**MPEP Proposal (Project Plan) – Assignment 1 guide provided by Lecturer**

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# Purpose

The purpose of this Proposal is to ensure that the student fully understands what the project is about, what the aims and objectives are and has given due consideration to what needs to be done to successfully complete it. The student has been advised to include:

* background to the project, what is it about;
* clear aims and objectives of the project;
* project deliverables (what the output/achievable of the project will be)
* identification of resources requirements; such as technician support, materials and equipment;
* a list of any references they have identified which may support the work;
* a project schedule, i.e. a detailed Gantt chart that identifies the work required and timescales involved in completing the project on time.

Students are informed that the Proposal, written in their own words, ~~should not be more than 2500 to 4000 words long no penalty~~. (Excluding the Gantt chart)

# **Proposal Outline/Structure:**

* cover page
* table of contents
* list of tables and figures
* P1: statement of engineering problem and relation to theme of SAFETY including aims and objectives. Make a statement on how safety risks are ‘designed out’ in the design phase: Design Risks; interpretation of brief, design and development errors, time scales, estimating / pricing errors, design team experience, professional negligence, liquidation / insolvency, management of design, completeness of documents. AND how safety risks are mitigated in the construction phase: Construction Risks; procurement route, programme, variations, price, disputes and claims, site management, workmanship, accident / injury, liquidation / insolvency, latent defects, material supply, approval period, statutory bodies, weather.

* P1: preliminary research at least 10 secondary sources of based on the following:

For MET students: CNG systems; CNG supply (pipeline or small scale LNG), integration into a liquid fuel station, CNG components (metering station, compressors, storage and dispensers), CNG automobile kits.

For EEET students: EV charging systems; see components at end of this document

* P2: scope of works (the work to be performed on the project, the major engineering deliverables) see list at end of this document.
* P2: the schedule with tasks and timelines (Gantt chart)
* M1: the justification for undertaking this project (the feasibility discussion with no LCC ~~and risk assessment see overleaf)~~
* D1: effect of legislation and ethics on decision making process (P and L only of PESTLE)
* list of references
* appendix

# Reverse writeup as stated in the assignment

Illustrate the effect of legislation and ethics in developing the project plan by comparing code of ethics of one foreign and one local Engineering Authority and discussing the ethical implications of decision making in choosing the solution to the identified engineering problem. Undertake a feasibility study to justify project selection by performing simple risk assessment and life cycle costing amongst the solutions under consideration. Create a project plan for the engineering project by developing a simple scope of works and schedule of works for the distinct activities involved up the end of the design stage. Select an appropriate engineering-based project, giving reasons for the selection by researching EEET websites for appropriate research projects or using real life E&I work problems and supporting with ten secondary sources of information such as websites, journals, etc.

# Feasibility Study for M1:

* Government mandated for both CNG and EV as well as a business opportunity project for the dealer (gas station)
* Incentives were provided for persons to convert to CNG (taxis).
* Influx of EV into country due to reduced taxes and inadequate charging points
* State the solution or range of applicable alternative solutions available to meet the requirement of the topic.
* Determine design requirements for the solution(s) you stated above (labour, materials, equipment) this is already covered in the scope for P2.
* ~~Investigate solution(s) concepts using simple life cycle cost (LCC) analysis using elementary costs such as capital cost, maintenance cost, return period and salvage cost.~~

|  |  |  |
| --- | --- | --- |
| ~~Items for MET~~ | 1. ~~NGC supply~~ | 1. ~~Trucked Supply~~ |
| ~~Batteries for EEET~~ | 1. ~~Lead acid~~ | 1. ~~Gel~~ |
| ~~Capital cost~~ | ~~TT$ 50,000.~~ | ~~TT$ 75,000.~~ |
| ~~Maintenance cost (10-year life cycle)~~ | ~~$1000 per month x 12 months x 10 years = $120,000.~~ | ~~$750 per month x 12 months x 10 years = $90,000.~~ |
| ~~Salvage cost~~ | ~~$5000.~~ | ~~$15000.~~ |
| ~~LCC 10 year~~ | ~~$175,000.~~ | ~~$180,000.~~ |

* For the feasibility report, discuss the legal aspects of selling electricity for EVs, you will sell the space by time at the charging port. Say TT$50. Per half hour and work out cost of system and how long it will take to pay back the cost. Also you can discuss the theory of using the spare capacity to supplement electricity requirement for convenience store etc.
* ~~identify the results of the~~ **~~risk assessment~~** ~~of each solution(s) in terms of~~ **~~scope, time, cost (economic), design, technical, environmental~~****~~or~~**~~other considerations surrounding the problem/opportunity.~~ Electrical and Mechanical project problems will be unlikely to have social issues and each student would be treating with **political and legal constraints in legislation and ethics section for D1.**
* ~~Shortlist top two or three solutions from results of simple analysis above~~
* ~~Make selection based on analysis~~

~~Risk Assessment format~~

|  |  |  |
| --- | --- | --- |
| ~~Category~~ | ~~Risk~~ | ~~Mitigation measure~~ |
| ~~Scope~~  ~~Time~~  ~~Cost~~  ~~Design~~  ~~Technical~~  ~~Only E, T and E of PESTLE~~ | ~~The major risk per category~~ | ~~The major mitigation measure for the major risk~~ |

# Political and legal constraints in legislation and ethics section for D1.

|  |  |  |  |
| --- | --- | --- | --- |
| Criteria | UK or US/ International | T&T | Comment |
| Ethics | RAE, EC, NSPE  Student to provide write-up from the above on ethics | Professional Engineering Act 1985 | Discuss the ethical implications of decision making in choosing the solution to the identified engineering problem |
| Legislation | UKSPEC, EC, RAE  Student to provide write-up from above on legislation with respect to qualifications | Professional Engineering Act 1985 | Discuss the legislative issues surrounding the qualifications of professionals chosen to execute projects and make decisions accordingly as they are professionally bound to act in an ethical manner under their registration |

# Gantt Chart instructions:

I have seen students list tasks which they will NOT actually be doing.

