coming up with proposal. We hope the delay has been compensated in terms of quality since we have benefited from the experience of these institutes.

Students will be admitted to these programme(s) through JEE, the initial intake being 20 students each year.

PROGRAM OBJECTIVES

(1) To train students in all the fundamentals of Mathematics and Computer Science with emphasis on features common to both disciplines.

(2) To impart the training in such a way that graduates are able to take up jobs in academia and industry or pursue higher studies. **In particular, a graduate from this programme is expected to be able to provide a viable interface between engineers and mathematicians.**

3. Feedback/Comments from the Industry/Employment Prospectus

We have been constantly in touch with the industry through our placement programme, alumni, personal contacts, comments made by industrialists at national forums, press etc. We are confident that the graduates from this programme will be welcomed by the following segments of industries:

(1) Quantitative/Computational/Mathematical Finance:
* Investment Banks, Consulting Firms etc.

(2) Optimization and Operations Research:
* Management Consultancy Firms, In-house R&D of various large scale industries etc.

(3) Information Technology:
* Software Development Firms, In-house IT departments, Scientific Computing Software Development etc.

(4) Data Analysis (Statistical Analytics):
* Consultancy and Analytics Firms, Banks, Pharma Industries etc.

(5) Signal Processing, Image Processing, Computer Vision:
* Defense R&D Organizations, Geological R&D, Geometrical Software Solutions Provider, CAD (Computer Aided Design) industries etc.

(6) R & D sector (both corporate and government):

(7) Aerospace industries.

Moreover, every now and then we come up with students who take up other engineering career options out of peer/parental pressures despite their strong inclination to Mathematics. We hope that this programme is a viable go-between choice for such students who may ultimately become future engineering faculty with strong Mathematical background.

4. Feedback/comments from the Associated departments

As there is a visible dependence on the department of CSE, one faculty member from CSE was appointed as a member of this committee right from its inception. Another member is presently with the EE department, who willingly continues to teach courses for our students. So, dependence/help from EE department is taken for granted. We are having a continual dialog with the faculty in CSE. We have taken into account interim feed-backs from the DUGC of CSE as well. Our proposals have gone through several rounds of revisions based on these dialogs. At this stage, the role of CSE is in offering the minimal required help of teaching the following courses which make up one of the most essential component of the programme:

1. **Abstractions and Paradigms -6**
2. **Paradigm Lab-3**
3. **Data Structure and Algorithm-6**
4. **Data Structure Lab -3**
5. **Logic Designs-6**
6. **Logic Design Lab 3**

Each of these courses have been put in the respective semesters as they occur in the proposed curriculum of CSE department.

5. Credit Structure at a Glance

Credit Structure of entire (8 Semesters) at a Glance

Institute Requirements				Departmental Requirements				Total Credits
Semesters	Basic Science and Mathematics	Engineering Sciences	Electives/ HSS	Core Theory	Lab	Electives	Supervised Learning	
I	17	11/10	6					34/33
II	17	10/11		6	3			36/37
III		12		14	3			29
IV	6+6			14	3			29
V				32				32
VI				24		12		36
VII			6+6	6		12		30
VIII			6	8		12		26
Total	46	33	24	104	9	36		252

However, the minimum number of credits required for this Minimum programme is:

(Institute)103+(Department) 147 =250

The table shows 252 points. There are 6 electives in the department component out of which four of them are FREE ELECTIVES. It is possible to opt for 8 credit electives instead of 6 credit ones. Then a student may cover exactly 250 points even by doing one less free elective. Similarly, it is possible to cover 280+ points with only three free electives and four honors electives (along with other mandatory courses).

