社会開発協力部報告書

No. 7

フィリピン工科大学
総合技術訓練センター
計画打合せチーム報告書

昭和60年11月

国際協力事業団
社会開発協力部

フィリピン工科大学
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序　　文

本プロジェクトは，フィリピン国の要請に基づき，昭和５６年に無償資金協力により，施設建設及び機材供与が行われ，引き続き昭和５７年１１月３日，５年間の技術協力実施に係る討議議事録（Ｒ／Ｄ）が締結された次第であるが，現在，フィリピン国の教術教育のレベルの向上を目的に順調にとり進められている。

昨年８月の巡回指導チームの派遣から１年を経て，Ｒ／Ｄの協力期間も残すところ２年を迎えた今般，本プロジェクトの協力実施に係るレビューを行い，今後の方向性を見極めるため，当事業団は計画打ち合せチームを派遣した。

同チームは，東京工学大学内藤喜之教授を団長として，昭和６０年９月１９日から同年９月２６日まで派遣され，フィリピン国政府プロジェクト関係者及び日本人専門家チームと精力的に協議を行ない，プロジェクトの実施状況を調査した。

本報告書は，この調査結果をとりまとめたものである。

本調査の実施に関し，多大なご協力をいただいた関係者各位に対し，深甚なる謝意を表する次第である。

昭和６０月１１月

国際協力事業団

理　事　　中　澤　弋　仁

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第１章　チームの派遣

１－１　チーム派遣の目的

協力開始後２年半を経過した本プロジェクトの実績を評価し，問題点を明らかにした上でプロジェクトの残り期間における計画についてその基本方針を策定し，計画内容を検討する。

また，プロジェクトの実施上の問題点について，その解決をはかる。

１－２　チームの構成

総括・電気電子工学	内藤喜之	東京工業大学教授
機械工学	川勝邦夫	舞鶴工業高等専門学校 助教授
計画管理	木郷洸一	ＪICA海外センター課

１－３　期間及び日程

昭和６０年９月１９日～昭和６０年９月２６日

月日	曜日	行程	調査内容
9／19	木	東京－(PR431)→マニラ	大使館，ＪICA表敬，打合せ
20	金	マニラ	日本人専門家チームとの打合せ （実績評価，問題点把握，今後の計画）
21	土	〃	
22	日		
23	月	マニラ	TUP学長表敬，General Meeting，C／Pとの打合せ
24	火	〃	ロハス所長との打合せ，ミニッツ準備
25	水	〃	Joint Steering Committee／ミニッツ署名／大使館ＪICA報告
26	木	マニラ－(PR432)→東京	

1－4　調査結果概要

チームは，日本人専門家チーム，ＴＵＰ学長他運営陣ＩＲＴＣロハス所長及びカウンターパートとの打合わせを行い，本プロジェクトの実績について調査した。その結果，C/Pの日本研修に一部問題はあったものの本プロジェクトの進捗状況は非常に良好で，特にアウトプットとしてTEXTやマニュアルが，日本人専門家の協力のもとに精力的に作成されており，今後も引続き成果が期待できるものである。

また，今後の基本方針として残りの協力期間をできるだけ効果的なものにするため，今までの科目を学問大系にまとめる方向でカリキュラムを編成し，今までの成果を，より一層高めるものとし，日本人専門家チーム及び「比」側の了解を得た。（資料参照）

その他に，テクニシャンの増員，ＩＲＴＣ機材配置スペースの再考，ＩＲＴＣコースのＣＯＥ，ＣＩＴのカリキュラムへの統合及び単位としての承認について，本プロジェクトの効果的な実施のために必要であるとの意見の一致を見た。

以上は，９月２５日開催されたＪＯＩＮＴ　ＳＴＥＥＲＩＮＧ　ＣＯＭＭＩＴＴＥＥにおいて確認され，チームとしては，チーム団長とＴＯＰ学長の間に，別添のとおりミニッツが署名交換された。

なお，今後の日本側投入計画については，今回の調査結果をもとに，具体化されてゆくものである。

TECHNOLOGICAL UNIVERSITY OF THE PHILIPPINES
M a n i l a

The Japanese Technical Cooperation Program

for

The Integrated Research

and Training Center Project

MINUTES OF DISCUSSIONS ON

The Mutual Consultation for the

Integrated Research and Training Center Project

September 19 - 26, 1985

MINUTES OF DISCUSSIONS

ON

THE MUTUAL CONSULTATION FOR THE

INTEGRATED RESEARCH AND TRAINING CENTER PROJECT

The Mutual Consultation Team of the Japan International Cooperation Agency (JICA), headed by Dr. YOSHIYUKI NAITO (Professor, Tokyo Institute of Technology), has been dispatched to the Republic of the Philippines from September 19 to 26, 1985 for the purpose of carrying out an evaluation of the performance of the Integrated Research and Training Center (IRTC) Project since the signing of the Records of Discussion in 1982.

The team conducted a field survey and held a series of discussions with the Philippine Authorities concerned to grasp the existing condition and problems of the IRTC Project and to examine the betterment of it.

As a result of discussions, both parties have agreed as mentioned in Annex attached herewith.

25th September, 1985

DR. YOSHIYUKI NAITO
Leader, The Japanese
Team, JICA

DR. JOSE R. VERGARA
President, Technological
University of the Philippines, The Republic of the
Philippines

Technological University of the Philippines
INTEGRATED RESEARCH AND TRAINING CENTER
M a n i l a

SUMMARY AND HIGHLIGHTS

As a result of the discussions in the General Meeting between the Japanese Mission and the TUP-IRTC Team, the JICA experts in the IRTC and the Branch meetings with the counterparts in each field, 5-point items were considered most significant in the course of implementation of the IRTC project:

1. Immediate hiring of additional technicians for proper care, upkeep and maintenance of equipment and precision machines.
2. Allocation of additional space and facilities for the installation of new equipment that will be arriving next year and the arrangement of Foundry laboratory.
3. Efforts will be exerted to develop a system by which journals will be sent by JICA to IRTC on a continuing basis.
4. The remaining two (2) years will be used to put together and integrate existing programs into new programs in an academic way.
5. To cause an integration of the training programs developed in IRTC into the curriculum of COE and CIT. As an immediate measure, all basic and advance training programs for COE and CIT students will be given credits.

Members of the Japanese Mission for the Japanese Technical Cooperation to the Integrated Research and Training Center, Technological University of the Philippines

DR. YOSHIYUKI NAITO	Professor, Tokyo Institute of Technology
PROF. KUNIO KAWAKATSU	Professor, Maizuru Technical College
MR. SENICHI KIMURA	Japan International Cooperation Agency (JICA), Tokyo

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DR. JOSE R. VERGARA	President Technological University of the Philippines
DR. GALICANO J. DATU	Vice President for Academic Affairs Technological University of the Philippines
DR. ERLINDA F. MANALANG	Vice President for Administration Technological University of the Philippines
PROF. PERLA S. ROXAS	Executive Director Integrated Research and Training Center
MRS. CORAZON CS. CONANAN	Budget Officer Technological University of the Philippines

IRTC - JICA EXPERTS

PROF. JUZO YOSHIDA	Chief Advisor
DR. KOICHI UESAKI	Mechanical Engineering Expert
DR. TADASHI SHINKAWA	Mechanical Engineering Expert
DR. YOSHIHIDE YAMAO	Civil Engineering Expert
PROF. SHINJI KARASAWA	Electrical/Electronic Engineering Expert
ENGR. HIDEKI TANIMOTO	Coordinator

第２章　内藤団長総括

本プロジェクトは，昭和５７年１１月３日にＲ／Ｄの調印がなされたもので，現在リーダを含めて長期派遣専門家６名によって遂行されている。

昨年８月に巡回指導チームが渡比し，プロジェクトの進捗状況を把握し，プロジェクトのより一層の発展のために必要な事項を要求項目としてミニッツに記載した。チームの帰国後に発生した種々の問題点については，そのつどリーダならびに専門家から連絡をいただき，そのつど解決をはかって来た。

