UNIVERSITÀ DI PISA
MECCANICA STRUTTURALE E COSTRUZIONI NUCLEARI

DONATO AQUARO

Anno accademico	2021/22
CdS	INGEGNERIA NUCLEARE
Codice	519II
CFU	12

Moduli	Settore/i	Tipo	Ore	Docente/i
COSTRUZIONI NUCLEARI	ING-IND/19	LEZIONI	60	DONATO AQUARO
MECCANICA STRUTTURALE	ING-IND/19	LEZIONI	60	DONATO AQUARO ALESSIO PESETTI

Obiettivi di apprendimento

Conoscenze

The student who completes successfully the course will achieve the ability to perform structural calculations of complex components of a nuclear power plant such as pressure vessels, steam generators, piping, pumps and valves. The student will be able to apply the failure criteria by plastic collapse, incremental plastic strain and thermal ratcheting and will be able to demonstrate advanced knowledge of the relevant standards such as ASME III and ASME XI.

Modalità di verifica delle conoscenze
Assessment criteria of knowledge

- The student will be assessed on his capabilities to discuss the main course contents using appropriate terminology.
- An exercise/report will be performed by the student ad discussed during the oral examination. The student must demonstrate the ability to put into practice and to execute, with critical awareness, the activities illustrated or carried out under the guidance of the teacher during the course.

Capacità
Skills
The following main skills are provided by the course:

- Capability to understand structural problems geometry and boundary conditions;
- Capability to apply the proper theory (simplified or general) and solution method for evaluating stress and strain state;
- Capability to perform the limit analysis of structures;
- Capability to evaluate the linear-elastic fracture mechanics;
- Capability to assess thermal ratcheting and shake down;
- Capability to perform seismic assessment;
- Capability to adopt standards (ASME III and XI) for vessel, pump, valve and piping design.

Modalità di verifica delle capacità
Assessment criteria of skills
During the oral interview, the skills acquired by the students will be assessed, evaluating the comprehension degree and capability to connect different topics of the course.

Comportamenti
Behaviours
Students will acquire/develop awareness on structural analysis of nuclear power plant main components and sensibility and understanding of their implementation in nuclear plants.

Modalità di verifica dei comportamenti
Assessment criteria of behaviours
The oral interview will ascertain the personal attitude of the student by proposing questions and problems related to structural analysis of

nuclear power plant components.

Prerequisiti (conoscenze iniziali)

Prerequisites

Knowledge and skills on beam structures theory (isostatic and hyperstatic) and knowledge of the main concepts of the continuum mechanics constitute the prerequisites for this course

Indicazioni metodologiche

Teaching methods

Front and distance (live online by Microsoft Teams) lectures with the support of slides are provided. Task-based teaching, problem-based teaching and inquiry-based teaching are performed. A written exercise/report will be assigned to the students on topics developed during the lectures and solved by themselves.

Programma (contenuti dell'insegnamento)

Syllabus

The specific topics of the course are:

- the methods of the elasticity theory applied to plates and shells solicited by mechanical loads and temperature gradients;
- the theory of limit analysis for the determination of the collapse load of plates, shells and beams;
- the theory of linear elastic fracture mechanics;
- the determination of seismic loads by means of modal analysis theory;
- failure criteria for plastic collapse, incremental plastic strain and thermal ratcheting;
- the relevant standards such as ASME III and ASME XI

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