I
PRELIMINARY

A. Background

Muhammadiyah Surakarta University is the largest private university in Central Java Province with total active students 24.787 people. The number of students each year has increased especially in engineering students, causes in limited space that a major requirement for students. Therefore, Muhammadiyah Surakarta University have to improve facilities with engineering faculty building larger to accommodate all the activities of engineering students and UMS staff.

Engineering faculty building is a building with all the activities of engineering students, ranging from teaching and learning activities through organizational activities. It is demanding to plan a building with plenty of spaces. Due to limited area, the building is not only one floor but 4 floors to meet space requirements.

Basically to construct a building with floor more than one is needed a designed structure, from roof structure till foundation. The strength of structure sustaining all kinds of loads (gravity and lateral) that work is an important factor in designing, particularly for earthquake loads Indonesia lies between Circum Pacific and Asiatic Tran meeting.

When the earthquake happened, building sustains vertical and horizontal movement. That earthquake load happened in structure mass point, both in vertical or horizontal direction. Vertical direction load on earthquake just change some gravitation load that worked on the structure, even though the structure is usually designed against vertical load which is really safe. Therefore, structure generally seldom collapse due to vertical earthquake load. Otherwise, horizontal earthquake load worked on weak point of the structure that have no enough strength and cause collapse directly. That factors become key reason in designing earthquake resistant-building.

The main principle in designing of earthquake resistant buildings is increasing deficiency of structures against lateral load (sideways) which is generally inadequate.

From some of the problems that have been explained above, so in this final project, the writer designs an engineering faculty building with four floors using intermediate moment resisting frame (IMRF) which refers to the recent regulations in Indonesia.

B. Design Formulation

On the issues that have been outlined in the background, it can be some formulation of the problem as follows:

1) What is dimension of truss design?
2) What is dimension of slab and stairs design?
3) What is dimensions of the beams and columns were able to carry earthquake loads the work plan and the formation of the structural elements of the reinforcement beams and columns?
4) What is dimension of bottom structure (pile, *poer*, and *sloof*) ?

C. Authenticity Research

Before the final project is structured, there have been several previous final project that have the same discussion, namely the structural design of the building. In this final project will be discussed on the structural design of buildings fakuktas 4 floors with the principle of partial or ductile Intermediate Moment Resisting Frame (IMRF) in Sukoharjo. This final project refers to the Final before with the title: "Building Structural Design Doctors Hospital Roesnedy 6 Floor and Basement in Area 1 Solo with Intermediate Moment Resisting Frame” (Muhammad Harun, 2015).

D. Design Objectives

This final project has the objective to obtain the design of reinforced concrete structures UMS Engineering Faculty building an efficient and earthquake-resistant in accordance with Intermediate Moment Resisting Frame (IMRF) based on the latest standards regulations in Indonesia.

E. Design Benefits

1) The benefit for the writer is to deepen the knowledge of the structure, especially in designing of multi-story building earthquake resistant and efficient start from the beginning of the design process, mechanical analysis, to the design of reinforced concrete.
2) Benefits for the reader is to increase knowledge and references about the planning structure of Terraced Building resistant to earthquakes and efficiently with Intermediate Moment Resisting Frame (IMRF).

F. Scope of Design

Final preparation of this Plan is limited to the scope of any structure, such as: structural analysis, planning roof, planning columns, beams planning, and planning the foundation. In order for the discussion to focus on issues and not very widespread, and therefore in this final project gives limitations as follows:

1) Regulations

Regulations used in this planning as a basic reference in the calculation of the structure is as follows:

a) SNI 1727: 2013, Minimum Expense for Designing Building and Other Structures.
b) SNI 1726:2012, Earthquake Resilience Planning Procedures for Building Structures and Non-Building.
c) SNI 2847:2013 Requirements for Structural Concrete Building.

2) General specifications

A general provision to make it easier to calculate and analyze the structure

a) The structure of the building is planned engineering faculty building 4 floors with Intermediate Moment Frame System bearers (IMRF). The location of the building is planned to be in the district of Sukoharjo.

b) Structure calculations performed include structural analysis calculations, design calculations roof, staircase design calculations, design calculations slab (slab floor and slab roof), beam design calculations, design calculations columns and foundation design calculations.

c) The roof structure is a combination of slab concrete roof with a size of 10 cm thick plate and frame steel easel angled profile.

d) Column height of +4.1 m the first floor, the second floor of +4.2 m, while the height of the third floor and four +4 m.

e) The specification of the materials used are :

1) Quality concrete f'_c = 25 MPa.
2) The quality of steel f_y = 400 MPa (BJTs main reinforcement).
3) The quality of steel f_{yt} = 240 MPa (BJTP shear).

f) Dimensions of initial beams and columns design, consist of:

1) Dimensions column (the first floor to the fourth floor) 400/400 mm.
2) Dimensions beam (the first floor to the fourth floor) 300/600 mm.
3) Dimensions joists 200/400 mm
4) Sloof beam dimensions 250/500 mm

Dimensions beams and columns above as initial data for design and may change in accordance with the results of the calculation of the most efficient.

g) Designed floor slab using 12 cm of thickness.

h) Assumed the building stands on the ground of being.

i) The foundation used is the type of bore pile foundation.

j) Undesigned construction lift.

k) Analysis structure using program "SAP 2000".