



REDESIGNING THE PHILIPPINE MECHANICAL ENGINEERING PROGRAM TO PROMOTE REGIONAL DEVELOPMENT

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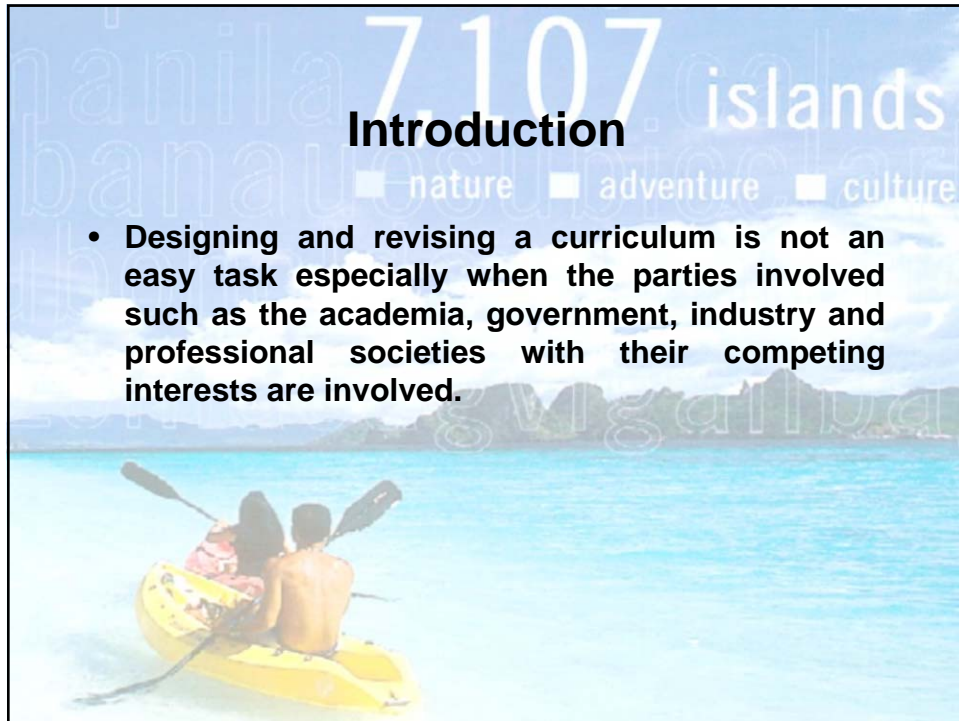
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Outline of Presentation