今回のチームが，比側ならびに日本人専門家と協議し，解決すべき問題として取り上げたものの大きなものは下記のごときである。

(i)　昨年のチームとかわした覚書きの内容が実行されたかどうか。

(ii)　日本で研修を受けて帰ったＣ／Ｐの評価およびそれに伴う日本で研修をうけるＣ／Ｐの人選方法のみなおし。

(iii)　本プロジェクトも残り期間が２カ年となったわけであるから，今後のテクノロジートランスファのあり方および方法を検討する。

(iv)　無償および技協で供与した機材の運用のなされ具合はどうか。

(v)　この１年間の専門家によるＣ／Ｐ教育ならびにＣ／Ｐによる学生教育の内容の把握。

まず，(i)については「比」側の努力のあとが見られた。すなわち質の良いＣ／Ｐの採用，学科の占有空間の拡大，空間の有効利用等で評価すべき実績をあげている。

しかし，ＩＲＴＣで行うコースが，まだＴＵＰ内の授業の単位として認められておらず，これについては，単位として認められるよう努力してほしいむねの強い要求をした。

(ii)については，２のＣ／Ｐに日本で何を行ったかをＩＲＴＣの教員全員参加の席で報告してもらった。１人は実にすばらしく立派であったが，もう１人は残念ながら研修の成果は全くあがっていなかった。

人選に問題があるのは明白であるが，ＩＲＴＣ内のＣ／Ｐに２つのグループがあり，（１つはＩＲＴＣが出来る以前からＴＵＰに在職していたグループ，もう一つはＩＲＴＣが設立されてから就職したグループ）その間のバランスもあり，日本側からあまり強く人選に対して主張することは問題があるようである。

(iii)については，この３年間のＣ／Ｐ教育が供与機材オリエンテッドなものであったが，ほぼその目的は達せられたので，今後はそれらを学問大系にもとづいた方向で整理統合する方向の教育にすることで合意を得た。「比」側から「研究」オリエンテッドな希望も出たが，それは

まだであり，まず学問の大系をきちんと理解すべきであると説明をした。

(iv)教材の運用について，今後の短期専門家派遣にまつものを除くと，故障しているもの以外はすべて活用されている。

(v)別添資料中にその内容が掲載されている。また現在教材づくりに各専門家ならびにC／Pが力を入れており，近々に数多くのテキストが出来上る予定であり，これは1つの大きい成果である。

Vergara 学長とかわしたミニッツにはすでにふれた点以外に機材の保守・管理の重要性を指摘し，テクニシャンの増員の約束をもりこんだ。

また「比」側から学術雑誌の定期購入をしてもらえないかという強い要望が再度だされたが，JICAの方で善処方をお願いいたしたい。

今回のチームには，都合によって土木関係担当者が参加できなかった関係で土木工学関係についてのつめが出来なかった。機会をみて早急に人を派遣してつめをやっていただきたい。

また明年は専門家のほとんど全員が任期を終えて交替することになっているので，早急に後任の人選を行い，十分に引きつぎが行えるように文部省および国内委員会にお願いいたしたい。

本プロジェクトは日本人専門家と「比」側関係者の協力の下に，スムーズに進行していると判断される。

最後に今回のチームの滞比中に協力して下さったTUP，IRTCの関係者ならびにリーダはじめ日本人専門家，調整員に対して，心からお礼を申し上げます。

第３章　川勝団員報告

機械工学科について

３－１　プロジェクトの実施実績と現状

(1) 訓練計画

① 専門家からカウンターパート（Ｃ／Ｐ）への訓練

〔評　価〕 順調に進行している。

〔背　景〕 i 長期，短期専門家の派遣が，計画通の進行し引継ぎも円滑であった。

ii 無償供与機材が，そのまま訓練用教材として活用できた。

iii 昨年度より長期派遣専門家が１名増員された。

② Ｃ／Ｐから学生への訓練

〔評　価〕 順調に進行している。

〔背　景〕 i プロジェクト開始から２～３年間は，基礎訓練期間として位置づけし，無償供与機材並びに初年度供与機材についても，その操作法と基礎訓練事項等をＣ／Ｐに対して集中的に訓練を実施した。その結果，訓練を修了したＣ／Ｐが早期にＣＩＴ等の学生への訓練が実施できた。

ii Ｃ／Ｐが我々の予想以上に積極的に訓練を受け，学生への訓練も実施してきた。

〔備　考〕 i プロジェクト開始当初より，Ｃ／Ｐの数が多ければ，それ相当に学生訓練の実績が残せたであろうと推察できる。

(2) 教材作成

〔評　価〕 マニュアル，テキスト等の教材作成は積極的に推進されている。

〔背　景〕 i 専門家一同が本プロジェクトにおいて“将来に残せる最大の財産は，教材である”との認識に立って積極的に取り組んできている。

ii Ｃ／Ｐの多くが教材の必要性と有効性を理解するとともに，教材作成に強い関心を持ってきた。

(3) 機材活用

〔評　価〕 既設の機材については，故障しているものを除き，そのほとんどが，Ｃ／Ｐへの基礎訓練を完了し，学生訓練に活用されている。

〔背　景〕 i プロジェクト開始当初より基礎訓練期間を設定し，無償供与機材並びに初年度分供与機材についても，まず稼動させる努力をしてきた。

ii 供与機材の要求に際し，可能な限り次期専門家と連携をとって立案し，

購入することができた。

iii　専門家が，各自の専門分野にとらわれず幅広く担当されてきてきた。

3－2　「比」側プロジェクト実施体制

(1)　予算措置・ローカルコスト負担

〔評　価〕　少しずつではあるが，ＴＵＰ側の積極的な姿勢が認められるものの，まだ専門家の要求が十分に満たされない事例が多い。

〔背　景〕　i　昨今のフィリピン経済の悪化

ii　予算執行システムの相違

iii　ＴＵＰ関係者のＩＲＴＣに対する認識の相違

〔対　応〕　今後とも改善されるよう関係者に強く要求する必要があると考える。一方，ＴＵＰ側関係者のＩＲＴＣに対する認識が高まってきていることや，財務担当者との良好な人間関係が得られたこと等のプラス要因もあるので，今後に期待はもてると思われる。

当面の対応については，現地業務費からの援助や一時立て替え払い等，日本側の柔軟な対応が不可欠であろう。

(2)　Ｃ／Ｐ，テクニシャンの配置

○Ｃ／Ｐについて

〔評　価〕　良好である。６０年度２名の増員があった。さらに増員計画があることが，ＴＵＰ側より示された。

〔背　景〕　i　ＴＵＰ側関係者の多くが，ＩＲＴＣの存在価値を徐々にではあるが，真に理解してきた。

ii　毎年度到着する供与機械と現状のＣ／Ｐの数を比較したとき，明らかにＣ／Ｐの数が不足していることが，現実の問題点として理解されてきた。

iii　チームリーダはもとより専門家一同のＣ／Ｐ増員要求に対する地道な努力が実現した。

○テクニシャンについて

〔評　価〕　現在２名のみであり不足している。

〔背　景〕　今までから要求されていたものの，さし当ってはまずＣ／Ｐの増員要求を主として対処してきた経緯がある。

〔対　応〕　供与機材が相当数となった現在，これらを有効活用するための大前提として，機材の保守管理は欠かせないものである。現状の２名にこれらを全て

任せることは無理である。したがって，C／Pの増員要求が善処されたので，次にはテクニシャンの増員をTUP側に要求する。この件に関しては，TUP側の合意を得た。これを受けて将来計画実施のために必要なC／Pとテクニシャンの具体的な増員計画の立案を専門家に依頼した。

