Project Status

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Aim

Presenting the status of the research project at the end of the first semester.

Overview

Overview

- Objective

Overview

- Objective
- Assumptions

Overview

- Objective
- Assumptions
- Methodology

Overview

- Objective
- Assumptions
- Methodology
- Time Table

Title of the Dissertation

Development of the Thermo-hydraulic Code THELMA for Safety Parameters in a Fuel Assembly.

THELMA is from THermo Hydraulic Model Analysis

Director: Gustavo Alonso Vargas

Objective

Developing a solver for modelling the flow of water-steam between the fuel rods (sub-channel) of a nuclear assembly in the core of a BWR analysing the thermal and hydraulic distribution of the flow mixture to estimate safety margins in steady-state operation.

Particular Goals

THELMA will be coupled with the neutron transport code GEMMA. This code solves the neutron transport equation in two dimensions using the characteristics method.

For the analysis of the steam-water flow THELMA uses:
The homogeneous model in combination with the drift-flow model in the axial direction.

The drift-flux model allows different speeds in the phases.

TH Assumptions

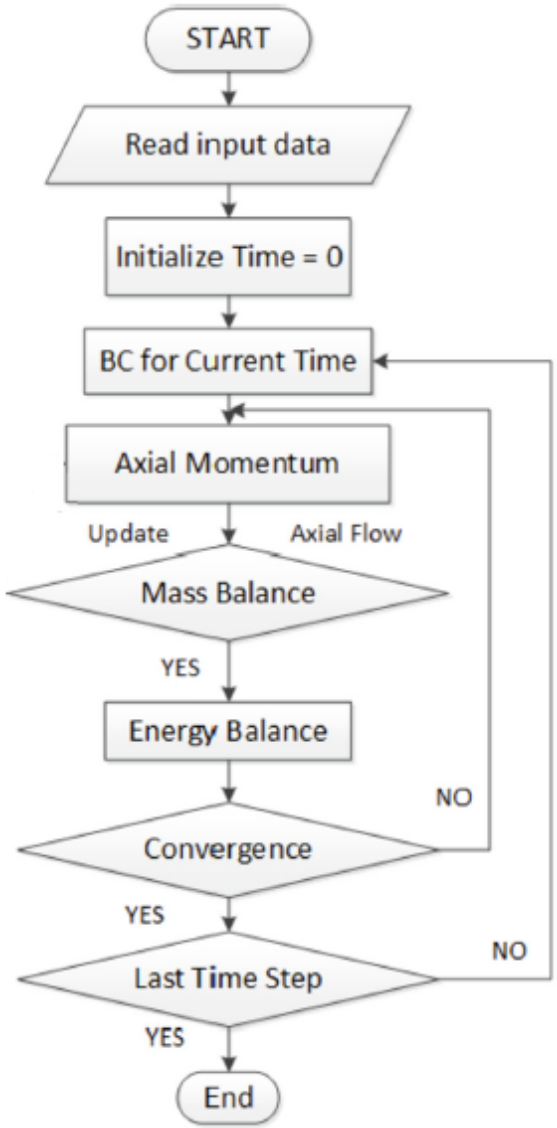
- Analysis object: Water-Steam two-phase flow in a BWR fuel assembly
- Basis Equations: Conservation equations of mass, momentum, and energy
- Coordinate: 3-dimensional Cartesian coordinate
- Spacial discretization: Finite difference method
- Treatment of flow: Homogeneous model and Drift flux model (only axial direction)
- Drift flux model: Ishii's model
- Boundary Conditions: Mass flow rate, pressure, temperature at inlet,
- Single-phase heat transfer convection: Dittus-Boelter model
- Nucleate boiling: *

Coupling Assumptions

GEMMA will provide: Critical power, Thermal power from fuel.