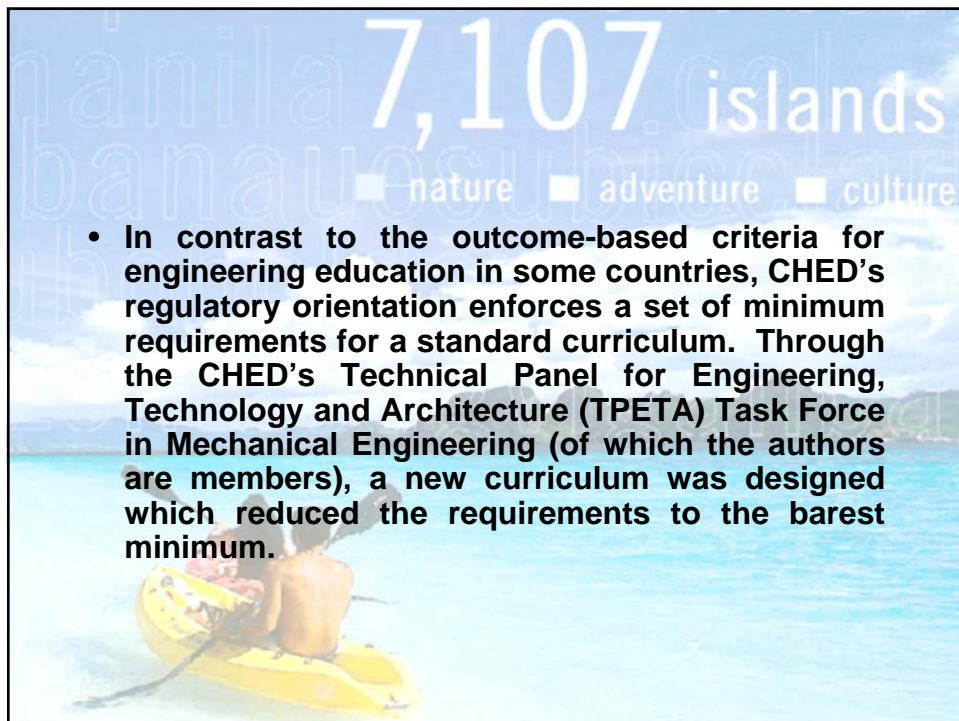
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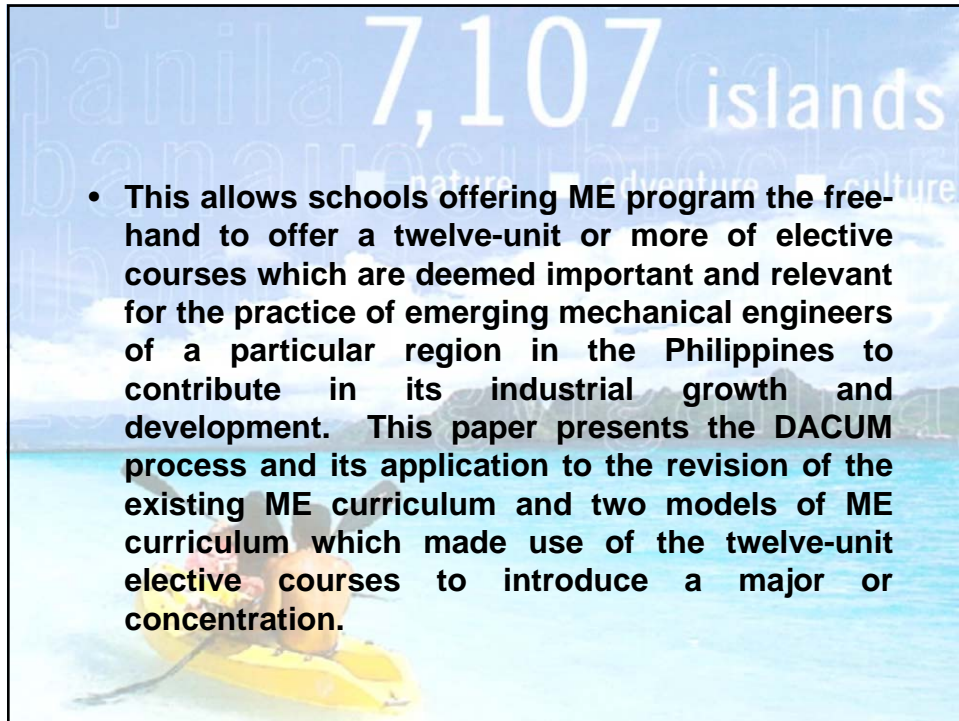
Introduction

- **Designing and revising a curriculum is not an easy task especially when the parties involved such as the academia, government, industry and professional societies with their competing interests are involved.**