6. Semesterwise Detailed Course Requirements

Structure Tables

B. Tech. in Mathematics & Computing

Table-I-Common to all Students

I Year: Total Credits: 70

Semester-I					
Code	Name	L	T	P	C
MA105	Calculus	3	1	0	8
CS101	Com. Pr.& Util.	2	0	2	6
CH101/ PH101	Chemistry-I/ OR Physics-I	2	1	0	6
CH/PH115	Chem/Ph.-Lab	0	0	3	3
HS101	Economics	3	0	0	6
ME111/ ME118	Workshop Pract. OR Eng. Gra.	0 1	.5 0	3 3	4 5
	Total				33/34

Semester-II					
Code	Name	L	T	P	C
MA106	Linear algebra	3	1	0	4
MA108	Diff.Equa-I	3	1	0	4
PH101/ CH101	Physics-I OR Chemistry-I	2	1	0	6
PH/CH115	Phy/Chem. Lab	0	0	3	3
XX102	Data Anal. and Int.	2	1	0	6
ME118/ ME111	Engg. Gra. OR Workshop Prac.	1 0	0 .5	3 3	5 4
CS152	Abstr. & Para.(DIC)	2	1	0	6
CS154	Paradigm Lab	0	0	3	3
	Total				38/37

II- Year Total credits:58

Abbr. FE=Free Elective

Semester-III					
Code	Name	L	T	P	C
EE101	Intro. EEC	3	1	0	8
XX115	Exp. and Meas. Lab	0	.5	3	4
CS213	Data Str. and Algor.	3	0	0	6
CS293	D.S Lab	0	0	3	3
MA405	Basic Algebra	3	0	1	8
	Total				29

Semester-IV					
Code	Name	L	T	P	C
SI412	Algorithms	3	1	0	8
CS???	Logic Des.	3	0	0	6
CS???	Logic Design Lab	0	0	3	3
ES403	Envirn. Studies/FE-I	3	0	0	6
PH102	Physics-II/FE-I	2	1	0	6
	Total				29

B. Tech. in Mathematics & Computing

Minimum Programme (Continued)

III Year : Total Credits 68

Semester-V					
Code	Name	L	T	P	C
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI407	Intro. Probability	3	1	0	8
	Total				32

Semester-VI					
Code	Name	L	T	P	C
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
MA214	Intro. Numerical Anal.	3	1	0	8
	ES403/PH-II/FE-I	2	1	0	6
	FE-II	2	1	0	6
	Total				36

IV-Year: Total Credits 56

Semester: VII					
Code	Name	L	T	P	C
HSS102	Socio./Psych./Lit./Phil.	2	1	0	6
SI413	Combinatorics	2	1	0	6
	Free Elective -III	2	1	0	6
	Dept. Elective -I	2	1	0	6
	Inst. Ele.-I	2	1	0	6
	Total				30

Semester: VIII					
Code	Name	L	T	P	C
New	Matrix Computation	3	0	2	8
	Free Elective-IV	2	1	0	6
	Dept. Elective-II	2	1	0	6
	Inst. Ele-II				6
	Total				26

Grand Total: 70+58+68+56=252

Structure Details

(1) In the first two semesters, students will do most of the courses common to all B.Tech. students exactly as implemented part of Biswas committee recommendations during this academic year. Note that the DIC for this programme is Abstractions and Paradigms(DIC).

(2) From III-IV-semester, along with several Institute requirements, the student must clear certain basic courses (Data structure and Logic Design).

(3) A student interested in acquiring honors/minors has to over-load preferably from III-semester onwards, spreading out the load of 30 credits over the remaining 6 semesters. These 30 credits may be earned through additional courses with an option to earn 6-12 credits through supervised

learning within the department. The minimum for Minimum Programme being **250 credits**, the minimum for Honors/minor is **280 credits**.

(4) Form IV-semester onwards, the plan offers the student an important freedom in the form of four FREE ELECTIVES (FE), which if appropriately utilised would help in strengthening the programme in a direction of students choice. For instance, in the IV semester, a student who would like to go for honors does well by post-poning the FE-I, whereas a student who would like to go for minors in a particular discipline may opt for an additional course in that discipline as her FE-I by post-poning ES course or Ph-II. Moreover, a student who just wants to spread his knowledge base wider can use all her FE's across various disciplines in the Institute. **See scheme tables for such likely choices.**

(5) However, it should be noted that **most** of the courses mandatory for all B.Tech. students will be cleared by the end of IV-semester.

(6) The total number of credits for the minimum programme may vary in the range 250-260 depending on the specific choice of electives, since some of the math. electives carry 8 credits.

