CAPSTONE PROJECT

GUIDELINE FOR UNDERGRADUATE ● CIVIL ENGINEERING COURSES

CAPSTONE PROJECT

GUIDELINE FOR UNDERGRADUATE ● CIVIL ENGINEERING COURSES

NORAM IRWAN RAMLI
MOHAMAD IDRIS ALI
DOH SHU ING
WAN NAZRI WAN ARIA
TAN YEONG YU

FAKULTI KEJURUTERAAN AWAM DAN SUMBER ALAM
UNIVERSITI MALAYSIA PAHANG

Publisher
Universiti Malaysia Pahang
Kuantan
2020

First Published, 2020

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Noram Irwan Ramli

CAPSTONE PROJECT GUIDELINE FOR UNDERGRADUATE CIVIL ENGINEERING COURSES / PREPARED BY: NORAM IRWAN BIN RAMLI, MOHAMAD IDRIS BIN ALI, PhD, DOH SHU ING, PhD, WAN NAZRI BIN WAN ARIA DAN TAN YEONG YU.

ISBN 978-967-2226-49-9

1. Civil engineering.
2. Government publications--Malaysia.
I. Mohamad Idris Ali.
II. Doh, Shu Ing.
III. Wan Nazri Wan Aria.
IV. Tan, Yeong Yu.
V. Title.
624

Published By:
Publisher
Universiti Malaysia Pahang
Lebuhraya Tun Razak, 26300 Gambang
Kuantan, Pahang Darul Makmur
Tel: 09-549 3273 Fax: 09-549 3281

Printing:
Bangsawan Pictures
No 92, Lorong Permatang Badak Perdana 4,
Taman Permatang Badak Perdana 4,
25150 Kuantan, Pahang.
Tel: 013-918 6131
E-mail: admin@bangsawanpictures.com.my

TABLE OF CONTENTS

PREFACE

The Capstone Project Guideline for Undergraduate Civil Engineering Courses aims to provide an authentic and practical inter disciplinary learning experience where students apply academic discipline in a real-world context. It is worth 3 credits and could be as exit exam for Final Year Undergraduate Civil Engineering students.

Each calculation procedure presented in this handbook gives numbered steps for performing the calculation, along with a numerical example illustrating the important concepts in the procedure. Each section of this handbook is designed to furnish comprehensive coverage of the topics in it. Where there are major subtopics within a section, the section is divided into parts to permit in-depth coverage of each subtopic.

Civil engineers involve in layout planning, earthwork calculation, road network, buildings, water supply, sewage treatment, scheduling, bill of quantities, cost and estimation as well as a variety of other key structures and facilities throughout the world. Because of the importance of such structures and facilities to the civilized world, civil engineers have long needed a handbook which would simplify and speed their daily design calculations. This handbook provides answers to that need.

While there are computer programs that help the civil engineer with a variety of engineering calculations, such programs are highly specialized and do not have the breadth of coverage this handbook provides. Further, such computer programs are usually expensive because of their high cost, these computer programs can be justified only when a civil engineer makes several repetitive calculations on almost a daily basis. In contrast, this handbook can be used in the office, field, drafting room, or laboratory. It provides industry-wide coverage in a convenient and affordable package. As such, this handbook fills a long-existing need felt by civil engineers worldwide.

The step-by-step practical and applied calculation procedures in this handbook are arranged so they can be followed by anyone with an engineering or scientific background. Each worked-out procedure presents fully explained and illustrated steps for solving similar problems in civil-engineering design, research, field, academic, or license-examination situations. For any applied problem, all the civil engineer need do is placed his or her calculation sheets alongside this handbook and follow the step-by-step procedure line for line to obtain the desired solution for the actual real-life problem. By following the calculation procedures in this handbook, the civil engineer, scientist, or technician will obtain accurate results in minimum time with least effort. And the approaches and solutions presented are modern throughout.

INTRODUCTION

Look at around us. There are many development areas with many buildings, infrastructures, facilities and utilities. Do you ever know that, how the structures are to be there and functioning as necessary?

Generally, all started from planning. A concept and a layout plans drawn in the form of thematic and development strategies that will give profit to developer and meeting the development zone which has been established in the local physical planning plan. The planning is part of design phase in three major lifecycle phases of any development and construction projects. The three phases are: Design [D], Construction [C] and Operations [O]. The Framework subdivides these phases into sub-phases which are in turn further subdivided into multiple activities, sub-activities and tasks. Example: [D] Design Phase, [D1] Conceptualisation, programming and cost planning (Town Planner), [D2] Architectural, structural and systems design, [D3] Analysis, detailing, coordination and specification; [C] Construction, [C1] Construction planning and construction detailing, [C2] Construction, manufacturing and procurement, [C3] Commissioning, as-built and handover; [O] Operations , [O1] Occupancy and operations, [O2] Asset management and facility maintenance, [O3] Decommissioning and major re-programming.