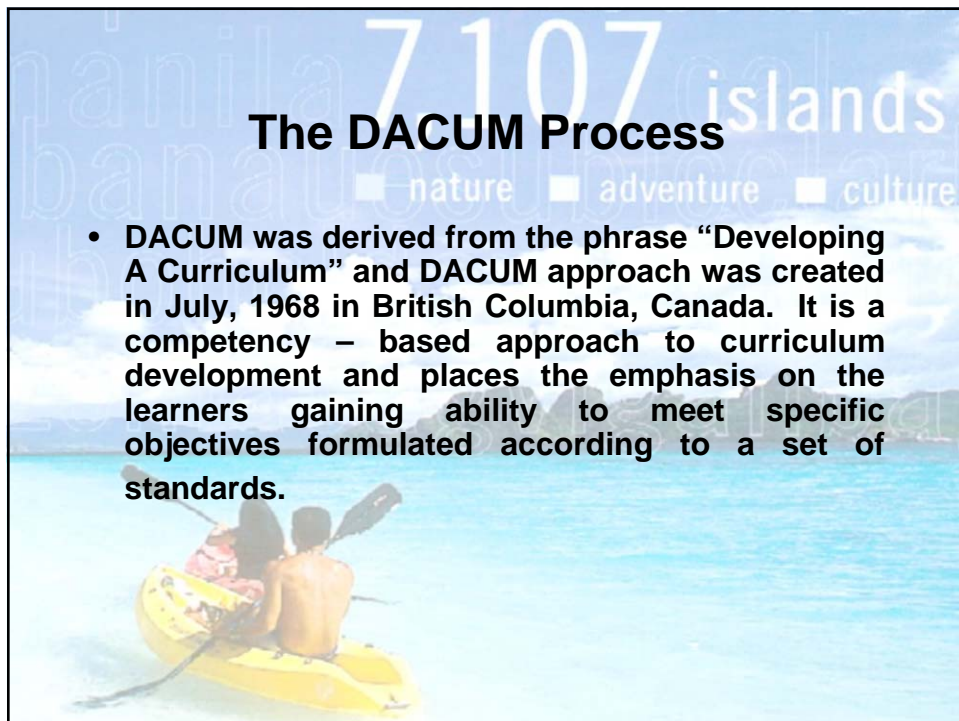
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- **In contrast to the outcome-based criteria for engineering education in some countries, CHED's regulatory orientation enforces a set of minimum requirements for a standard curriculum. Through the CHED's Technical Panel for Engineering, Technology and Architecture (TPETA) Task Force in Mechanical Engineering (of which the authors are members), a new curriculum was designed which reduced the requirements to the barest minimum.**



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- This allows schools offering ME program the free-hand to offer a twelve-unit or more of elective courses which are deemed important and relevant for the practice of emerging mechanical engineers of a particular region in the Philippines to contribute in its industrial growth and development. This paper presents the DACUM process and its application to the revision of the existing ME curriculum and two models of ME curriculum which made use of the twelve-unit elective courses to introduce a major or concentration.



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The DACUM Process

- DACUM was derived from the phrase “Developing A Curriculum” and DACUM approach was created in July, 1968 in British Columbia, Canada. It is a competency – based approach to curriculum development and places the emphasis on the learners gaining ability to meet specific objectives formulated according to a set of standards.

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According to Mancebo, DACUM is based on three assumptions as follows:

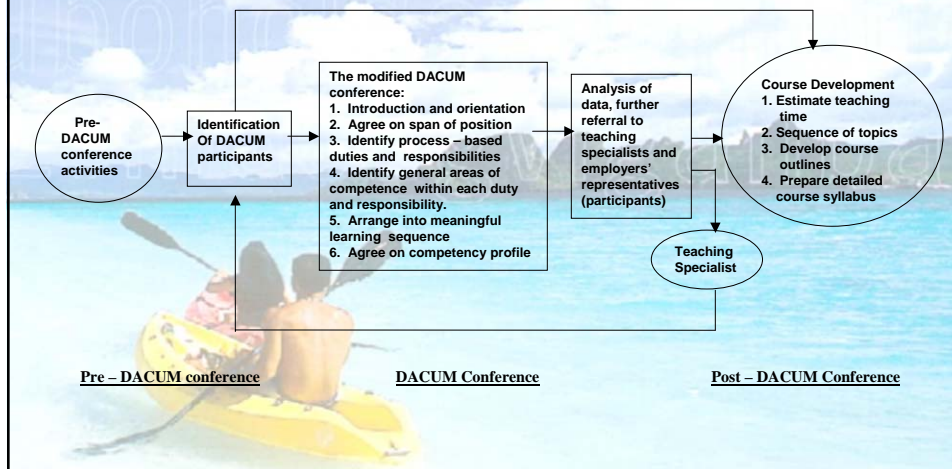
1. Expert workers can define and describe their job more accurately than anyone else.
2. Any job can be effectively described in terms of the tasks that successful workers in that occupation perform.
3. In order to be performed correctly, all tasks demand certain knowledge and attitudes from workers.

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- The DACUM process consists of four components namely:
 - (1) the selection of workshop participants,
 - (2) the DACUM workshop,
 - (3) data analysis and
 - (4) the development of the course.

Process Flow of the various components of the DACUM approach to curriculum development (Mancebo, 1994)



Applying the DACUM Process to ME Curriculum Revision

The initial step to develop the mechanical engineering curriculum using the DACUM process was to establish the profile of duties and responsibilities of an engineer in general.

