Course structure for the 5 year integrated M.Sc. programme

1 Course structure for undergraduate students switching after the first year

Code	Course Title	Credits
MA401	Linear Algebra	8
MA403	Real Analysis	8
MA419	Basic Algebra	8
SI419	Combinatorics	6

Semester 3 (Credits = 30)

Code	Course Title	Credits
MA406/412	General Topology/Complex Analysis	8
MA410	Multivariable Calculus	6
MA414	Algebra I	8
MA214	Numerical Analysis	8

Semester 4 (Credits = 30)

Code	Course Title	Credits
SI427	Probability I	8
MA417	Ordinary Differential Equations	8
	Institute Elective 1	6
HS301		6
	Department Elective 1	6

Semester 5 (Credits = 34)

Code	Course Title	Credits
MA406/412	General Topology/Complex Analysis	8
MA408	Measure Theory	8
	Institute Elective 2	6
ES200	Environmental Science	3
HS200	Environmental Science	3
SI404	Applied Stochastic Processes	8

Semester 6 (Credits = 36)

Code	Course Title	Credits
MA503	Functional Analysis	8
MA515	Partial Differential Equations	8
	Department Elective 2	6
	Department Elective 3	6
	Institute Elective 3	6

Semester 7 (Credits = 34)

Code	Course Title	Credits
	Department Elective 4	6
	Department Elective 5	6
	Department Elective 6	6
	Department Elective 7	6
	Institute Elective 4	6
MA 450	Independent study	6

Semester 8 (Credits = 36)

Code	Course Title	Credits
	Advanced Elective 1	6
	Department Elective 8	6
	Department Elective 9	6
	Department Elective 10	6
	Project	12

Semester 9 (Credits = 36)

Code	Course Title	Credits
	Advanced Elective 2	6
	Department Elective 11	6
	Project	18

Semester 10 (Credits = 30)

Total credits for 8 semesters = 264.

Independent Study: The student should pursue a topic of his or her choice for one semester under the supervision of a faculty member. The course is the analogue of the "Seminar" courses that undergraduate students were required to take in previous years. The Independent Study should end with a presentation to the supervising faculty member and the preparation of a brief report of about ten pages.

Department Electives 1 - 11 may include any Department Elective offered or Ph.D. course offered in the relevant semester. The existing departmental rules for prerequisites for these courses will apply.

The Advanced Elective listed in Semesters 9 and 10 must be one of the core Ph.D. courses (that is, not a "Topics" course). These will be courses with numbers MA8xx.

For Semester 9 (Advanced Elective 1): MA 813 (Algebra I), MA 819 (Measure Theory), MA 815 (Differential Topology), MA 817 (Partial Differential Equations), MA 833 (Weak Convergence and Martingale Theory), MA 821 (Theory of Estimation)

For Semester 10 (Advanced Elective 2): MA 812 (Algebra II), MA 814 (Complex Analysis), MA 816 (Algebraic Topology), MA 818 (Partial Differential Equations II), MA 820 (Stochastic Processes), MA 822 (Testing of Hypothesis), MA 824 (Functional Analysis)

2 Course structure for undergraduate students switching after the second year

Eligibility. The department will use its discretion to admit students who apply for a branch- change after their second year. Students will not be admitted after their second year unless they have already completed MA 403 (Real Analysis) and at least one of MA 406 (GeneralTopology), MA 410 (Multivariable calculus), MA 412 (Complex Analysis) or MA 414 (Algebra I). Other criteria, such as performance in these courses, may also be used to determine eligibility.

Code	Course Title	Credits
MA401	Linear Algebra	8
MA417	Ordinary Differential Equations	8
MA419	Basic Algebra	8
SI419	Combinatorics	6
HS301		6

Semester 5 (Credits= 36)

Code	Course Title	Credits
MA406	General Topology	8
MA408	Measure Theory	8
MA410	Multivariable Calculus	6
MA412	Complex Analysis	8
MA414	Algebra I	8
ES200	Environmental Science	3
HS200	Environmental Science	3
SI416	Optimization	8

Semester 6 (Credits =38-40) [See Marks.]

Code	Course Title	Credits
SI427	Probability I	8
MA515	Partial Differential Equations	8
MA503	Functional Analysis	8
	Institute Elective 1	6
	Department Elective 1	6

Semester 7 (Credits= 36)

Code	Course Title	Credits
SI404	Applied Stochastic Processes	8
	Institute Elective 2	6
MA 450	Independent study	6
	Department Elective 2	6
	Department Elective 3	6
	Department Elective 4	6

Semester 8 (Credits=40)

Code	Course Title	Credits
	Advanced Elective 1	**6**
	Department Elective 5	**6**
	Department Elective 6	**6**
	Department Elective 7	**6**
	Project	**12**

Semester 9 (Credits = 36)

Code	Course Title	Credits
	Advanced Elective 2	**6**
	Department Elective 8	**6**
	Department Elective 9	**6**
	Project	**18**

Semester 10 (credits =36)

Total credits for 6 semesters = 220-222.