(7) **Distribution of Credits:**

Institute Requirement (103 credits)			**Departmental Requirement**		
(i)	Mathematics and Computer Sc.	**22**	(i)	Core theory	**104**
(ii)	Other Scs. and Engineering Sc.	**67**	(ii)	Lab	**9**
(iii)	Humanities	**12**	(iii)	Department Electives	**12**
(iv)	Institute Elective	**12**	(iv)	Free Electives	**22-24**
	Total	**103**		Total	**147-149**

The above table shows that even if a student chooses to do all the four free electives outside the discipline she would have covered 22+104+9+12=147 credits directly concerned with the discipline which is more than 50% of the total credit requirement.

(8) It is possible to reduce the number of actual Free Electives courses, keeping total minimum of 24 credits by choosing courses with 8 credits especially in the department of Mathematics and CSE. Thus a student may be able to earn her minimum 250 by going through 3 free electives only.

(9) It is advised that a student draws up a scheme similar to one of these examples at the end of the II semester with the guidance of Faculty Adviser. She would still have some freedom to make changes in her scheme at the end of IV semester.

7. Additional Credit requirement from B. Tech. (Honors) or B.Tech. minor(s)

(1) As per Viswas Committee recommendation, a student who acquires 30 additional credits from the parent department (in this case, Mathematics Department) courses above the common minimum gets an honors degree. If the additional 30 points are from a single department other than the

parent department she gets a minor degree from the department. A student is allowed to acquire even two minor degrees from two different departments or one honors and a minor degree.

(2) A student interested in acquiring honors/minors has to **over-load preferably from III-semester onwards,** spreading out the load of 30 credits over the remaining 6 semesters.

(3) An honors student has the **option** to earn 6-12-credits through supervised learning within the department in lieu of course-work of same weight-age. This is exercised by opting for a seminar course during VII semester (6 credits). Subject to satisfactory perfomance (supervisor to decide), she may be allowed to continue for the project during VIII semester (6 credits). The onus of finding a willing supervisor is on the student.

(4) Since the Minimum Programme is of **250 credits**, the minimum for Honors/minor is of **280 credits**.

(5) A few examples of likely coherent schemes for both Minimum and Honours programmes are included in Scheme Tables. In each of the examples the students end up acquiring slightly more than the minimum required points.

(6) **Programme with a minor:** The student should acquire 30 credits over and above the 250 required for the minimum programme through courses from other disciplines. For this purpose, **courses from CSE are not allowed. However, courses from our own ASI are allowed. These**

(7) **Programme with honors and a minor** A student in this programme should be allowed to do one extra courses each semester from III semester itself over and above the student with a honors programme only so as to acquire extra 30 credits under minor and 30 credits under honors.

(8) All these students should preferably make a tentative plan for the entire programme at the ent of II semester in consultation with the Faculty advisor and spread the extra loads evenly and meaningfully throughout the remaining 6 semesters. The Scheme Tables of some examples of such choices have been included at the end of this document.

8. Course Content

Four new courses have been proposed especially for this programme. The proposed contents for them have been included in the appendix. The contents of all other courses are already available in various bulletins and on department websites.

9. Lists of Courses

1. List of Core Courses

ODD SEMESTER			EVEN SEMESTER		
MA105	Calculus	8	MA106	Linear Algebra	4
CH101	Chemistry-I	6	MA108	Diff. Equations	4
CH115	Chemistry Lab.	3	HSS102	Socio/Psycho/Lit./Philo.	6
PH101	Physics-I	6	CH101	Chemistry-I	6
PH115	Physics-Lab	3	CH115	Chemistry Lab.	3
PH102	Physics-II	6	PH101	Physics-I	6
CS101	Comp. Prog. and Util.	6	PH115	Physics-Lab	3
HS101	Economics	6	PH102	Physics-II	6
HSS102	Socio/Psycho/Lit./Philo.	6	XX102	Data Ana. and Appl.	6
ME111	Workshop Practice	5	ME118	Engg. Graphics	5
EE101	Intro. to Elec. and Electronic circuits	8	CS152	Abs. & Paradigms(DIC)	6
XX115	Exp.and Meas.Lab	4	CS154	Abs. & Paradigms Lab	3
CS213	Data Str. and Algorithm and Lab	9	CS???	Logic Design	6
MA405	Basic Algebra	8	CS???	Logic Design Lab	3
MA401	Linear Algebra	8	MA214	Intro. Numerical Analysis	8
MA403	Real Analysis	8	SI412	Algorithms	8
MA417	Ordinary Diff. Equations	8	MA406	General Topology	8
SI407	Intro. Probability	8	SI402	Statistical Inference	8
SI413	Combinatorics	6	ES???	Environmental Studies	6
SI507	Numerical Analysis	8			
MA421	(New)Matrix Computation	8			

