Examination topics of
Mathematical Introduction to QFT

1. Second quantization (Fock spaces, creation/annihilation operators, etc.)

2. The Klein-Gordon equation, its distinguished Green's functions and solutions.

3. Symplectic structure on the space of solutions of the KG equation.

4. Quantization of the KG equation (the quantum Hamiltonian, Hilbert space, various 2-point functions).

5. Superselection sectors, definition and examples;

6. *-algebras and their commutants; definition of a von Neumann algebra.

7. Haag-Kastler axioms.

8. Wightman axioms.

9. Symplectic (Bogoliubov) transformations, implementability of Bogoliubov transformations.

10. Time dependent Hamiltonians, Schrödinger/Heisenberg picture, time-ordered Green's functions.

11. Diagrammatic methods of computation of the scattering matrix.

12. Feynman rules for the $: \hat{\phi}(x)^2 :$ interaction.

13. Renormalization of the $: \hat{\phi}(x)^2 :$ interaction.