

TIFR Centre for Applicable Mathematics, Bangalore.
ATM Workshop on Riemannian Geometry
 19–30 July, 2010.

Schedule of Lectures

Date	0930-1100	1130-1300	1400-1500	1530-1700
19/7 (Monday)	L1(CSA)	L2(AM)	Discussion	L3(HS)
20/7 (Tuesday)	L4(AM)	L5(HS)	Discussion	L6(AM)
21/7 (Wednesday)	L7(AM)	L8(GS)	Discussion	L9(HS)
22/7 (Thursday)	L10(HS)	L11(CSA)	Discussion	L12(CSA)
23/7 (Friday)	L13(CSA)	L15(GS)	Discussion	L14(CSA)
24/7(Saturday)	L16(GS)	L17(AM)	Discussion	L18(HS)

Date	0930-1100	1130-1300	1400-1530	1600-1700
26/7 (Monday)	KV1	KS1	SG1	GB(GL1)
27/7 (Tuesday)	KV2	KS2	SG2	HS1(BT)*
28/7 (Wednesday)	HS2(BT)	KS3	SG3	TNV1(GL2)
29/7 (Thursday)	CSA1(RF)	KS4	HS1(RF)	TNV2(GL3)
30/7 (Friday)	SG4	HS2(RF)	CSA2(RF)	KS(GL4)

* This lecture will be from 1600 to 1730 hrs.

Speakers: 1st Week

AM: Anandateertha Mangasuli

CSA: C S Aravinda

GS: G Santhanam

HS: Harish Seshadri

Speakers: 2nd Week

KS: – K Shankar

KV: – Kaushal Verma

SG: – Siddhartha Gadgil

TNV: – T N Venkataramana

GB: – Gautam Bharali

First week

- Lecture 1: Smooth manifolds - definition and examples; smooth functions, bump functions (smooth urysohn lemma); tangents vectors, vector fields, tensor fields - definition and properties (of tensors).
- Lecture 2: Metric tensor, Riemannian manifolds, covariant differentiation, curvature tensors and curvatures; lengths of curves, distance function, geodesics, parallel transport and exponential map.
- Lecture 3: Hopf-Rinow theorem.
- Lecture 4: First and second variations of length and energy functionals; Jacobi fields, Gauss lemma.
- Lecture 5: Cartan-Hadamard and Bonnet-Myers theorems.
- Lecture 6: Models of constant curvature; Cartan's theorem on the determination of the metric by (constant) curvatures.
- Lecture 7: Rauch and Toponogov comparison theorems (include proof of Rauch but only state Toponogov).
- Lectures 8, 9 and 10: Klingenberg's injectivity radius estimate, Synge's theorem, Bishop and Bishop-Gromov volume comparison theorems.
- Lectures 11, 12, 13 and 14: Preissmann (and Flat-torus) theorems, Eberlein-O'Neill compactification, Busemann functions, classification of isometries (into elliptic, parabolic and axial or hyperbolic).
- Lectures 15 and 16: Riemannian immersions, submersions; immersion and submersion equations; second fundamental form.
- Lectures 17 and 18: Symmetric spaces of compact and noncompact type; their curvatures.

Second week

Shankar (KS) will give 4 lectures on the Soul theorem, the splitting theorem, structure of fundamental groups in non-negative and positive curvature. About 4 lectures on Bochner technique (BT) (2 by KV and 2 by HS), 4 lectures on Ricci flow (2 by CSA and 2 by HS) and about 4 lectures on Gromov-Hausdorff convergence, by SG.

Besides the above main series lectures, we will have two guest lectures by T N Venkataramana on the construction of compact and finite-volume quotients of real hyperbolic space forms, one guest lecture by Gautam Bharali on uniformization of surfaces and one guest lecture by K Shankar.