- Coupling Procedure: Parallel codes
- Type of coupling: external
- Properly spatial nodalization
- Algorithms to interchange the time step in coupling calculations
- Control of convergence scheme

Methodology



Output

- pressure,
- velocity,
- void fraction,
- quality,
- enthalpy,
- wall and fuel temperature,
- wall heat flow,
- heat transfer coefficient on wall,
- critical heat flow rate (CHFR)
- critical power radio (CPR)

Index of the Dissertation

- Introduction
- Thermohydraulic fundamentals
- Sub-canal analysis
- Coupling
- Results Analysis
- Conclusions

Full Index of the Dissertation

Schedule

PROJECT-STEP	START	END
MASS BALANCE	01.07.2020	31.07.2020
TESTING	01.08.2020	15.08.2020
MOMENT BALANCE	15.08.2020	15.09.2020
TESTING	16.09.2020	15.10.2020
ENERGY BALANCE	16.10.2020	16.11.2020
TESTING	16.11.2020	30.11.2020
TOTAL BALANCE	01.12.2020	31.12.2020

PROJECT STEP	START	END
WRITING THE REPORT	07.12.2020	31.12.2020

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SEPTIEMBRE						
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OCTUBRE						
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NOVIEMBRE						
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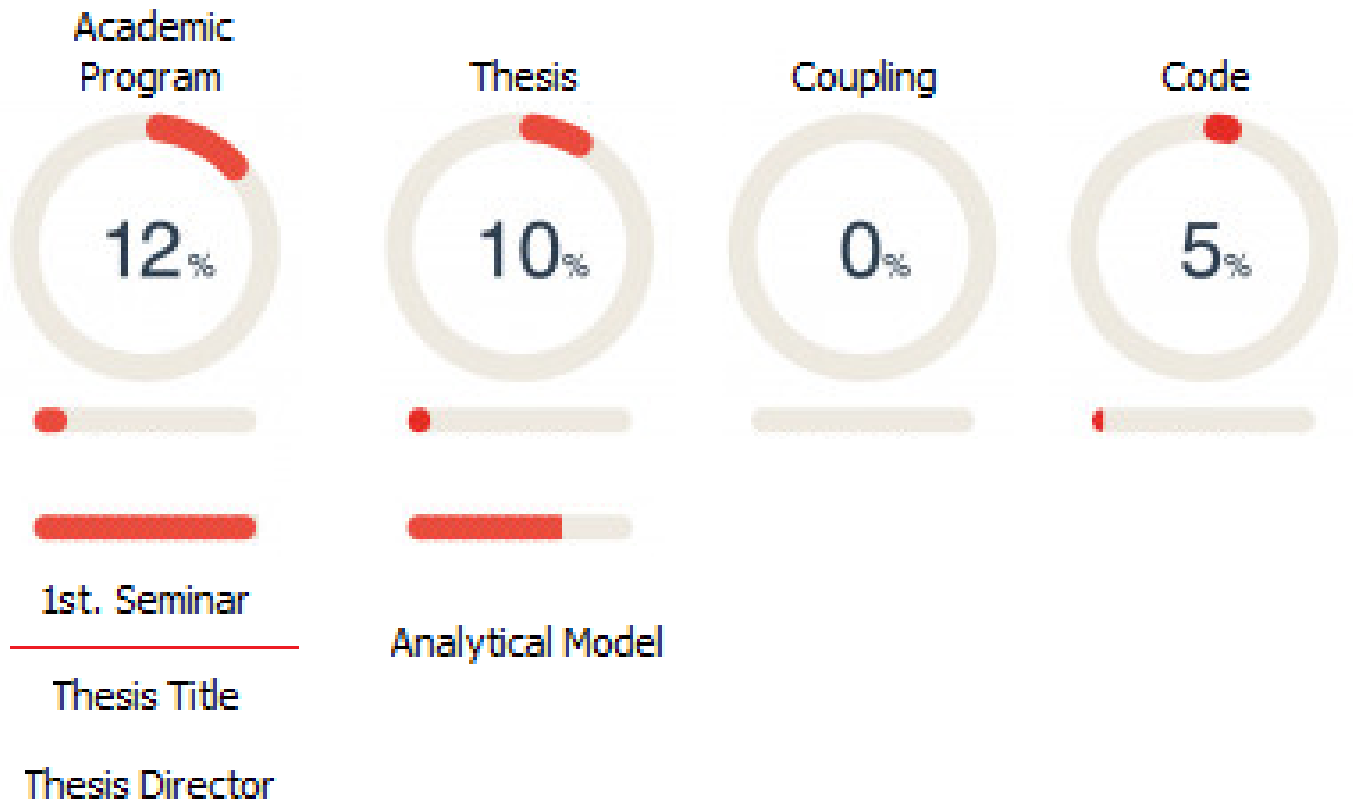
Status