In Semester 6, it is expected that the student will take 4 out of the 5 MA courses. The credit calculation assumes this.

Independent Study: The student should pursue a topic of his or her choice for one semester under the supervision of a faculty member. The course is the analogue of the "Seminar" courses that undergraduate students were required to take in previous years. The Independent Study should end with a presentation to the supervising faculty member and the preparation of a brief report of about ten pages.

Department Electives 1 - 9 may include any Department Elective offered or Ph.D. course offered in the relevant semester. The existing departmental rules for prerequisites for these courses will apply.

The Advanced Elective listed in Semesters 9 and 10 must be one of the core Ph.D. courses (that is, not a "Topics" course). These will be courses with numbers MA8xx.

For Semester 9 (Advanced Elective 1): MA 813 (Algebra I), MA 819 (Measure Theory), MA 815 (Differential Topology), MA 817 (Partial Differential Equations), MA 833 (Weak Convergence and Martingale Theory), MA 821 (Theory of Estimation)

For Semester 10 (Advanced Elective 2): MA 812 (Algebra II), MA 814 (Complex Analysis), MA 816 (Algebraic Topology), MA 818 (Partial Differential Equations II), MA 820 (Stochastic Processes), MA 822 (Testing of Hypothesis), MA 824 (Functional Analysis)

3 Minimum Requirements

The minimum requirements for students to obtain a 5-year Integrated M.Sc. degree are as follows:

Number of core courses: 2 HSS courses + HSS Environmental Science + CESE Environmental Science + 10 MA courses (excludes MA 1xx courses) = 14.

Compulsory Project in the 5th year.

Number of Credits in core courses (counted as above): 92

Number of credits for the project: 30

Minimum number of Department electives: 9

Minimum no of credits in department electives (including the Advanced Electives):54

Minimum no of Institute electives: 2

Minimum No of credits in institute electives: 12

Minimum No of credits: 330

4 List of Electives

4.1 Odd-semester Electives

1. MA 521 Theory of Analytic Functions
2. MA 523 Basic Number Theory
3. MA 525 Dynamical Systems
4. MA 537 Probability II
5. MA 538 Representation Theory of Finite Groups
6. MA 539 Spline Theory and Variation Methods
7. MA 556 Differential Geometry
8. MA 581 Elements of Differential Topology
9. SI 507 Numerical Analysis
10. MA 5101 Algebra II
11. MA 5103 Algebraic Combinatorics
12. MA 5105 Coding Theory
13. MA 5107 Continuum Mechanics
14. MA 5109 Graph Theory
15. MA 5111 Theory of finite Semigroups
16. MA 5113 Category Theory I
17. MA 5115 Hopf Algebras
18. MA 813 Algebra I
19. MA 819 Measure Theory
20. MA 815 Differential Topology
21. MA 817 Partial Differential Equations I
22. MA 821 Theory of Estimation
23. MA 833 Weak Convergence and Martingale Theory

24. MA 841 Topics in Algebra I
25. MA 843 Topics in Analysis I
26. MA 845 Topics in Combinatorics I
27. MA 847 Topics in Geometry I
28. MA 849 Topics in Topology I
29. MA 851 Topics in Number Theory I
30. MA 853 Topics in Differential Equations I
31. MA 855 Topics in Numerical Analysis I
32. MA 857 Topics in Probability I
33. MA 859 Topics in Statistics I

Even-semester electives

34. MA 504 Operators on Hilbert Spaces
35. MA 510 Introduction to Algebraic Geometry
36. MA 518 Spectral Approximation
37. MA 524 Algebraic Number Theory
38. MA 526 Commutative Algebra
39. MA 528 Hyperplane Arrangements
40. MA 530 Nonlinear Analysis
41. MA 532 Analytic Number Theory
42. MA 534 Modern Theory of PDE
43. MA 540 Numerical Methods for PDE
44. MA 562 Mathematical Theory of Finite Elements
45. SI 416 Optimization
46. SI 527 Introduction to Derivative Pricing
47. MA 5102 Basic Algebraic Topology
48. MA 5104 Hyperbolic Conservation Laws
49. MA 5106 Introduction to Fourier Analysis
50. MA 5108 Lie Groups and Lie Algebras
51. MA 5110 Noncommutative Algebra
52. MA 5112 Introduction to Math. Methods
53. MA 5116 Species and Operads
54. MA 5118 Category Theory II
55. MA 812 Algebra II
56. MA 814 Complex Analysis
57. MA 816 Algebraic Topology

58. MA 818 Partial Differential Equations II
59. MA 820 Stochastic Processes
60. MA 822 Testing of Hypothesis
61. MA 824 FunctionalAnalysis
62. MA 842 Topics in Algebra II
63. MA 844 Topics in Analysis II
64. MA 846 Topics in Combinatorics II
65. MA 848 Topics in Geometry II
66. MA 850 Topics in Topology II
67. MA 852 Topics in Number Theory II
68. MA 854 Topics in Differential Equations II
69. MA 856 Topics in Numerical Analysis II
70. MA 858 Topics in Probability II
71. MA 860 Topics in Statistics II