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Several duties were identified during the workshop, which includes:

1. **Conceptual Design**
2. **Research**
3. **Project Planning**
4. **Technology Innovation**
5. **Systems Development**
6. **Supervision of Personnel, Project and Operation**

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Identification of Courses for the ME Curriculum

The following specific objectives which were primarily based on ABET Criteria were formulated in coming up with the new ME curriculum that will provide quality education for global competitiveness:

1. **Develop ability to apply knowledge of mathematics, science and engineering.**
2. **Develop ability to design and conduct experiments, as well as to analyze and interpret data.**
3. **Develop ability to design a system, component or process to meet the desired need.**
4. **Develop ability to function on multi-disciplinary team.**

5. Develop ability to identify, formulate and solve engineering problems.

6. Develop an understanding of professional and ethical responsibility.

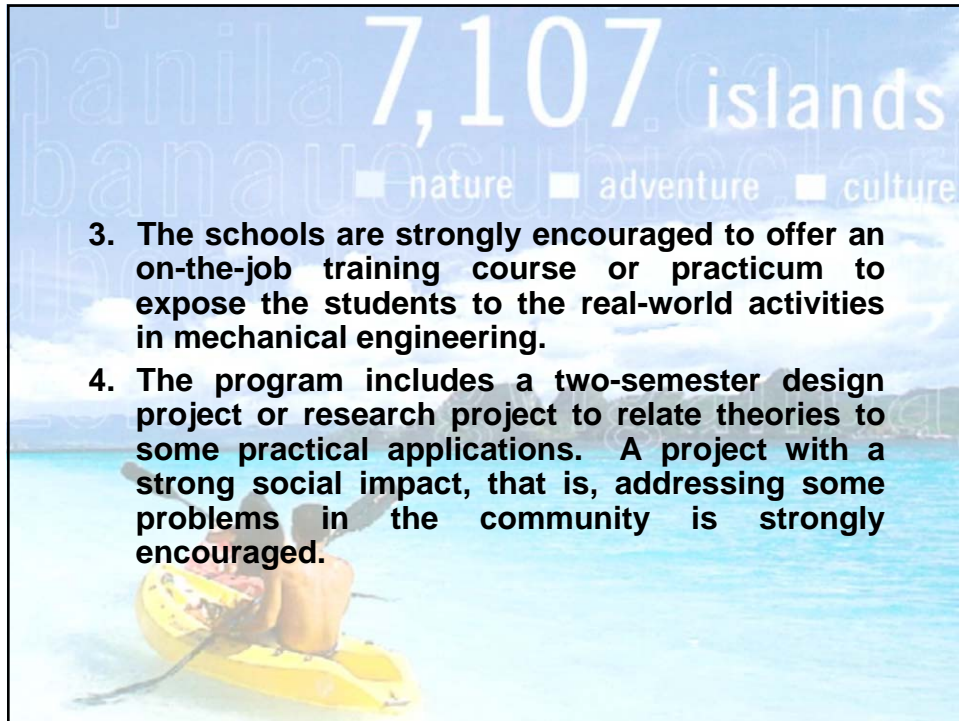
7. Develop ability to communicate effectively.

8. Develop an understanding of the impact of engineering solutions in a global and societal context.

9. Develop ability to use techniques, skills and modern engineering tools necessary for Mechanical Engineering practice

The changes made in the existing ME curriculum are summarized as follows:

- 1. The allotted credit units to traditional courses such as machine design, power plant design and industrial plant design courses are reduced to the barest minimum.**
- 2. The number of units allotted for electives courses is increased to twelve units. These courses may be utilized to introduce a major or concentration relevant to the industrial needs of the region where the school is located to promote regional development.**



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3. The schools are strongly encouraged to offer an on-the-job training course or practicum to expose the students to the real-world activities in mechanical engineering.
4. The program includes a two-semester design project or research project to relate theories to some practical applications. A project with a strong social impact, that is, addressing some problems in the community is strongly encouraged.



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Introducing Concentrations in the ME Program To Promote Regional Development

Two schools offering ME namely- De La Salle University- Manila and Mapua Institute of Technology have prepared their curricula utilizing the twelve-unit elective courses for their major or concentration such as mechatronics engineering and HVAC&R System Design, respectively.