(3) 機材，設備等

〔評　価〕 将来計画を考慮し，既設の実験室ならびに諸機材のレイアウトが改善されたことは高く評価できる。

〔背　景〕 i 今までの配置では今後到着する供与機材の有効配置が困難となり，訓練計画実施上大きなマイナス要因となることが，やっとTUP関係者に理解された。

ii 供与機材が多数到着した現状をつぶさに見て，実験室並びに諸機材のレイアウト改善が現実の問題点として認識された。

iii チームリーダはもとより専門家一同の地道な努力の成果

〔対　応〕 TUP側関係者に次の要望事項を伝えた。

i IRTC内の残ったスペースの有効活用への協力要請。

ii 鋳造工場の改修をすみやかに推進すること。

3－3 プロジェクト到達目標のレビュー，将来計画の明確化について

〔経　緯〕 本プロジェクト開始当初前田チームリーダは，到着目標に関してはR／Dに記された精神を尊重するものの，実際にプロジェクトを展開し，その実績を踏まえてこそ確かな到達目標が定まると考えられた。この考えのもとに具体的な展開として，プロジェクト開始から1～3年間を基礎訓練期間とし，3～5年間を応用訓練期間と定められて，基礎訓練から応用訓練への移行期に到達目標を見直すことで進められた。この思想は，以降の専門家にも継続されてきた。

本年度は，プロジェクトの開始後3年目に当り，半ばも過ぎたし，応用訓練期への移行期にも当るので，今までの訓練実績や比国の諸条件の変化と現状，さらには工業技術教育の理念等を考え合せて，本プロジェクトの到達目標をひとまず確立すべ時期を迎えたといえる。

〔問題点〕 現時点で考えられる主な問題点として次のことが指摘できる。

i プロジェクト完了後のIRTCの位置づけについてTUP側関係者において検討が進められているものの，まだ確定していない。

ii 比国における現状の教育体制は，機械工学の学問体制にそぐわない。

このことは，ＴＵＰ側関係者も認めるところである。

〔将来計画〕　上記の問題点に対して，次の対応をすることにより，これを将来計画のレビューとする。

ｉ　ＩＲＴＣの将来の位置づけは，ＴＵＰ側の責任領域であるといえるが，我々プロジェクト側としては“ＣＯＥもしくは大学院相当の高等工業技術教育を援助できる体制を確立する”ことで専門家一同合意した。

ii　今後の展開（訓練カリキュラム，派遣専門家，機材供与等）においては，機械工学の学問体制にのっとり進めることとする。具体的には，熱，流体，材料設計，制御，加工といった機械工学を構成する主要な科目グループに分類して展開する。従来の自動車工学や冷凍・空調工学……等は，上記のグループに包含するものとする。

〔備　　考〕　これらの判断は，本プロジェクトの将来展開にとって大きな意味をもつものである。この結果は，Ｒ／Ｄの精神にも合致しておぬ，しかもプロジェクト終了後のＩＲＴＣの自動発展の可能性と自由度を高めることになる。

３－４　今後の訓練計画，プロジェクト実行計画

Ｃ／Ｐへの訓練，学生への訓練，派遣専門家，供与機材等の具体的計画を表１に示す。

(1)　専門家派遣について

次期派遣専門家の人選が可能な限り早期に決定するよう，関係者一同に特に要望する。私の経験から言えることは，人選が早期に円滑に進むか否かは，残り少ないプロジェクト期間を思うにつけ，プロジェクトの成果に直接影響をおよぼす要因と云う。

本年度分短期派遣専門家については，次の通り確認された。

ｉ　機械加工担当の短期専門家について

当初は，ＮＣ工作機械の訓練可能専門家の要請であったが，これを歯車形削盤の訓練可能専門家の要請に変更する。その期間は約２週間でメーカの方を希望する。

ii　計測担当の短期専門家について

内藤団長より派遣予定の人選は完了しているので，派遣期日はいつがよいか？との報告がなされた。専門家と打合せの結果，６０年１２月２０日までの期間で，３週間の訓練を願いたい旨回答した。

(2)　Ｃ／Ｐ研修員の受入れ

今までにＪＩＣＡ東京に提出されている６１年度以降の派遣計画については，白紙にもどす。

今回の調査団との打合せにより，将来計画が明確になったことやＣ／Ｐの増員等の諸条

件の変化また昨年度研修を終えたC／Pの実績をも考慮し，来年度以降の人選については，すみやかに検討する。

日本側での受入れ機関については，C／Pの特質又はTUPの現状を考慮すると，できるだけアフターケアーがお願いできる高専が望ましいとの要望があった。

(3) 訓練カリキュラム

本年度以降の具体的な訓練カリキュラムを表2に示す。

(4) 機 材 供 与

将来計画と残りのプロジェクト期間を考え合せて，61，62年度供与機材の要求に関して専門家と次の合意を得た。

i 新たな部門にかかわる機材は要求しない。

ii 既設の機材と組合せる（付属する）ことにより，その機材の性能もしくは教材としての活用範囲を高めることができるようなものを要求する。

iii 全領域に活用できるもので，現状では不足している機材を要求する。

以上の基本方針のもとに，61年度要求供与機材をリストアップして，見積りをとっているところである。

3－5 総 括

(1) プロジェクトの進行状況について

昨年1年間専門家として本プロジェクトにかかわった経験を通して，現状を見たとき，本年度はC／Pへの訓練ならびに教材作成に関して著しい成果が認められる。又IRTCの将来計画を見越して，学問体制を整えた訓練カリキュラムの立案実施と実験室，機材のレイアウト改善を実施されたことは，プロジェクト運営上，実に大きな成果であると考える。この背景には，吉田チームリーダはもとより上崎，新川専門家のご努力によるところ大であることは言うまでもないが，プロジェクト開始当初チームリーダ代行として運営に当られた前田専門家の卓越したご見識とご判断ならびにご苦労を忘れることはできない。又，TUP側関係者のIRTCに対する認識の高まりも高く評価できる。

このような良好な環境と本年度の実績から，次年度の派遣専門家の人選が計画通り円滑に実施されれば本プロジェクトは，日比両国の関係者の期待通りか，それ以上の成果を残せるものと確信する。

(2) C／Pの配置について

TUPの発足の経緯からみても，C／Pの能力ならびに特質には大きな差異があることは，現状にては容認せざるを得ないであろう。しかし一方，いずれのC／Pそれぞれの経験とすぐれた特質をもっているし，我々の分らない比国流の教育実績をもっていることも