Separate your tasks into three to four stages below:

**Student is required to submit a schedule in the Proposal for ALL three aspects (assignments) of this course i.e., the proposal, the report and the presentation.**

1. Proposal due in week 6, meaning the following activities should happen within the first 6 weeks of the course:

Restate problem (CNG system design and installation) and select project solution – start date and end date

perform secondary research – start date and end date

create project plan – start date and end date

perform feasibility study - start date and end date

determine legislation ethics on decision making - start date and end date

prepare logbooks weekly - start date and end date W1 to W15

2. Report due in week 13, meaning the following activities should happen within week 6 and week 13 of the course:

prepare logbooks weekly

conduct project activities – start date and end date

explore alternative solutions

critically evaluate own behaviours, make recommendations for improvement

prepare and execute primary research (questionnaire)

analyse and prepare discussion

prepare project report

3. Presentation due in week 15, meaning the following activities should happen within week 13 and week 15 of the course:

Select and prepare appropriate method for audio visual presentation

Challenges and value gained

Success of project and justified improvements

Self-reflection on own performance

4. Implementation – not an actual MPEP course requirement

All and any construction or other activities that you will NOT actually be doing

Develop an outline project brief and design specification:

How many vehicles do you need to fill simultaneously? And at what rate?

# Scope of Works for MET CNG:

Major design components for a CNG System (for MET students read in conjunction with list of drawings that need to be prepared):

1. Natural gas supply: pipeline or trucks or portable unit (MRU)or mobile refueling unit? Pressure?
2. Metering and Regulation Station: stabalize pressure, remove liquids, add odourant, metering type (orifice plate or ultrasonic)
3. Compressors: inlet and outlet pressure? Electricity supply? Voltage? Separate transformer and panel?
4. Storage tanks: number of tanks, volume, pressure and control interface
5. Dispenser: number of dispensers, number of hoses, pressure? Safety mechanisms?

# Engineering Deliverables for MET CNG:

**Engineering drawing list for MET CNG project**

Chemical & Process drawings: Process Flow Diagrams, Process and Instrumentation Diagrams

Mechanical and Piping drawings: Isometric Piping drawings, Piping general arrangement or layout, sections, elevations, details for metering/regulator station, compressor, storage tanks and dispensers

Electrical, Instrumentation and Control drawings - single line diagrams, electrical supply, panels, wiring, grounding layout and details, cable trays, perimeter lighting, for metering/regulator station, compressor, storage tanks and dispensers

Civil & Structural drawings - general arrangement or layouts of foundations for metering/regulator station, compressor and storage tanks and dispensers, pipe supports and electrical infrastructure supports, drainage and perimeter fence and collision mitigation devices, pedestal foundations for perimeter lighting

Specifications for any materials, plant and equipment needed to be purchased.

# **Scope of works for EEET EV**

**Components needed for a solar charging station (for EEET students) assume off-grid**

1. EV charger
2. Solar panel array, installed on roof, ground or canopy
3. Battery energy storage system (ESS, in case of an Off-Grid Solar energy charging station)
4. Solid foundation, in case of a stand-alone solar charging canopy (Often used: a steel base plate that functions as ballast, so no foundation is required, simplifying the installation) (Comm Tank 2022).
5. Intelligent software
6. Cabling, trays and junction boxes, grounding etc,

What are the assumptions or parameters for the design, for example you are required to charge two cars simultaneously from 6am to 10pm. Use any existing design of a liquid fuel station as your basis for installation.

# Engineering Deliverables for EEET EV:

**Engineering drawing list for EEET EV project**

Chemical & Process drawings: Not applicable

Mechanical and Piping drawings: Minimal to zero - maybe a cooling system for batteries or chargers

Electrical, Instrumentation and Control drawings - single line diagrams, backup electrical supply, panels, wiring, grounding layout and details, cable trays, perimeter lighting, BATTERIES, SOLAR PV Panels, EV charging station dispenser, Control Room interface (HMI), inverters/transformers, automatic transfer switch (ATS) for low solar periods, etc.

Civil & Structural drawings - general arrangement or layouts of foundations for structural supports for PV panels, electrical infrastructure supports, perimeter fence and collision mitigation devices, pedestal foundations for perimeter lighting, EV dispenser platforms, battery storage and protection for inverters/transformers, car parking and access/egress

Specifications for any materials, plant and equipment needed to be purchased such as the PV panels, batteries for ESS, panels and switchgear and the charging station

# References for sample purposes

AFDC. n.d. https://afdc.energy.gov/fuels/natural\_gas\_cng\_stations.html.

CNGTT. n.d. https://cng.co.tt/what-is-cng/#:~:text=Compressed%20Natural%20Gas%20(CNG)%2C,and%20diesel%20fuels%20for%20vehicles.

2022. *Comm Tank.* 20 01. Accessed 01 20, 2022. https://www.commtank.com/services/gas-station-construction-company/.

Power, paired. n.d. *Lead the charge, drive solar.* https://pairedpower.com/.