Speaker : K.N. Raghavan
Title : Branching laws for certain classical group pairs.
Abstract : How does an irreducible representation (finite dimensional, say polynomial) of $GL(n, \mathbb{C})$ break up into irreducibles when restricted to $GL(n-1, \mathbb{C})$ (embedded, say, as the upper left corner block)? The *branching law* gives an answer to this. We describe with proof this law and analogous ones when "GL" is replaced by "Spin" or "Sp".

Speaker : A. Nair
Title : Matsushima's formula and related topics.
Abstract : We will prove the classical Matsushima formula expressing the singular cohomology of compact locally symmetric spaces in terms of representation theory. If time permits we will discuss the coherent version and other generalisations.

Speaker : A. Raghuram
Title : Representations of GL(2).
Abstract : We will review the local Langlands correspondence for representations of GL(2,R) and GL(2,C). We will especially look at those representations of GL(2) which sit as the first term in a 3-term short exact sequence with the third term being a finite-dimensional representation.

Speaker : P. Sankaran
Title : Admissible representations.
Abstract : The following topics will be covered in these lectures: 1. Representations induced from parabolic subgroups 2. admissible representations 3. spherical functions 4. the subrepresentation theorem.

Speaker : A. Raghuram
Title : $(\mathfrak{g}, K)$-cohomology: some generalities.
Abstract : Define relative Lie algebra cohomology; Wigner's Lemma; cohomology of a parabolically induced representation.

Speaker : A. Raghuram
Title : Cohomological representations of $GL(n)$.
Abstract : We will describe in detail those irreducible representations of $GL(n, R)$ and $GL(n, C)$ which have nontrivial $(\mathfrak{g}, K)$-cohomology and which appear as local components of global cuspidal automorphic representations. This classification of cohomological representations of $GL(n)$ will be used to give an arithmetic application (to special values of L-functions) of the branching rules for finite-dimensional representations for the pairs $(GL(n), GL(n-1))$ and $(GL(2n), GL(n)xGL(n))$.

Speaker : R. Parthasarathy
Title : The Dirac inequality for irreducible unitary representations.
Abstract : We will begin with a brief review of the spin representation. We will then define the Dirac operator on homogeneous vector bundles, as well as a formal analogue for $\mathfrak{g}$ -representations. Then we will state a formula for the Dirac laplacian and indicate how it leads to the Dirac inequality. We will then go through an overview of its role in representation theory - particularly in the context of the discrete series and highest weigh modules in the hermitian symmetric case.

Speaker : W. Casselman
Title :A new way to analyze orbital integrals for $SL(2)$.
Abstract : I shall show how the Whitney filtration of Schwartz spaces and Bernstein polynomials can give a new proof of a theorem of Langlands characterizing orbital integrals.

Speaker : R. Parthasarathy
Title : On the modules $A_{(\mathfrak{q},\lambda)}$.
Abstract : These modules came about in trying to understand the irreducible unitary modules which contribute to cohomology of locally compact symmetric spaces via the right side of Matsushima's formula. We will begin with an algebraic construction of these modules, then look at some other incarnations of the same modules as derived functor modules and cohomologically induced modules. We shall restrict to a rather concise treatment and devote relatively more time to emphasis how the dirac inequality plays a definitive role in narrowing down possibilities for an irreducible module to appear in the right side of Matsushima's formula referred to above and in deriving crucial properties of these modules. If time permits we will conclude with a description due to Zuckerman of how these modules fit in the Beilinson - Bernstein picture of "Localisation de $\mathfrak{g}$ - modules.