Note that we have listed PH101,CH101,HSS102 are listed under both odd and even semesters under the assumption that these courses will be available in both semesters.

2. List of Electives From the Department

Autumn(odd) Semester

From Math Program			From ASI Programme		
MA205	Complex Analysis	4	SI401	Intro.Comp.Arch.& O.S.	6
MA207	Diff. Equations-II	4	SI501	Topics in Th. Computer Sc.	8
MA503	Functional Analysis	8	SI503	Cat. Data Analysis	6
Ma505	Algebra-II	8	SI505	Multivariate Analysis	6
MA515	Partial Differential Equations	8	SI509	Time Series Analysis	6
MA521	Theory of Analytic Functions	6	SI511	Computer Aided Geom. Design	6
MA523	Basic Number Theory	6	SI513	Theory of Sampling	6
MA525	Dynamical Systems	6	SI515	Stat. Techniques in Data Mining	6
MA533	Advanced Probability Theory	6	SI525	Testing of Hypothesis	6
MA539	Spline Theory and Var. Methods	6	SI527	Intro to Derivative Pricing	6
MA581	Elements of Differential Topology	6			

3. List of Electives from the Department

Spring(even) Semester

From Math Programme

MA414	Algebra-I	8
MA408	Measure and Integration	8
MA412	Complex Analysis	8
MA410	Multivariable Calculus	6
MA504	Operators on Hilbert Spaces	6
MA508	Mathematical Methods	6
MA510	Intro. to Algebraic Geometry	6
MA516	Algebraic Topology	6
MA518	Spectral Approximation	6
MA522	Fourier Analysis and Appl.	8
MA524	Algebraic Number Theory	6
MA526	Commutative Algebra	6
MA530	Nonlinear Analysis	6
MA532	Analytic Number Theory	6
MA534	Modern Theory of PDE	6
MA538	Repre. Theory of Finite Groups	6
MA540	Numerical Methods for PDE	6
MA556	Differential Geometry	6
MA562	Math. Theory of Finite Elements	6

From ASI Programme

SI414	Optimization	8
SI422	Applied Stochastic Processes	6
SI418	Adv. Prog and Unix Environ.	6
SI404	Regression Analysis	6
SI508	Network Models	6
SI514	Statistical Modeling	6
SI526	Experimental Designs	6
SI528	Biostatistics	6
SI530	Statistical Quality Control	6
SI532	Statistical Decision Theory	6
SI534	Nonparametric Statistics	6
SI540	Stochastic Programming and Appl.	6
SI542	Math. Theory of Reliability	6