Academic Program
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Thesis
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Coupling
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Code
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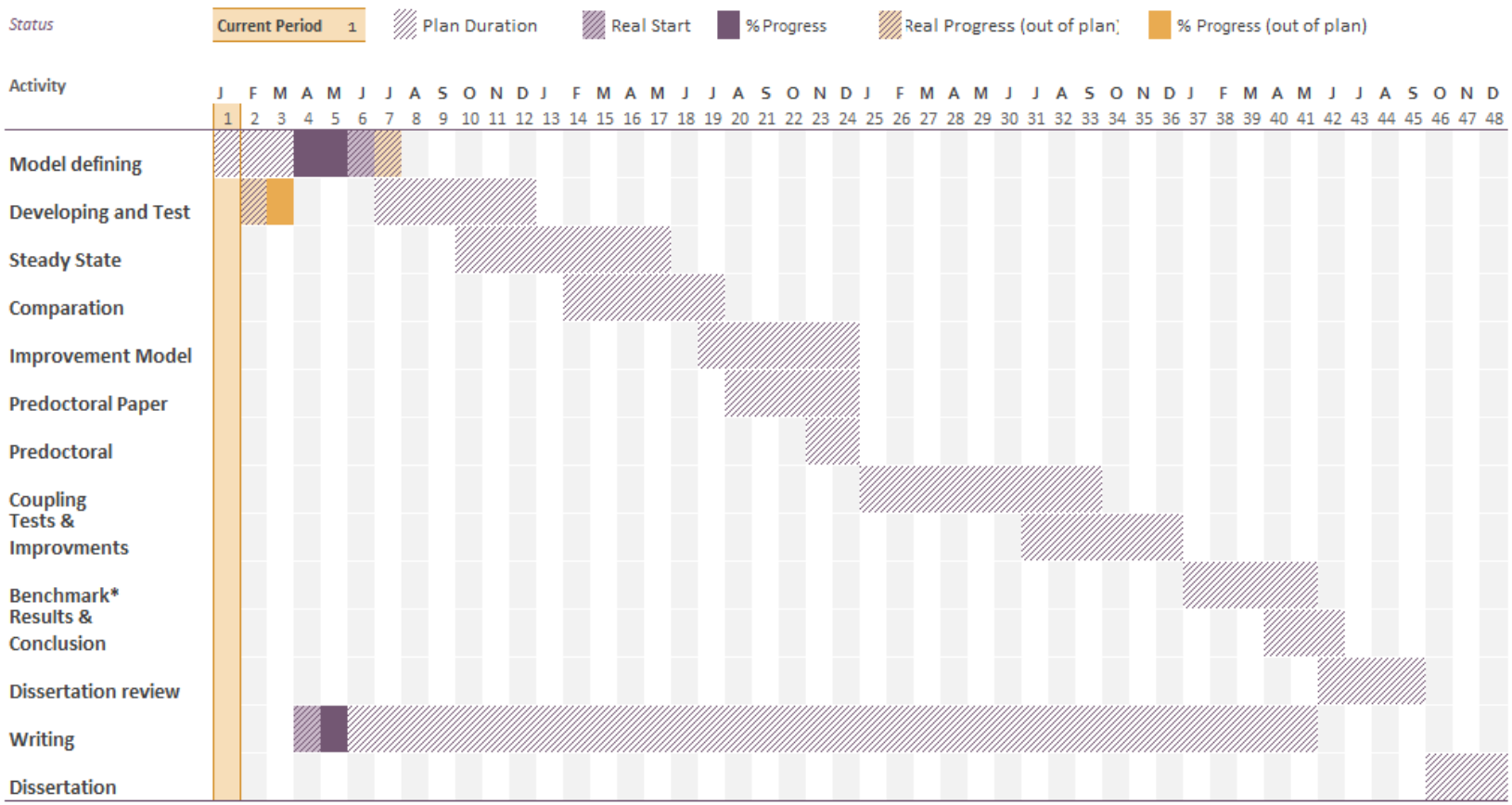
1st. Seminar
Analytical Model
Thesis Title
Thesis Director

Project Time Table



Thanks !!
Questions??