

## Part II : Inhomogeneous Universe

### Perturbation Theory

Governing EQ (Nonlinear)  $\rightarrow$  Symmetry  $\rightarrow$  PT EQ (Nonlinear)  $\rightarrow$  Order by Order  
Conserv. Euler. Poiss. Homogeneity & Isotropy  $S = \bar{S}(1+\delta)$  Linear EQ  
Einstein EQ BQ solution  $\bar{S}(t), \vec{v} = H\vec{r}$   $\vec{v} = H\vec{r} + \vec{u}$

### Probes of Inhomogeneity

T, S,  $\Theta$  measurement today  $\rightarrow$  initial conditions  $\rightarrow$  inflationary models ch. 4  
test of cosmological models. (we only study standard)

Theorist : initial conditions  $\xrightarrow{\text{evolution}}$  predictions today for T, S,  $\Theta$  ...

### Fourier Transforms

same structure for linear EQ

$x \leftrightarrow k = 2\pi/L$   
length energy

$$A(\vec{x}) = \int \frac{d^3k}{(2\pi)^3} e^{i\vec{k}\cdot\vec{x}} A(\vec{k})$$

$$A(\vec{k}) = \int d^3x e^{-i\vec{k}\cdot\vec{x}} A(\vec{x})$$