New courses

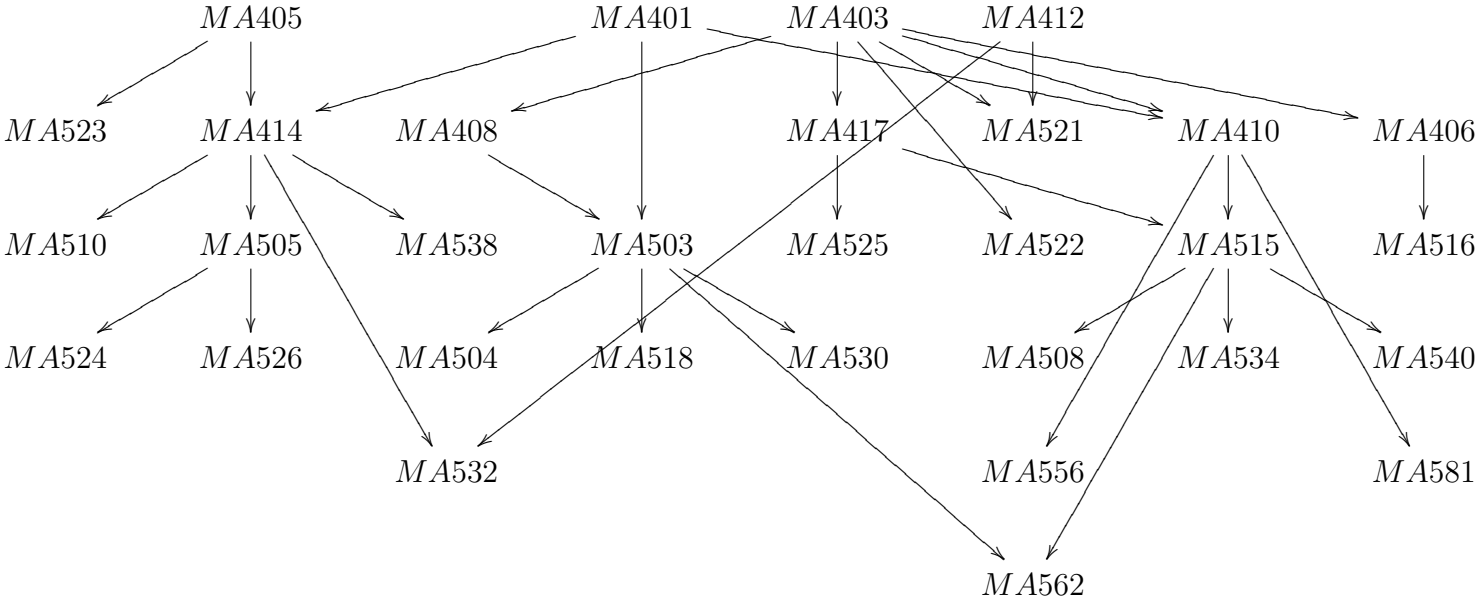
MA426	Matrix Computation	8*
MA422	Introduction to Wavelets	6
MA423	Finite Fields and Coding Theory	6
MA424	Comp. Algebraic Geometry	6

The new courses listed above are being floated especially for this programme though some of them may be recommended for M. Sc. students as well. Of these, only the course on Matrix computation(*) is compulsory.

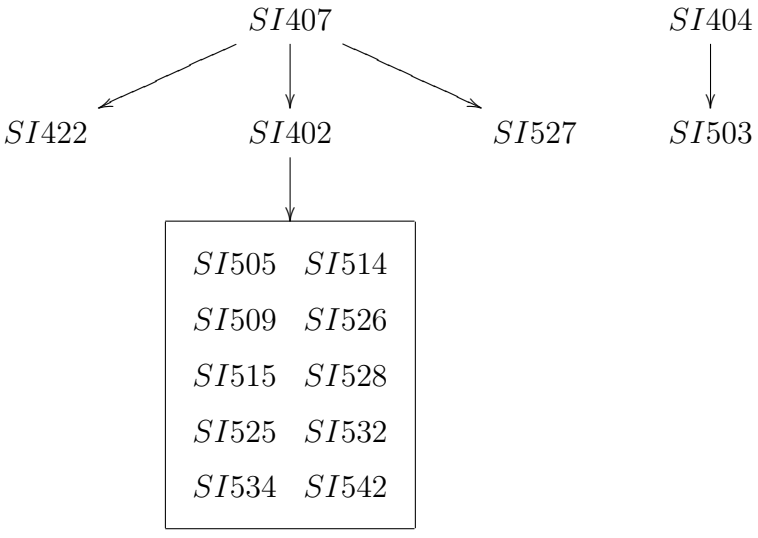
10. Pre-requisite (or Dependence) Tree

PS: Courses which do not appear in this table are neither pre-requisite to some other course nor require any other pre-requisite. If a course X is a prerequisite to a course Y and Y is a prerequisite(or even exposure) to a course Z then X is a pre-requisite to Z.