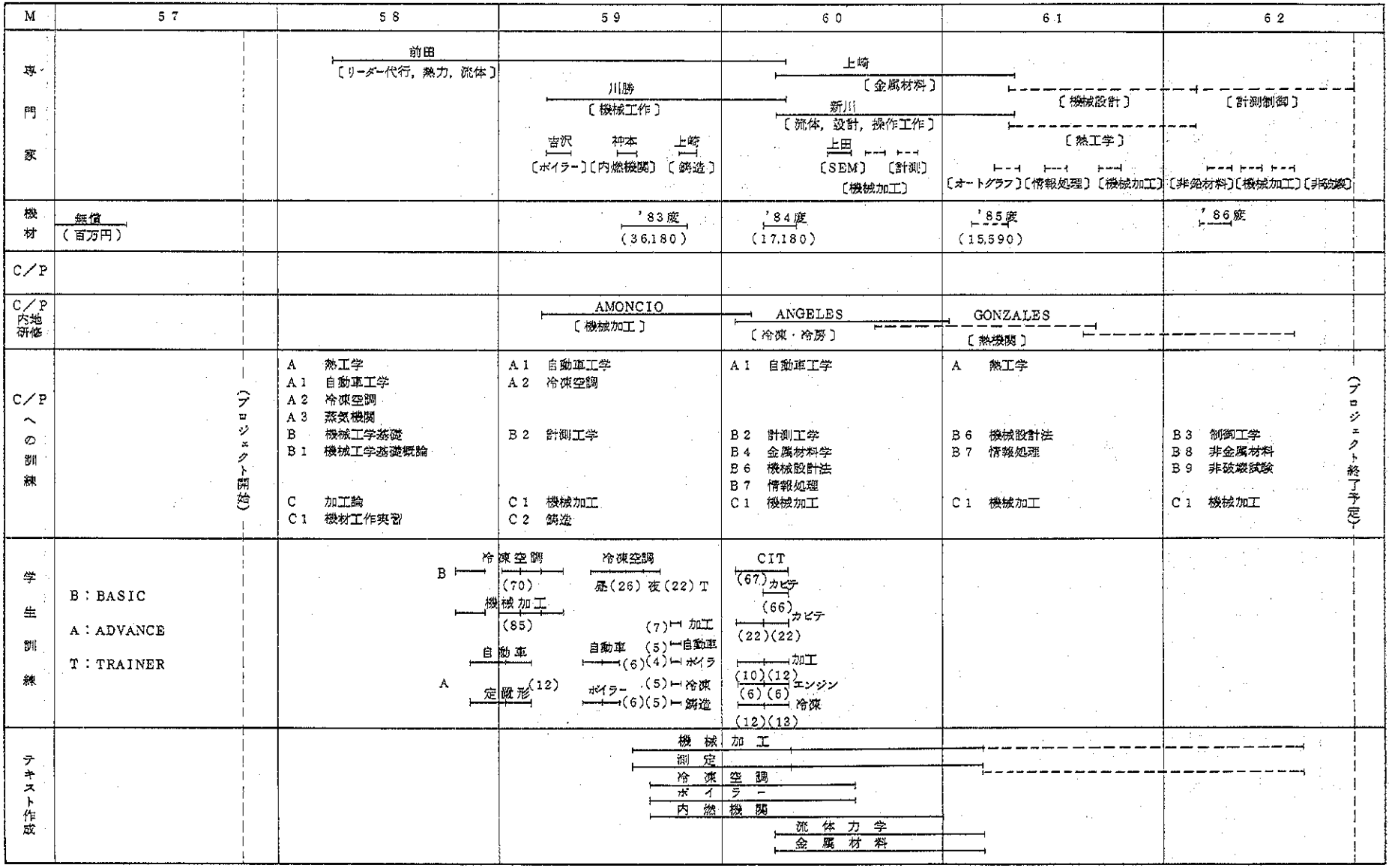
認めざるを得ない。

そこでC／Pの担当科目や配置においては，上記のことを十分認識した上で“適材適所の配置”をあえて専門家に要望する。

今後は応用訓練期間となり訓練内容が高度になること，又C／Pによる学生訓練も拡大されることは明らかであり，このような状況のもとでプロジェクト運営を円滑に進めるためには，専門家とC／Pの信頼関係が何よりも大切であると危惧するため，あえて記す次第である。

以　上

表－1　機械工学コース


M
57
58
59
60
61
62
専門家
前田
〔リーダー代行，熱力，流体〕
上崎
〔金属材料〕
川勝
〔機械工作〕
新川
〔流体，設計，操作工作〕
吉沢
〔ボイラー〕
神本
〔内燃機関〕
上崎
〔鋳造〕
上田
〔SEM〕
〔計測〕
〔機械加工〕
〔機械設計〕
〔計測制御〕
〔熱工学〕
〔オートグラフ〕
〔情報処理〕
〔機械加工〕
〔非鉄材料〕
〔機械加工〕
〔非破壊〕
機材
無償
（百万円）
'83度
（36,180）
'84度
（17,180）
'85度
（15,590）
'86度
C／P
C／P内地研修
AMONCIO
〔機械加工〕
ANGELES
〔冷凍・冷房〕
GONZALES
〔熱機関〕
C／Pへの訓練
（プロジェクト開始）
A　熱工学
A1　自動車工学
A2　冷凍空調
A3　蒸気機関
B　機械工学基礎
B1　機械工学基礎概論
C　加工論
C1　機材工作実習
A1　自動車工学
A2　冷凍空調
B2　計測工学
C1　機械加工
C2　鋳造
A1　自動車工学
B2　計測工学
B4　金属材料学
B6　機械設計法
B7　情報処理
C1　機械加工
A　熱工学
B6　機械設計法
B7　情報処理
C1　機械加工
B3　制御工学
B8　非金属材料
B9　非破壊試験
C1　機械加工
（プロジェクト終了予定）
学生訓練
B：BASIC
A：ADVANCE
T：TRAINER
B
A
冷凍空調
(70)
機械加工
(85)
自動車
定盤形(12)
冷凍空調
昼(26) 夜(22) T
自動車 (7) 加工
(5) 自動車
(6)(4) ボイラ
ボイラー (5) 冷凍
(6)(5) 鋳造
CIT
(67) カビテ
(66) カビテ
(22)(22)
加工
(10)(12)
エンジン
(6)(6)
冷凍
(12)(13)
テキスト作成
機械加工
測定
冷凍空調
ボイラー
内燃機関
流体力学
金属材料

機械工学カリキュラム

100 熱 工 学

101 熱 力 学 L

1.1 熱と仕事

1.2 完全ガス

1.3 サイクル

1.4 エントロピー

102 熱機関工学 * L

2.1 ボイラ

2.2 タービン，蒸気機関

2.3 内燃機関

103 伝熱工学 * L

3.1 熱伝導基礎

3.2 自然対流伝熱

3.3 強制対流伝熱

3.4 熱交換

104 熱工学実習

1. 内燃機関 ◎ P
2. ボイラー，タービン ◎ P
3. 冷凍，空調 ◎ P
4. 熱交換実験 ◎ X

120 機械工学基礎

121 機械設計法 * L

1. 基本通則，図学
2. 機械の要素
3. 軸及び軸継手
4. 軸受及潤滑法
5. 摩擦伝導装置
6. 歯 車
7. 巻掛伝導装置
8. ブレーキ，はずみ車
9. ば ね
10. 管，管継手，弁

実習・演習 *

1. ブラケットスタンドの設計製図 E
2. オルダムシャフト 〃 E
3. サクションヒーター 〃 E

（熱交換器）

122 流体工学 ○ L，X

1. 緒 論
2. 気液二相流
3. 連続式
4. ベルヌリーの定理
5. 流速分布（原流及び乱流）
6. ニュートン粘性法則
7. ハーゲン・ポアズイユの法則
8. デイメンション解析
9. 図上積分法
10. 対数log.log紙の利用法
11. オリフィス流量計
12. レイノルズ数の計算（Re）

11. オリフィス流量計
12. レイノルズ数の計算
13. 単位の換算
14. 実験式の換算
15. 重力換算係数
16. 流動に於ける頭損失

123 金属材料学

1. 金属の諸性質 ○ L
2. 金属変形
3. 合金状態図
4. 製鉄及び製鋼
5. 鉄－炭素状態図
6. 鋼の熱処理
7. 鋼の分類
8. 低合金鋼
9. 工具鋼
10. ステンレス鋼
11. 鋳鉄
12. 非鉄金属材料

実　験○

1. 鋼の熱処理と組成及び機械的性質との関係　X
2. 鋼の熱処理と破面検査との関係　X
3. 鋼の熱処理と疲れ強さとの関係　X
4. 鋼の炭素量と組織及び機械的性質との関係　X
5. アルミニウム合金に於ける析出硬化現象　X
6. ステンレス鋼のWeld decay　X
7. 鋳鉄の冷却速度と組織との関係　X
8. 鋼の　接部の組織及び硬度変化　X

124　非金属材料*　L

1. セメント，コンクリート
2. 耐火剤及び保温剤
3. 木材，皮，ゴム
4. プラスチック
5. 接　着　剤
6. 油　滑　剤

125　計　測　工　学*　L

1. 測定と精度
2. 計測量と変換
3. 長さ角度の測定
4. 質量，力，時間，温度の測定
5. 流体の測定

実　験*

1. デジタル測長機　X
2. 測微計　X
3. 電気マイクロメータ　X
4. ダイヤルゲージデスク　X
5. 表面あらさ計　X
6. 歯車ふれ試験器　X
7. 工具顕微鏡　X
8. 万能試験器　X
9. オートコリメータ　X
10. 電気容量計による計測　X
11. 硬度試験　ブリネル　X
12. 〃　ショーア　X
13. 〃　ビカース　X
14. シャルピ衝撃試験機　X
15. ひずみ計　X

126　計測制御*　L

1. 制御系，過渡特性
2. プロセス制御
3. サーボ機構
4. 自動調節

実　験

127　情報処理*　L，E

1. 情報化について
2. 計算機。しくみ
3. ベーシックプログラム
4. 数値計算法
   4.1　機関，手滑化
   4.2　積分
   4.3　方程式
   4.4　微分方程式
5. パスカル文法

