

## SUMMARY OF DISCIPLINE

1. *Name of discipline* Reliability and Operation Modes of TPP
2. *Symbol (code) in the curriculum* M.3.V5
3. *Direction (PLO)* 13.04.01 Heat and Power Engineering
4. *Profile* Computer technologies of Thermal and Nuclear Power Plants Design
5. *Qualifications (degree)* Master
6. *Department* DEPT. OF NUCLEAR AND THERMAL POWER PLANTS
7. *Teacher* O. Yu. Romashova, tel. 16-31, E-mail roma@tpu.ru
8. *Learning Outcomes:*

M1: knowledge and understanding of resource design, technologies and techniques of justification and maintenance of a specified lifetime at the stage of design, lifetime management methods for Thermal and Nuclear Power Plants;

M2: knowledge and understanding of durability according to fatigue resistance and brittle fracture resistance;

M3: knowledge of methods to predict such phenomena as vibration and corrosion at the stage of design;

M4: ability to evaluate reliability of Thermal and Nuclear Power Plants, thermal power units;

M4: analysis of design, research, repair, maintenance, operation companies outcomes on the basis of vibration, dynamic, cyclic reliability and strength.

### 9. *Contents (list of the main topics (sections))*

Safe operating of power equipment. Challenges and operation of thermal power plants and systems, interrepair maintenance services. Operational characteristics of thermal power plants. Form and structure of pipe deposits. Types of treatment of pipe deposits. In-pipe deposition. Types of treatment of tube deposits. Impact of different treatment systems on the reliability of power equipment.

Preventing accidents at thermal power plants and systems. The explosion in gas-fueled furnaces. Damage to the drums and collectors of steam boilers. Damage and defects of rolled joints. Malfunction of the steam boilers. Measures to prevent damage to drums and collectors. Technological defects arising in manufacturing, installation and repair of the boiler. Examples of damage to the bends of non heated pipes, boilers and steam lines. Approximate technique of examination of damage to smoke exhausters and fans. The main causes of feed pumps failure. Measures to ensure the reliable operation of feed pumps. Internal corrosion of pipes economizer. External corrosion of pipes economizer. Operating conditions and main causes of damage to pipelines. Defects in welds. Working conditions and damage to the main armature.

Technologies and ways to justify and ensure its useful life, during the design and manufacture. Technology of resource planning. Methods of justification of the resource exploitation by the criteria of fatigue resistance and resistance to brittle fracture. Impact of neutron irradiation on the material of the reactor vessel. Allowance for corrosion at the design stage. Providing resource on the stage of manufacture and assembly.

Premature depreciation due to obsolescence. Control of resources during plant operation. Non-destructive testing. Control of mechanical properties. Measuring control. Controlling the resource of hydraulic pressure tests for strength and density. Control of operating time for the resource.

Violation of operating conditions of TPP and NPP with damage to the metal and / or construction. Assessment of residual life, taking into account the aging of the metal during operation. Deviations from the nominal requirements for the properties of the metal, geometry of the design and various resource characteristics. Deviations in the modes and operating conditions without visible damages of the metal and construction.

Obsolescence of the structural element, or a power unit as a whole. The increase of its useful life. Technical and organizational issues related to the control and resources support. The automatic test set of residual life. Useful life and safety of operation of TPP and NPP.

10. *Types of learning activity:*

Lectures	16/8 h. (class/self.)
Laboratory work	16/16 h. (class/self.)
Practical classes	24/16 h. (class/self.)
Class hours	56 h.
Term paper	40 h.
Self-learning	80 h.
Total	136 h.
Assessment:	Exam, graded credit

12. Course 2; Semester 3; the number of credits 6.

*Author (s)* Associate Professor O.Yu. Romashova

2. Prerequisites "Set the mode of electric power systems, modern methods and means of calculation "," Transients in electric power systems. "

13. Korekvizity "emergency control in power."

14. Type certification (exam, test) Exam

Author (s) Associate Professor N.N. Galashov