This module focus on Design [D] phase. As engineer to be, the student will expose on preparing development proposal and the stages related to their future work. The detail task the student should be prepare are as follow;

a. Proposed development concept and layout plan
b. Proposed earthwork and platform design
c. Proposed road network design
d. Proposed Drainage network design and plan
e. Proposed Water supply pipe reticulation with water tank design
f. Proposed Sewerage pipe network with sewerage treatment plan design
g. Proposed Estimated Scheduling
h. Proposed Estimated cost
i. Proposed Example Bill of Quantities any proposed building

TASK 1: PROPOSED DEVELOPMENT CONCEPT AND LAYOUT PLAN

1.1 OUTCOME

1. Able to developed and propose planning layout for new development area that fulfilling all the necessary requirement from local authority.
2. Propose and integrated the propose planning layout with the entirely necessary infrastructure criteria and fulfilling all the requirement of planning approval.
3. Prepare high quality, detailed planning layout drawings using computer aided design software without errors

1.2 DESCRIPTION

The layout plan is a sketch of the position of a usability requirements and suitability. Layout plan in the context of surveyors and planners is a sketch for manages a land use development as and when appropriate. Proposed layout should be adapted to the Housing planning guidelines.

To accomplish this task, the following suggested steps should be implemented;

1. A detail survey plan of proposed development land parcel shall be obtained prior any steps by each group. In practised, a Licensed Land Survey consultant will give a service to prepare the plan. (In this task, a detail survey plan will be provided). Typically, the detail survey plan, will provide information of location, size and shape of land parcel, location of existing natural and man-made features, and variation of profile **(Figure 1.1)**.
2. If necessary, the site visit to proposed development land parcel shall be arranged by each group. During the site visit, the following information should be taken, namely existing entrance roads, development and activities in nearby lots, existing facilities and utilities **(Figure 1.2)**.
3. All information obtained from the survey plan and the site visit shall be analysed so that a concept and a layout plan can be made better. As example, if there are many residential areas around, could be proposed commercial buildings. Higher area should be proposed for location of reservoir and meanwhile the lowest and adjacent the river should be proposed for sewerage treatment plants
4. The concept plan drawn in the form of thematic and development strategies that meeting the development zone has been established in the local physical planning plan **(Figure 1.3)**.
5. The layout plan drawn that will give profit to developer and following the Guidelines and Acts. A placement of a land use plan should refer / appropriate to land survey and topographic plan. The layout plan was based on the concept plan such as the laying of residential, commercial, etc. The Guidelines involved with the development to be carried out: for a housing area - such as density, lot size and floor area, road reserves, public facilities based on population equivalence, infrastructures based on population

equivalence, area open space and buffer zones as percentages and estimated size of industries according to the lots.

6. The plan will be revised based on the interests and needs. Size and correspondent type of land use and the number of lot should be designed in accordance with the relevant provisions of the Guidelines and Acts. The total number of lots (for housing, commercial, industries and institutions) and the population should be known in advance, the number of houses or inhabitants are called Population Equivalent (PE), then refer to the Guidelines for the unit of facilities to be provided. The area of infrastructure and utilities such as Sewerage Treatment Plant, water tanks, electrical substation (except road) subject to the PE as well.
7. Providing basic land use, calculation of the land use basic considering the size of the specified Guideline **(Figure 1.4)**.
8. Provide proposal of development area report (In this task, the report no need to prepared).

i. Proposal of development area is a technical report that describes and explains the proposed development site to facilitate the Local Authority (LA) in the process of planning permission.

ii. The content of the proposal:
- **a.** Introduction
- **b.** Address, strategy and concept
- **c.** Justify development
- **d.** Location and proposed site
- **e.** Details of the land
- **f.** Analysis of proposed site
- **g.** The analysis of land use
- **h.** Analysis of development around the site
- **i.** The proposed development site
- **j.** Benefit of development
- **k.** Conclusion or summary

iii. The advantages of proposal:
- **a.** The proposal plays a big role as a tool in development and planning control.
- **b.** The proposal assist in decision making for planning permission for the development of area because it need full information and impact on economic analysis, environment and society.
- **c.** The proposal LCP the principles of the sustainable development.
- **d.** The proposal not only used by LCP, but other such as utility agencies involved in planning the provision of facilities.