Cesaro means: Convolutions, positive summability kernels and Fejer’s theorem.

Applications of Fejer’s theorem: the Weierstrass approximation theorem for polynomials, Weyl’s equidistribution theorem, construction of a nowhere differentiable function (time permitting).

Pointwise and uniform convergence and divergence of partial sums: the Dirichlet kernel and its properties, construction of a continuous function with divergent Fourier series, the Dini test.

$L^2$ approximations. Parseval’s formula. Absolute convergence of Fourier series of $C^1$ functions. Time permitting, the isoperimetric problem or other applications.

Applications to partial differential equations. The heat and wave equation on the circle and on the interval. The Poisson kernel and the Laplace equation on the disk.

Fourier series of linear functionals on $C^0(T)$. The notion of a distribution on the circle.

Time permitting: positive definite sequences and Herglotz’s theorem.

The Fourier transform: convolutions, the inversion formula, Plancherel’s theorem, Hermite functions. Time permitting: tempered distributions, further applications to differential equations.
• Fourier analysis on finite cyclic groups, and the Fast Fourier Transform algorithm.