128　非破壊試験*　L，P

1. X線検査
2. 超音波探場

140　加　工　論		
141　機械工作実習 ◎ 1. 旋　盤　P ＊ 2. インチ系旋盤　P ＊ 3. シェーパー　P ＊ 4. プレンナー　P ◎ 5. フライマ盤　P ○ 6. 工具研削盤　P ○ 7. 成形研削盤　P ○ 8. 円筒研削盤　P ◎ 9. ホブ盤　P ○ 10. 歯切盤　P ○ 11. コンタリングマシン　P ◎ 12. 鋸　盤　P ◎ 13. 帯鋸盤　P ○ 14. 放電加工機　P ◎ 15. 射出成形機　P ○ 16. ミニマシンニングセンタ　P		
◎ 142　鋳　造　学　L，P		
実　験 ◎ 1. 鋳物砂試験　P		

TECHNOLOGICAL UNIVERSITY OF THE PHILIPPINES
INTEGRATED RESEARCH AND TRAINING CENTER
M A N I L A

THE IRTC PROJECT ON ITS 3RD YEAR

As of September 15, 1985

FOR: The Japanese Mission
September 19 - September 26, 1985

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INTRODUCTION

Where it started as an $8.5M dollar five storey building and equipment grant in 1982, the Integrated Research and Training Center now projects a strong power resource potential for advanced engineering and technology in the country. This was made possible with the continuous interventions on technology transfer by way of implementation of the Five Year Japanese Technical Cooperation Program through Japan International Cooperation Agency (JICA). These consist of:

1. Dispatch of long term experts including a team leader and coordinator equivalent to eleven (11) persons or 17 man-years
2. Dispatch of short term experts equivalent to eight (8) persons or 22 man-weeks
3. Arrival of additional donated equipment amounting to ¥169,699,778 or $682,248.87
4. Counterparts training in Japan, 5 persons as of F.Y. 1984
5. Provision of books equivalent to 196 volumes
6. Direct assistance in other operational expenses

There was full support from government agencies like Ministry of Finance (MOF), Ministry of Foreign Affairs (MFA), Ministry of the Budget (MOB), and National Economic Development Authority (NEDA) which resulted in facilitation and approval of pertinent papers in the administration and

management of the project considering constraints due to existing economic measures. Specifically, the following are now provided:

1. A separate annual operational budget for IRTC amounting to ₱1.608M for F.Y. 1985
2. The endorsement by the Office of Compensation and Position Classification (OCPC) of Ministry of the Budget (MOB) of the request for authority in hiring additional counterparts
3. The number of counterparts hired total twenty five (25) as of 1985
4. The technician and support staff now total nineteen (19).

In consultation with the experts, the counterparts made attempts to effect technology transfer to students and other trainors. The training packages were initially designed to be of short duration and non-credit where students get certificates for completion of requirements and attendance. This experience in trying out the experiments and lectures on the students was utilized in the preparation of manuals and eventually textbooks and materials for the conduct of training in the future. In summary the performance output of the counterparts include:

1. Conduct of basic and advance training for students in engineering and technology to 906 students
2. Conduct of trainors training for faculty of other colleges and agencies and peers total to 295 participants of which twelve (12)

are in the three engineering fields and the rest are in computer programing.

3. Preparation of manuals and materials and softwares. There are now three (3) completed manuals and thirteen (13) others in progress for the three (3) engineering fields. Five softwares in computer and audio visual education have also been completed.

It could be seen that IRTC's major activities focused on preparation, trial and priming of resources. The counterparts being the most important resources, are continuously to be trained by the experts. The equipment are to be installed and experiments tried-out, materials, softwares and manuals including text are to be produced. These will still continue in the remaining two (2) years.

The experience gathered from the students who attended basic and advance training will be useful in improving the training packages in terms of utility, relevance and appropriateness towards improving and upgrading technological education in the Technological University of the Philippines (TUP).

In consideration of the Records of Discussion, there is a need to reassess the present functions of IRTC and define its future role in the development of the university in the next five or ten years. Beyond what it provides in terms of basic, advance and trainors' training, the IRTC can be a center for excellence in engineering and technology. And this can only be possible thru effective utilization of its resources.

I. MANAGEMENT AND ADMINISTRATION OF THE INTEGRATED RESEARCH AND TRAINING CENTER (IRTC) PROJECT

A. Comparison of Budget Structure, Allocations and Expenditures, F.Y. 1982 to F.Y. 1985

Budget appropriations for Current Operating Expenditures (COE) covering personal services and Maintenance and Operating Expenses (MOE) for F.Y. 1982 to F.Y. 1984 was fixed at ₱1,275,000. For F.Y. 1985, the current operating expenditures was increased to ₱1.608M. The effect is a slight increase in personal services equivalent to ₱1,208,000. However, there is a significant increase in maintenance and operating expenses equivalent to ₱400,000.

The expenditures for personal services started with a small amount of ₱291,509. for F.Y. 1982. This was for payment of salaries and wages of twenty two (22) personnel of the IRTC. By 1983, expenditures increased to ₱825,225.31 for the personal services of thrity six (36) counterparts and staff. And for F.Y. 1984, ₱788,997. was used for personal services of forty one (41) counterparts and staff. For F.Y. 1985, the total counterparts and staff number forty four (44) to which ₱557,818 was used for personal services covering the first three quarters only. The variations in expenditures on personal services for 1982 to 1984 is not only due to number of personnel and staff but also to such factors as salary adjustments and incentive provided for particular yeàrs.

Expenditures for maintenance and operations amounted to ₱418,417 in 1982; ₱335,034 in 1983; ₱265,287 in 1984 and ₱189,265 during the first three quarters of 1985.

B. The IRTC Staff and Counterparts

There are twenty five (25) counterparts as of F.Y. 1985. These are distributed as, nine (9) for Mechanical Engineering, five (5) for Civil Engineering and seven (7) for Electrical Engineering and the rest to the other departments. A request for authority to hire an additional fifteen (15) counterparts is now awaiting final approval at the Ministry of the Budget (MOB) before the end of F.Y. 1985. Including technicians and other staff, the personnel complement of the center is now forty four (44).

C. The Joint Steering Committee

Since its first meeting on October 7, 1983 the Joint Steering Committee was convened for the second time on August 8, 1984. In the second meeting 8-point items considered necessary for the effective implementation of the project were agreed upon. The Sub-steering Committee which is responsible for direct project monitoring has been meeting regularly. These weekly consultative meeting between experts and counterparts directly analyzed the activities and solved problems as they come. From August 1984 to September 1985, a total of twenty six (26) meetings were conducted.

INTEGRATED RESEARCH AND TRAINING CENTER
Manila

/6..