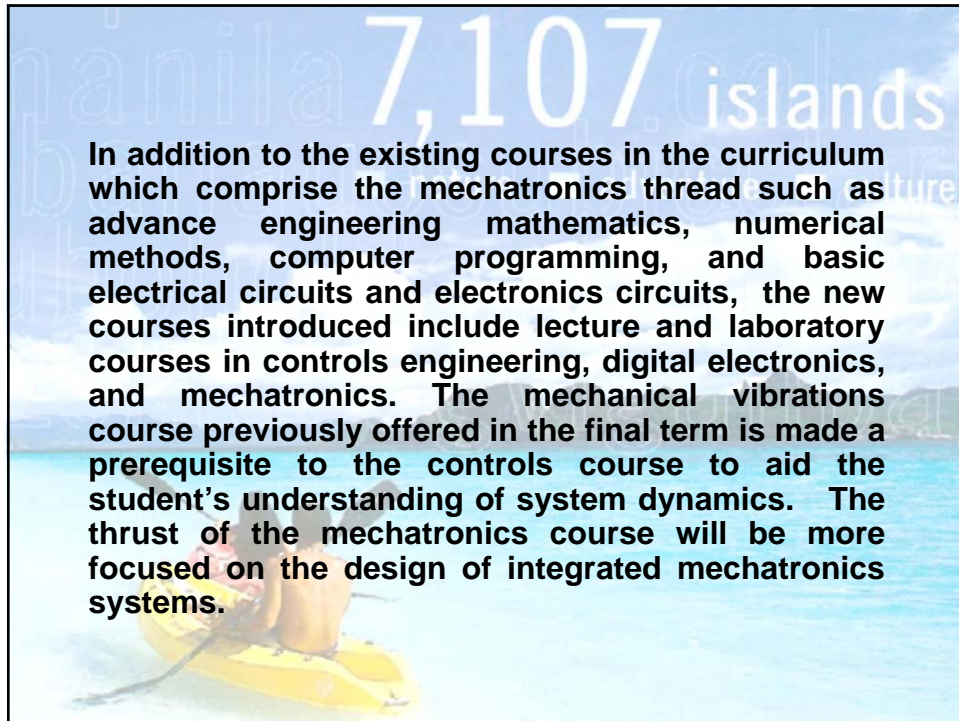
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These schools are located in Manila, the capital of the Philippines and a highly industrialized city in the National Capital Region. Mechatronics engineering and HVAC and R System Design applications in various industries found in the metropolitan area will definitely contribute to region's further development. The ME curricula designed by these schools will serve as models for other schools in the Philippines in redesigning their ME curricula.

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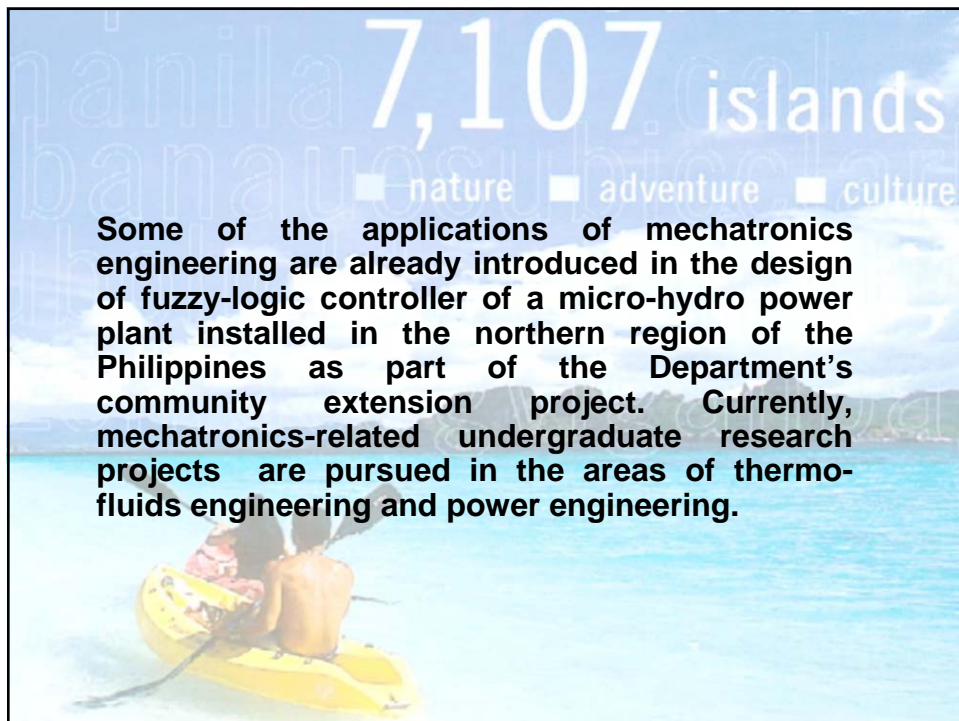
Mechatronics Concentration in the Mechanical Engineering Program of De La Salle University-Manila

