MATHEMATICS

CORE LEVEL MATHEMATICS

1. The Courses are meant to teach basic concepts of mathematics that are encountered in all areas of science. The courses are also meant to convey some of the exciting ideas that are relevant to mathematics today.
2. The courses should have enough of interest to those who may want to major in Mathematics

MTH-101: SYMMETRY & INFINITESIMAL SYMMETRY (3 credits 36 hrs)

	No. of Lectures
Vectors & matrices; linear equations; groups of matrices, rotations & translations; Vector fields and matrices with function entries; 1st or 2nd order O.D.Es; Algebraic techniques for their solution; gradient divergence and curl.	36

NOTES

This course is in pre-Dedekind, Cauchy, Weierstrass style calculus. Attention is restricted to functions that are "elementary." The material is meant to be challenging but not intimidating. It should draw students toward mathematics. Emphasis **must** be on concrete examples. Where possible the instructor should bring out the need for "more general functions" (as are in M102/M103).

IDC-101: INTRODUCTION TO COMPUTATION (4 credits, 48 hrs)

	No. of Lectures
(Permutation) Finite groups. Counting principles Induction, proofs, propositional and quantified logic, Algorithms, non-numerical algorithms, semi-numerical algorithms, numerical methods.	36

NOTES

1. This course accompanies a lab session as an integral part.
2. The need to analyze algorithms for correctness and complexity should be brought out.
3. The numerical methods should bring out the need for "a priori" analytic proof of convergence.

MTH-102: ANALYSIS IN ONE VARIABLE (REAL & COMPLEX) (3 credits 36 hrs)

	No. of lectures
Sequences, series, limits, differentiation, integration, fundamental theorem of calculus, Taylor series, power series, Fourier series.	36

MTH-201: MULTIVARIABLE CALCULUS (3 credits, 36 hrs)

	No. of Lectures
Partial differentiation, maxima and minima, multiple integrals, path	36

integrals, surface integrals, Gaussian curvature, Cauchy – Riemann equations, Cauchy integral formula, Green, Gauss & Stokes' theorems, Laurent Series. **Notes on MTH-102 & MTH-201:** 1. The material is "standard" calculus and meant to be introductory. 2. Emphasis must be on examples to show why careful definitions are required. 3. Refer to numerical algorithm where possible.	

MTH-202: PROBABILITY, MEASUREMENT, STATISTICS (3 credits, 36 hrs)

	No. of Lectures
The Laws of probability and their similarity to measure, Randomness and entropy. Random walks and Markov processes. Law of large numbers, statistical estimation, various common distributions.	36

Mathematics: Third year course titles

Semester-V		***Semester-VI***	
Subject	**Credits**	**Subject**	**Credits**
Analysis in R^n	5	Complex Analysis	5
Groups, Fields and Number Theory	5	Manifolds & Topology	5
Differential Equations	5	Probability & Measure	5
Elective (non Math)	3	Elective	3
Elective (non Math)	3	Elective (non Math)	3
Seminar	2	Seminar	2

Mathematics: Fourth year course titles

Semester-V			***Semester-VI***		
Subject	**Credits**		**Subject**	**Credits**	
Ring Modules	5	A	Elective (Math)	5	B
Functional Analysis	5	A	Elective (Math)	5	B
Elective (Math)	5	B	Elective (Math)	5	B
Free Elective	3	C	Elective	3	C
Elective (non-math)	3	D	Elective (non-math)	3	D
Seminar/project	3		Seminar/Project	3	

Titles of possible Electives:

1. Unitary Representation of linear Groups.
2. Spectral Theory.
3. Differential Geometry

4. Algebraic Geometry

5. Stochastic process

6. Number Theory

+ other Courses based on Core (A)

MATHEMATICS : NOTES

A = Math Core (8)

B = Math Elective (4)

C = Free Elective (4)

D = Non-Math (4)

Semester-V - 3A + 2D, **Semester-VI** - 3A + 1D + 1C

Semester-VII - 2A + 1B + 1C + 1D **Semester- VIII** - 3B + 2C

Fifth year program

Research/ training Project work for both semesters of the 5th year with two supplementary and/or optional courses each semester. Students will be required to write a Project Thesis. Total No. of Credits in the 5th Year is 48. For selected students, the program in the fifth year may initiate research work towards a subsequent Ph D degree