	FISCAL YEAR 1982			FISCAL YEAR 1983			FISCAL YEAR 1984			FISCAL YEAR 1985		
GENERAL APPROPRIATIONS GRAND TOTAL	₱2,275,000.00		STATEMENT OF EXPENDITURE ANALYSIS/DETAILS	₱1,717,000.00		STATEMENT OF EXPENDITURE ANALYSIS/DETAILS	₱1,275,000.00		STATEMENT OF EXPENDITURE ANALYSIS/DETAILS	₱1,608,000.00		STATEMENT OF EXPENDITURE ANALYSIS/DETAILS
	APPROP.	RELEASED		APPROP.	RELEASED		APPROP.	RELEASED		APPROP.	RELEASED	
PERSONAL SERVICES	₱375,000.	₱300,000.	₱291,509.01	₱920,000	₱839,544.	₱825,225.31	₱1,026,000	₱1,022,000.	₱788,997.79	₱1,208,000	₱ 891,000 1st to 3rd quarter (released	₱557,818.38 Jan. '85 to Sept. 12,'85
			A. ITEMIZED POSITION ₱.63,876.52 B. OTHER PERSONAL SERVICES part-timer,evening services,contractual employees,per diem compensation,commut- & non-commutable allowance,merit/incentive & cost of living allowance ₱227,632.49			A. ITEMIZED POSITION ₱263,355.40 B. OTHER PERSONAL SERVICES part-timer,contractual wages,per diem compensation,commutable & non-commutable allowances, incentive,clothing allowance & cost of living allowance ₱561,899.91			A. ITEMIZED POSITIONS ₱318,932.11 B. OTHER PERSONAL SERVICES part-timer,evening commutable,overtime wages,clothing allowances,incentive training & consultant and cost of living allowance ₱470,065.68			A. ITEMIZED POSITIONS ₱420,906.97 B. OTHER PERSONAL SERVICES part-timer,evening services,commutable allowances,clothing allowance and cost of living allowance ₱136,911.41
MAINTENANCE AND OPERATING EXPENSES	₱900,000.	₱800,000.	₱418,417.18	₱355,000	₱355,000.	₱335,034.05	₱249,000	₱ 199,000.	₱265,287.51	₱400,000.	₱255,000. 1st to 3rd quarter	₱189,265.83 Jan.'85 to Sept. 4, '85
			Travelling expenses--- 397.00 Communication services-- 377.58 Rep.& Maint. of Motor Vehicle---- 14,837.00 Other Serv. 57,588.58 Supplies & Materials--196,223.24 Water,Light & Illumination-------142,294.42 Repair & services of moter veh.---- 155.00 Spare parts of motor vehicle------- 207.00 Gasoline of motor veh.-- 6,337.30			Travelling expenses-- 24,000.00 Other Services- 114,048.70 Supplies & Materials- 129,371.40 Water,Light and Illumination---- 60,773.10 Gasoline & Oil of Motor Vehicle 6,840.85			Travelling expenses---1,919.25 Communication services--- 22,105.73 Repair,maintenance and transportation services---.12,996.67 Other services---- 80,153.67 Supplies and materials--54,654.30 Water, illumination & power64,482.19 Repair & services and spare parts-------2,466.10 Gasoline & oil of motor vehicles--- 18,947.58 Representation expenses--- 7,562.02			Communication services--- 5,279.48 Transportation services--- 1,000.00 Other services------13,031.45 Supplies and materials--32,109.22 Water Illumination and power-----121,070.65 Repair,services, spare parts of motor veh.-- 578.00 Gasoline and oil of motor vehicle---- 13,479.65 Taxes,duties and fees--- 1,350.58 Representation expenses-- 1,366.80
EQUIPMENT OUTLAY	₱1,000,000	₱403,900.		₱442,000.	₱219,410.	₱214,025.00						
						Disk Drives 143,000.00 Office equipment 40,050.00 Furniture 30,975.00						
TOTAL	₱2,275,000	₱1,503,900.	₱709,926.19	₱1,717,000	₱1,413,954	₱1,374,284.30	₱1,275,000	₱1,221,000	₱1,054,285.30	₱1,608,000	₱1,146,000	₱747,084.21

IRTC COUNTERPARTS/TECHNICIANS/STAFF

/7..

FIELD/AREA	SPECIALIST/TECHNICIAN/STAFF 1982		SPECIALIST/TECHNICIAN/STAFF 1983		SPECIALIST/TECHNICIAN/STAFF 1984		SPECIALIST/TECHNICIAN/STAFF 1985	
MECHANICAL ENGINEERING	SPECIALISTS: Nenet C. Graza Quirino F. Almeniana [2] TECHNICIANS: Vicente Julian Edgar Felipe [2]	4	SPECIALISTS: Nenet C. Graza Quirino F. Almeniana Ramon Q. Amoncio Alexander Malonzo Valentino J. Angeles [5] TECHNICIANS: Vicente Julian [1]	6	SPECIALISTS: Nenet C. Graza Quirino Almeniana Ramon Amoncio *Rey Crisanto Hizon* Harlonito Gonzales Valentino Angeles Noe B. Ramirez [7] TECHNICIANS: Lot B. Ramirez Reymundo Hontoya [2]	9	SPECIALISTS: Nenet C. Graza Quirino Almeniana Ramon Amoncio Rey Crisanto Hizon Harlonito Gonzales Valentino Angeles Noe B. Ramirez Ruben Mario Domingo Gerardo D. Erguiza [9] TECHNICIANS: Lot B. Ramirez Reymundo Hontoya [2]	11
CIVIL ENGINEERING	SPECIALISTS: Marte SH. Gutierrez Loreto Apilado Ma. Carmen Buzar [3] TECHNICIANS: Eduardo Quintos Benjamin D. Verdejo [2]	5	SPECIALISTS: Marte SH. Gutierrez Loreto Apilado David P. Hundo Victor R. Macam [4] TECHNICIANS: Benjamin D. Verdejo Arnel Gomez Eduardo Quintos [3]	7	SPECIALISTS: Marte Gutierrez Loreto Apilado David P. Hundo Victor R. Macam [4] TECHNICIANS: Eduardo Quintos Benjamin Verdejo Arnel Gomez [3]	7	SPECIALISTS: Marte SH Gutierrez Loreto Apilado David P. Hundo Victor R. Macam Dominador Pagbilao [5] TECHNICIANS: Benjamin Verdejo Arnel Gomez [2]	7
ELECTRICAL ENGINEERING	SPECIALISTS: Jerome dela Torre Marissa S. Calma [2] TECHNICIANS: Alberto Cruz Manuel N. Cawil [2]	4	SPECIALISTS: Jerome de la Torre Harvil V. Graza Mariana S. Calma Wilfredo Lopez [4] TECHNICIANS: Alberto Cruz [1]	5	SPECIALISTS: Jerome dela Torre Harvil V. Graza Harry Alfonso Joson Alan T. Sandoval [4] TECHNICIANS: Alberto Cruz Tito Querido [2]	6	SPECIALISTS: Jerome dela Torre Harvil V. Graza Harry Alfonso DL Joson Alan T. Sandoval Vicente Elizar Pendang Jose Juan Ignacio Noda [6] TECHNICIANS: *Alberto Cruz* Tito Querido [2]	8
COMPUTER	SPECIALIST: ---- TECHNICIAN: ----	-	SPECIALIST: ---- TECHNICIAN/COMPUTER OPERATOR: Ma. Carmela Fajardo [1]	1	SPECIALIST: Edwin W. Koh [1] TECHNICIAN/COMPUTER OPERATOR Ma. Carmel Fajardo [1]	2	SPECIALIST: Edwin W. Koh [1] TECHNICIAN/COMPUTER OPERATOR: Ma. Carmela Fajardo [1]	2
AUDIO VISUAL	SPECIALIST: Elizabeth Javier Rodrigo dela Cruz-detailed [2] TECHNICIAN: ----	2	SPECIALISTS: *Elizabeth Javier* Nona Sevilla [2] TECHNICIAN: Teodoro Gatioan [1]	3	SPECIALIST: Elizabeth Javier [1] TECHNICIAN: Teodoro Gatioan [1]	2	SPECIALIST: Elizabeth Javier [1] TECHNICIAN: Teodoro Gatioan [1]	2
PHYSICS	SPECIALIST: ---- TECHNICIAN: ----	-	SPECIALIST: Alfredo Cate [1] TECHNICIAN: Manuel N. Cawil [1]	2	SPECIALIST: Alfredo Cate [1] TECHNICIAN: Manuel Cawil [1]	2	SPECIALIST: Alfredo Cate [1] TECHNICIAN: Manuel Cawil [1]	2
PRINTING AND PUBLICATION	SPECIALIST: Gelacio Dagum-detailed [1] TECHNICIAN: Leticia Caranguian (detailed) [1]	2	SPECIALIST: Gelacio Dagum -detailed [1] TECHNICIAN: Leticia Caranguian (detailed) [1]	2	SPECIALIST: Gelacio Dagum-detailed [1] TECHNICIAN: Leticia Caranguian [1]	2	SPECIALIST: Gelacio Dagum-detailed [1] TECHNICIAN: Leticia Caranguian [1]	2
EXECUTIVE DIRECTOR SUPPORT STAFF	PERLA S. ROXAS Emma Francisco Michaela Andrada *Maria Criste* Tina Chang [4]	1 4	PERLA S. ROXAS Emma Francisco Michaela Andrada Maria Criste Tito Querido Cynthia Jussy 3 Janitors (detailed) 1 Driver (detailed) [9]	1 9	PERLA S. ROXAS Liza Bautista Abelardo Able Ernita Rodriguez Michaela Andrada Maria Criste Arnel Uyaco Eulogio Galingan Gregorio Lebato Florephis Suan Alex Frigillana [10]	1 10	PERLA S. ROXAS Abelardo Able Ernita Rodriguez Michaela Andrada Maria Criste Arnel Uyaco Eulogio Galingan Gregorio Lebato Florephis Suan Alex Frigillana [9]	1 9
GRAND TOTAL		22		36		41		44