Courses from Math Programme



Courses from ASI Programme



11. Examples

Scheme-I Minimum Programme

I-year Common plan as on Page 6 Credits:70

II- Year Total credits:58

Code	Name	L	T	P	C
Semester-III					
EE101	Intro. EEC	3	1	0	8
XX115	Exp. and Meas. Lab	0	.5	3	4
CS213	Data Str. and Algor.	3	0	0	6
CS293	D.S Lab	0	0	3	3
MA405	Basic Algebra	3	0	1	8
	Total				29

Code	Name	L	T	P	C
Semester-IV					
SI412	Algorithms	3	1	0	8
CS???	Logic Des.	3	0	0	6
CS???	Logic Design Lab	0	0	3	3
	FE-I	3	0	0	6
PH102	Physics-II	2	1	0	6
	Total				29

III Year : Total Credits 68

Semester-V					
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI407	Intro. Probability	3	1	0	8
	Total				32

Semester-VI					
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
MA214	Intro. Numerical Anal.	3	1	0	8
ES403	Envirn. Studies	2	1	0	6
	FE-II	2	1	0	6
	Total				36

IV-Year: Total Credits 56

Semester: VII					
HSS102	Socio./Psych./Lit./Phil.	2	1	0	6
SI413	Combinatorics	2	1	0	6
	Free Elective -III	2	1	0	6
	Dept. Elective -I	2	1	0	6
	Inst. Ele.-I	2	1	0	6
	Total				30

Semester: VIII					
New	Matrix Computation	3	0	2	8
	Free Elective-IV	2	1	0	6
	Dept. Elective-II	2	1	0	6
	Inst. Ele-II				6
	Total				26

Grand Total: 70+58+68+56=252

In the above scheme, since the student chooses to do FE-I in the III-semester which is most likely not a math course, her choice for math electives later becomes restrictive. On the other hand, (that may be precisely the idea,) she can acquire some basic knowledge of four different disciplines across the Institute or deeper knowledge in one of them, some thing **similar to a minor without overloading herself.**

The next table gives an example in which the student acquires specializtion in within the department without overloading herself. This is possible only because of the freedom exercised properly in IV-semester. Namely, in the first four semesters, the plan is as in the previous table except that in the IV semester, instead of opting to do FE-I she clears the mandatory ES course. The rest of the plan is given below.

III Year : Total Credits 70

Semester-V					
Code	Name	L	T	P	C
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI407	Intro. Probability	3	1	0	8
	Total				32

Semester-VI					
Code	Name	L	T	P	C
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
MA214	Intro. Numerical Anal.	3	1	0	8
SI404	FE-I:Applied Stoch.	2	1	0	6
SI416	FE-II:Optimization	3	1	0	8
	Total				38

IV-Year: Total Credits 58

Semester: VII					
Code	Name	L	T	P	C
HSS102	Socio./Psych./Lit./Phil.	2	1	0	6
SI413	Combinatorics	2	1	0	6
SI401	Intro. C.A. & Os(FE-III)	2	1	0	6
SI501	Topics in Th. Comp. Sc.(DE-I)	3	1	0	8
	Inst. Ele.-I	2	1	0	6
	Total				32

Semester: VIII					
Code	Name	L	T	P	C
New	Matrix Computation	3	0	2	8
SI514	FE-IV Stat. Modeling	2	1	0	6
SI508	DE-II Network Models	2	1	0	6
	Inst. Ele-II				6
	Total				26

Grand Total: 70+58+70+58=256

This student could have actually done one less elective.

Scheme-III Programme with a Minor in ASI

I-year (as on Page) 6 Credits 70

II- Year credits:72

Code	Name	L	T	P	C
Semester-III					
EE101	Intro. EEC	3	1	0	8
XX115	Exp. and Meas. Lab	0	.5	3	4
CS213	Data Str. and Algor.	3	0	0	6
CS293	D.S Lab	0	0	3	3
MA405	Basic Algebra	3	0	1	8
HSS102	Socio./Psych./Lit./Phil.	2	1	0	6
	Total				35

Semester-IV					
Code	Name	L	T	P	C
SI412	Algorithms	3	1	0	8
CS???	Logic Des.	3	0	0	6
CS???	Logic Design Lab	0	0	3	3
ES403	Envirn. Studies	2	1	0	6
PH102	Physics-II	2	1	0	6
MA214	Intro. Numerical Anal.	3	1	0	8
	Total				37