The ME curriculum is revised with these points in mind. A one-unit orientation course is introduced in the first year to give the students an overview of the mechanical engineering profession and an inkling of engineering design (with emphasis on mechatronics design) at the conceptual level.



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In addition to the existing courses in the curriculum which comprise the mechatronics threads such as advance engineering mathematics, numerical methods, computer programming, and basic electrical circuits and electronics circuits, the new courses introduced include lecture and laboratory courses in controls engineering, digital electronics, and mechatronics. The mechanical vibrations course previously offered in the final term is made a prerequisite to the controls course to aid the student's understanding of system dynamics. The thrust of the mechatronics course will be more focused on the design of integrated mechatronics systems.



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Some of the applications of mechatronics engineering are already introduced in the design of fuzzy-logic controller of a micro-hydro power plant installed in the northern region of the Philippines as part of the Department's community extension project. Currently, mechatronics-related undergraduate research projects are pursued in the areas of thermo-fluids engineering and power engineering.

HVAC and R System Design Concentration in the ME Program of the Mapua Institute of Technology

The Heating, Ventilating, Air-Conditioning and Refrigerating (HVAC and R) System Design concentration in the ME program of the Mapua Institute of Technology has its primary objective the students' understanding of the fundamentals of air-conditioning and refrigeration systems, their components and accessories including the electrical components of such systems, and the students' applications of such knowledge in their design or research project.

map of the philippines



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Iloilo City



3 | Subic/Clark
Subic Bay



5 | Palawan
El Nido



4 | Cebu/Bohol
Magellan's Cross

When redesigning the ME curriculum, therefore, the school must consider the major industries and products in the region to align their elective courses to the needs of such industries. The Philippines which is basically an agro-industrial country is divided into sixteen regions. Each region has identified its major products and industries.



2 | Ibahe
Ibahe Terraces



7 | Iloilo
Iloilo District



6 | Boracay
White Sand



8 | Davao
Mt. Apo

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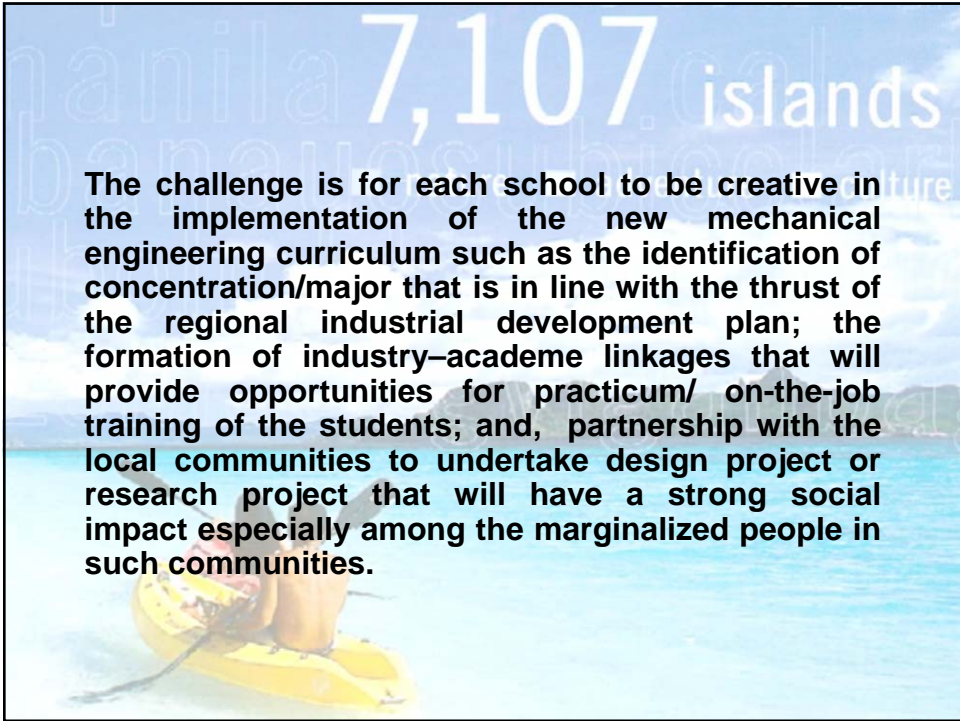
All regions produce same kind of agricultural products and are engaged therefore in food processing. The mountain regions have mineral resources and forest products. The coastal regions have aquaculture and mass transportation operation. Other major industries include machineries, milling, handicrafts, textiles and garments, energy and tourism.