II. STATUS OF PROJECT IMPLEMENTATION

A. Major Inputs on Technology Transfer

1. Counterparts Training by Experts

Since 1983, a total of eleven (11) long term experts have been dispatched providing 17 man-years of technical advice thru counterpart training. Staying from one to two years, the long term experts were directly responsible in sharing with the counterparts principles and theories in the operation of the machines and equipment, how experiments are designed and conducted, how experimental data is analyzed and reported, equipment and laboratory lay-outing and calibration of test equipment. Under their direct supervision, the counterparts were able to design training packages for students and have started writing laboratory manuals and textbooks.

It is most significant to state that the experts have shown examples on how Japanese professors work in their laboratories showing their commitment and devotion for the propagation of the depth of their disciplines.

Eight (8) short term experts equivalent to 22 man-weeks were also dispatched starting 1983. They stayed for two weeks to one month and conducted training in specialized fields. From them, the counterparts were able to learn the meaning of research, how research is initialized.

A summary of training conducted by the experts include:

Mechanical Engineering

*Prof. Y. Maeda (2 years)	- Metrology Fluid Mechanics Advanced Mathematics Computer Programming
*Prof. K. Kawakatsu (1 year)	- Machine Processing Principles of Hardness Testing
*Dr. K. Uesaki (7 months)	- Metallurgy Scanning Electron Microscope
*Dr. T. Shinkawa (7 months)	- Fluid Engineering
*Dr. Y. Yoshizawa (2 weeks)	- Steam Power Plant Engineering
*Dr. T. Kamimoto (2 weeks)	- Automotive Engineering
*Dr. K. Uesaki (2 weeks)	- Foundry
*Engr. Toshiaki Ueda (1 week)	- Scanning Electron Microscope

Electrical/Electronic Engineering

*Dr. S. Yamaguchi (1 year)	- Power Engineering I
*Dr. M. Kumagai (1 year)	- Electronics Engineering
*Dr. S. Karasawa (5 months)	- Electronics Engineering
*Dr. M. Kumagai (2 weeks)	- Electronics Engineering
*Dr. Y. Suzuki (2 weeks)	- Computer Engineering
*Dr. Y. Yamaguchi (1 month)	- Power Engineering II

Civil Engineering

*Engr. S. Iwai (2 years)	- Construction and Civil Engineering
*Dr. Y. Yamao (4 months)	- Structures and Concrete Engineering
*Engr. M. Kawakubo (6 weeks)	- Concrete

2. Counterparts Individual Training in Japan

Two (2) counterparts have returned and completed their individual training in Japan. Three (3) are still undergoing training and will be back by December this year. Another three will leave shortly by October this year.

A summary of individual training include:

*Marte SM. Gutierrez (completed)	- one year research trainee at Nihon University
*Ramon Q. Amoncio (completed)	- one year training in Metallurgy and Machine Processing at Tokyo Institute of Technology
*Jerome O. dela Torre (on-going)	- One year training in Electronics at Tokyo National College of Technology
*Valentino J. Angeles (on-going)	- one year training in Refrigeration and Air-Conditioning at Tokyo Institute of Technology
*Loreto D. Apilado (on-going)	- one year training in Civil Construction Works at Kisarazu Technical College
**Marlonito Gonzales	Mechanical Engineering
Harry Joson	Electrical Engineering
David Mundo	Civil Engineering

**will leave by October for training in Japan

3. Additional Donated Equipment

Six (6) shipments of experimental equipment totalling ¥169,609,778 or $682,248.87 have arrived in 1983 and 1984. As installation and layout require additional space, including electrical and water utilities, some rooms were expanded/converted into laboratories. The following are the new laboratories:

*Concrete Research Laboratory

*Soil and Asphalt Research Laboratory

*Structures Research Laboratory

*Numerical Control Machine Room Laboratory

*Fluid Engineering Laboratory

*Metallurgical and Precision Measurement Laboratory

The other laboratories are:

*Machine Processing Laboratory

*Boiler and Steam Power Laboratory

*Automotive Engineering Laboratory

*Refrigeration and Air-Conditioning Laboratory

*Foundry Engineering Research Laboratory

*Power Engineering Laboratory

*Electronics Laboratory

*Computer Laboratory

*Physics Laboratory

*Audio-Visual Laboratory

4. Other Support

A total of 196 volumes of books were purchased and donated thru the JICA experts. These are engineering and technical books for the three fields. Support in the purchase of some materials, equipment and services were also provided.

B. Performance Output

1. Student Training by Counterparts

From 1983 to 1985, 837 students completed Basic and Advance training in the three fields, 45 students attended computer programming and 24 attended training in audio visual equipment operation. The breakdown by field shows that 446 students completed the training in Mechanical Engineering, 151 students in Civil Engineering and 240 students in Electrical Engineering. The training packages were of short duration ranging two to five months.

2. Trainor's Training by Counterparts

Counterparts conducted training among peers and faculty of other colleges in T.U.P. and other institutions. Majority of these are in computer programming. In 1984, twelve (12) faculty from the College of Engineering (COE) attended training in Civil Engineering, Electrical Engineering and Mechanical Engineering. Between 1982 to 1985, two hundred eighty three (283) faculty have attended

DONATED BOOKS
As of September, 1985

		Number of Volumes	Total Number of Volumes
CIVIL ENGINEERING	1983	34	71
	1984	16	
	1985	21	
MECHANICAL ENGINEERING	1983	15	35
	1984	2	
	1985	18	
ELECTRICAL/ ELECTRONIC ENGINEERING	1983	55	90
	1984	27	
	1985	8	

over-all total 196

INTEGRATED RESEARCH AND TRAINING CENTER

FIELD		1983 TITLE OF TRAINING	1983 NO. OF STUDENTS WHO COMPLETED THE TRAINING: ADVANCED	1983 NO. OF STUDENTS WHO COMPLETED THE TRAINING: BASIC	1984 TITLE OF TRAINING	1984 NO. OF STUDENTS WHO COMPLETED THE TRAINING: ADVANCED	1984 NO. OF STUDENTS WHO COMPLETED THE TRAINING: BASIC	1985 TITLE OF TRAINING	1985 NO. OF STUDENTS WHO COMPLETED THE TRAINING: ADVANCED	1985 NO. OF STUDENTS WHO COMPLETED THE TRAINING: BASIC	SUB-TOTAL STUDENTS TRAINED 1983 - 1985
CIVIL ENGINEERING	BASIC	Soils & Materials Testing		13	Soils & Materials Testing		69	Concrete Mix Design		8	
					Site Surveying		26	Surveying		7	
	ADVANCED				Surveying Instrument	12					
					Site Surveying	16					
TOTAL				13		28	95			15	151
ELECTRICAL/ELECTRONIC ENGINEERING	BASIC	Basic Electronic Circuits		12	Basic Electronic Circuits		20	Basic Electronics & Color Television		11	
					Basic Electronics & Color Television		113	Electronic Fundamentals		20	
								Selected Experiments in Electronic Fundamentals		5	
								Electronic Fundamentals		16	
	ADVANCED				Power Engineering I & II	17		Electronic Fundamentals	26		
TOTAL				12		17	133		26	52	240
MECHANICAL ENGINEERING	BASIC	Machine Tools		57	Injection Pump Tester		4	Machine Shop Practice		45	
		Refrigeration & Air-Conditioning - Equipment Training		6	Refrigeration & Air Conditioning - Equipment Training		95	Steam Power Generation		45	
		Boiler Operation		4				Internal Combustion Engine		44	
		Steam Power Generation		2				Refrigeration & Air-Conditioning		75	
								Sand Testing & Molding		22	
	ADVANCED	Boiler Operation	8		Engine Performance & Design	12		Internal Combustion Engine	16		
					Injection Pump Tester	8					
					Internal Combustion Engine	3					
TOTAL			8	69		23	99		16	231	446