III Year : Credits 74

Semester-V					
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI407	Intro. Probability	3	1	0	8
SI413	Combinatorics	2	1	0	6
	Total				38

Semester-VI					
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
SI422	Applied Stoch. Pro.(FE-I)	2	1	0	6
SI404	Regression Analysis (M-I)	2	1	0	6
SI41	Optization (M-II)	3	1	0	8
	Total				36

IV-Year: Credits 64

Semester: VII					
SI501	Topics in T.C.Sc.(DE-I)	3	1	0	8
SI511	CAGD(FE-III)	2	1	0	6
SI503	Cat. Data Anal.(M-III)	2	1	0	6
SI527	Intro.to Der. Pricing(M-IV)	2	1	0	6
	Inst. Ele.-I	2	1	0	6
	Total				32

Semester: VIII					
New	Matrix Computation	3	0	2	8
SI414	DE-II Optimization	2	1	0	6
SI508	(FE-IV) Network Models	2	1	0	6
SI514	Statistical Modeling (M-V)	2	1	0	6
	Inst. Ele-II				6
	Total				32

Grand Total: 70+72+74+64=280

By choosing a different set of Free Electives, the student can acheive a variety of meaningful combinations.

Example Plan-IV(A) with Honors

I-year (As on page 6) Credits 70

II-year (As on page 16) Credits 72

III Year Credits 70

Code	Name	L	T	P	C
	Semester-V				
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI413	Combinatorics	2	1	0	6
SI407	Intro. Probability	3	1	0	8
	Total				38

Code	Name	L	T	P	C
	Semester-VI				
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
MA412	FE-I: Complex Analysis	3	1	0	8
MA408	HE-I:Measure theory	3	1	0	8
	Total				32

IV-Year Credits 70

	Semester: VII				
MA503	Funct. Anal.(DE-I)	3	1	0	8
MA515	PDE (FE-II)	3	1	0	8
MA521	Th. Anal. Funct.(HE-II)	2	1	0	6
A533	Adv. Prob.(HE-III)/BTP	2	1	0	6
	Inst. Ele.-I	2	1	0	6
	Total				34

	Semester: VIII				
New	Matrix Computation	3	0	2	8
MA522	Fourier Anal. & appl.(DE-II)	3	1	0	8
MA534	Mod.Th. of PDE(HE-III)	2	1	0	6
SI414	Optimization(HE-IV)/BTP	3	1	0	8
	Inst. Ele-II	2	1	0	6
	Total				36

Grand Total: 70+72+70+70=282

Example Plan-IV(B) with Honors

I-year (As on page 6) Credits 70

II-year (As on page 16) Credits 72

III Year Credits 76

Code	Name	L	T	P	C
Semester-V					
MA 403	Real Analysis	3	1	0	8
MA401	Linear Algebra	3	1	0	8
MA417	ODE	3	1	0	8
SI413	Combinatorics	2	1	0	6
SI407	Intro. Probability	3	1	0	8
	Total				38

Code	Name	L	T	P	C
Semester-VI					
MA406	General Topology	3	1	0	8
SI402	Statistical Inference	3	1	0	8
MA412	FE-I: Complex Analysis	3	1	0	8
MA410	FE-II:Multi. Calculus	2	1	0	6
MA414	HE-I:Algebra-I	3	1	0	8
	Total				38

IV-Year: Total Credits 66

Semester: VII					
MA503	Funct. Anal.(DE-I)	3	1	0	8
MA505	Algebra-II(FE-III)	3	1	0	8
MA521	Th. Anal. Fucnt.(HE-II)	2	1	0	6
MA581	Ele. Diff. Top.(HE-III)/BTP	2	1	0	6
	Inst. Ele.-I	2	1	0	6
	Total				34

Semester: VIII					
New	Matrix Computation	3	0	2	8
MA516	Algebraic Top.(DE-II)	2	1	0	6
MA526	Comm. Algebra(HE-IV)	2	1	0	6
MA510	Intro. Alg. Geometry/BTP	2	1	0	6
	Inst. Ele-II				6
	Total				32

Grand Total: 70+72+76+66=284

Ps: Note that in the above example, the student covers 284 points by doing only three electives and four honors, simply by choosong several eight credit courses instead of 6 credit ones.