Очная магистратура 24.04.05

1. "Тепловые процессы в ГТД" 2017/2018 (ШТУ) - Зо

2. "Тепло- и массообмен в энергетических установках" 2017/2018 - Зо

3. "Теплофизика и газовая динамика в газотурбинных двигателях" 2017/2018 (англ.яз.ПАКУ+Нанкин+Шэньян) - Зч

**Full-time master degree 24.04.05**

**1. "Thermal processes in gas turbine engines" 2017/2018 (STU) - Test with mark**

**2. "Heat and mass transfer in power plants" 2017/2018 - Test with mark**

**3. "Thermophysics and gas dynamics in gas turbine engines" 2017/2018 (English language. PACU + Nanjing + Shenyang) - Test without mark**

**1. The fundamental equations of fluid dynamics**

1.1. Governing equations of Gasdynamics.

1.2. Alternative forms of writing basic differential equations in partial derivatives.

1.3. Total energy

**2. Turbulence Modeling**

2.1. Laminar and turbulent flow regimes

2.2. Reynolds decomposition: mean and fluctuating values

2.3. Turbulence in flows of variable density. Favre averaged values.

2.4. The basic equations of fluid dynamics for averaged values. Reynolds-averaged Navier-Stokes equations (RANS)

2.5. Coefficient of turbulent viscosity.

2.6. The turbulent kinetic energy equation.

2.7. Two-equation turbulence models for incompressible fluid.

2.8. K-epsilon (k-ε) turbulence model

2.9. K–omega (k–ω) turbulence model

2.10. SST (Menter's Shear Stress Transport) turbulence model

2.11. Reynolds Stress Model

2.12. Reynolds Stress Model for high-speed flows

2.13. Baseline (BSL) Reynolds Stress (Omega-Based Reynolds Stress Model)

2.14. Boundary conditions for Reynolds stress.

2.15. Explicit Algebraic Reynolds Stress Model with assumption about complete equilibrium.

**3. Chemically reacting flows**

3.1. General concepts

3.2. Species mass conservation equation

3.3. The energy equation for chemically reacting gas mixture.

3.4. The transport properties of a gas mixture

3.5. The kinetics of chemical reactions

3.6. The detailed kinetic mechanism of hydrogen combustion

**4. Thermally Nonequilibrium Flows**

4.1. Translational, rotational and vibrational energy

4.2. Thermally equilibrium and nonequilibrium flows

4.3. Vibrational energy equation

4.4. Another form of the equation of vibrational energy.

4.5. The equation of total energy for vibrational nonequilibrium gas

4.6. Mechanisms of vibrational energy exchange

4.7. Rates of vibrational energy transitions

4.8. Spontaneous radiative deactivation of vibrational modes.

**5. Radiative Heat Transfer**

5.1. Basic concepts.

5.2. The radiative transfer equation (RTE) in the absence of scattering and on the condition of local thermodynamic equilibrium.

5.3. The Einstein Coefficients

5.4. Atomic and molecular spectrum

5.5. Line radiation

5.6. Some methods for solving the radiative transfer equation for homogeneous medium

5.7. Methods for solving the radiative transfer equation for an nonhomogeneous gases

5.8. Calculation methods Line-by-Line and k-Distribution

**6. Multiphase flows**

6.1. Introduction

6.2. Two distinct multiphase flow models

6.3. Mathematical modeling of multiphase flows.

6.4. A numerical method for solving the transport equations of a discrete phase

Reference.

1. Molchanov Alexander. THERMOPHYSICS AND FLUID DYNAMICS. Special Chapters. https://www.twirpx.com