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Conclusion

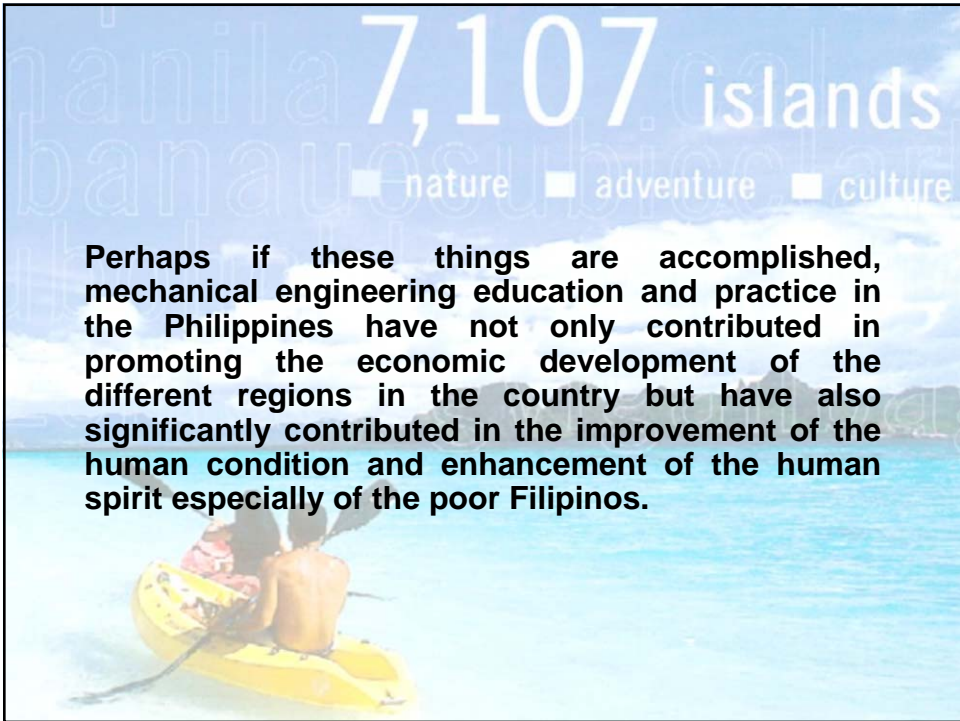
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With the participation of the various stakeholder in mechanical engineering education such as the industry, academia, government, and professional societies in the DACUM process, there is no doubt that their concerns are taken into consideration in redesigning the Philippine mechanical engineering program.



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The challenge is for each school to be creative in the implementation of the new mechanical engineering curriculum such as the identification of concentration/major that is in line with the thrust of the regional industrial development plan; the formation of industry-academe linkages that will provide opportunities for practicum/ on-the-job training of the students; and, partnership with the local communities to undertake design project or research project that will have a strong social impact especially among the marginalized people in such communities.



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Perhaps if these things are accomplished, mechanical engineering education and practice in the Philippines have not only contributed in promoting the economic development of the different regions in the country but have also significantly contributed in the improvement of the human condition and enhancement of the human spirit especially of the poor Filipinos.