NO. OF STUDENTS TRAINED ----- GRAND TOTAL = 837

GRAND TOTAL 837

TRAINORS TRAINING
October 22-30, 1984

Title of Training	Participants	Number of Trainees Input	Output
Concrete Design Mix	Civil Engineering Faculty, TUP-COE	6	6
Electrical Machines	Electrical Engineering Faculty, TUP-COE	6	2
Machine Tools Processing Engine Performance Foundry Technology Fundamentals of RAC Steam Power Generation	Mechanical Engineering Faculty, TUP-COE	4	4
		Total Output	12

TRAINORS TRAINING

Computer Division
1982 - 1985

	Title of Training	Participants	Number of Trainees
1982	Basic Computer Course	TUP Faculty & Staff	57
	Computer Basic Programming Course	TUP Faculty & Staff	32
1983	Computer Basic Programming Course	TUP Secretaries & Staff	8
	EDP for Executives	OBM Executives	22
		MOLE Executives	12
		OBM Executives	28
		MECS Executives	20
		PNC Executives	15
		PNB/PTRI/NMYC & heads of Government organization	29
1984	EDP for Executives	TUP-main and VTI Executives	20
		MOLE Executives	19
1985	Computer Course for the trainors of the TUP System	TUP Instructors	20
	Two-week Course in BASIC Programming	Mr. Rajesh Joshi*	1
		TOTAL	283

* Mr. Joshi is a Nepalist and his training was sponsored by the NMYC.

computer programming courses. Graduate students are also attending credit courses in computer fundamentals and audio visual education.

3. Preparation of Materials

As there are no available textbooks for the students taking basic and advance training, the counterparts started work on the preparation of manuals and materials as early as 1983. So far, two (2) manuals in Electrical Engineering are already printed and being used by students. A Surveying manual and a handout in Internal Combustion Engine are now in completed drafts and are being edited. Still on the writing stage are twelve (12) other manuals and materials in the various fields. The experts have also written manuals. They are: Dr. Yamaguchi, Dr. Karasawa, Prof. Kawakatsu, Dr. Shinkawa and Dr. Uesaki.

4. Conduct of Research

As an outcome of his training at Nihon University, Marte SM. Gutierrez, teamed with his professors Dr. T. Miyamori and Dr. Makiuchi conducted a research on Frictional Characteristics of Non-Woven Geotextile Sand Interface. This is to be published in the Philippine Engineering Journal.

DEVELOPMENT OF INSTRUCTIONAL MATERIALS
As of September, 1985

	Type of Materials	Title	Incharge	Remarks
CIVIL ENGINEERING	Manual	Surveying Manual	D. Mundo V. Macam	first draft completed
	-do-	Concrete Engineering Laboratory Manual	D. Mundo V. Macam	on-going (40% completed)
	-do-	Soil Engineering Laboratory Manual	M. Gutierrez*	on-going (40% completed)
	-do-	Asphalt Testing Laboratory Manual	D. Pagbilao	on-going
ELECTRICAL/ELECTRONIC ENGINEERING	Manual	Electrical Machines in the Electrical Engineering Laboratory	S. Yamaguchi M. Graza A. Sandoval	printed and being used in the training
	-do-	Electronic Fundamentals	H. Joson A. Sandoval	printed and being used in the training
	-do-	Assembly Language Programming Using TK-85	E. Koh M. Graza	on-going
	-do-	Analog I	H. Joson A. Sandoval	on-going 9R
	-do-	Analog II	S. Karasawa M. Graza H. Joson A. Sandoval J. Noda E. Pendang	on-going 10R
MECHANICAL ENGINEERING	Manual	Selected Experiments in Hardness Testing	K. Kawakatsu	still being completed by R. Domingo
	-do-	Fluid Engineering	T. Shinkawa	completed
	Handouts	Notes on Internal Combustion Engines	N. Graza	completed and being evaluated
	Textbook	Internal Combustion Engines	N. Graza	on-going (30% completed)
	-do-	Refrigeration and Airconditioning	R. Hizon	on-going
	Handouts	Basics of Steam Power Plant Reviews of Two Thermodynamic Processes Temperature Considerations for Heating Surface	M. Gonzales	on-going
	Textbook & Manual	Metallurgy	K. Uesaki	on-going
	Manual	Training Manual for Sand Testing Apparatus	Q. Almeniana	on-going

* M. Gutierrez together with Dr. Tateki Miyamori and Dr. Katsuhiko Makiuchi, Associate Professors of Nihon University, had conducted a research entitled "Frictional Characteristics of Non-Woven Geotextile-Sand Interface" and this will be published in the "Philippine Engineering Journal", Volume VI no. 2, December 1985.

III. IRTC's ROLE; NOW AND THE FUTURE

The role of IRTC is defined in broad and specific terms in the Records of Discussion. Broadly stated, IRTC's role is to promote and strengthen education and related training in the field of technology through the expansion and improvement of the educational training system. In specific terms, its objective is to be an open institution for training senior undergraduates in technology and engineering as well as mainly for upgrading trainors and other personnel engaged in teaching and related training in the fields of technology and engineering education at universities and other institutions.

The opening of undergraduates basic and advance programs and trainors program in 1983 saw the start of the operations of the project. The counterparts made attempts to effect the second stage in technology transfer and were able to reach 837 students. These are relatively small compared to the population of 6,000 in the university. Problems relevant to the mechanisms in the implementation were also observed as selection of student, scheduling and poor background among the students participants. Looking back at the broad purpose of the project, the present scheme in offering student training would not even produce a dent.

To improve the process, these are suggested:

1. The training programs designed for Basic and Advance courses should be integrated

into the curriculum or they must be part of the curriculum.

2. The preparation and production of manuals and texts are to be continued.
3. Trainors courses should be prioritized and number of participants increased.

And what about the future? The center may sooner or later outgrow its present functions. As more counterparts complete their training with the experts, the capabilities of the center will be far bigger than what it it is to perform. Add to this the strength of the laboratories the center is most ready for the conduct of research. This is its future role.

Here are suggestions on what the center can do in the future:

1. Conduct of research in the various laboratories
2. Offer graduate programs in engineering and technology
3. Revise and improve the curriculum of the Engineering courses and technology courses to better provide students with strong foundations in Science and Mathematics with emphasis on experiments.

－ 資 料 編 －

1. THE IRTC PROJECT ON ITS 3RD YEAR

2. プロジェクト実績表

3. 学問体系化によるカリキュラム再編成

4. カウンターパート訓練実績表

5. 学生訓練実績表

6. 機材活用状況表

TECHNOLOGICAL UNIVERSITY OF THE PHILIPPINES
INTEGRATED RESEARCH AND TRAINING CENTER
M a n i l a

ISANG PARANGAL
(A TRIBUTE)

Theme: The IRTC and Transfer of Technology

on March 5, 1985
at 6:00 P.M.
IRTC Conference Hall

PROGRAM OF ACTIVITIES

Philippine National Anthem	
Welcome	Dr. GALICANO J. DATU *Vice President* *for Academic Affairs*
Technological Educatio.. and TUP	Dr. JOSE R. VERGARA *President*
I.R.T.C. Resource Potential	Prof. PERLA S. ROXAS *Executive Director, I.R.T.C.*
State of Technology Transfer in	
Mechanical Engineering Division	Engr. NENET C. GRAZA *Coordinator, ME Div.*
Electrical/Electronics Engineering Division	Engr. MARVIL V. GRAZA *Coordinator, EE Div.*
Civil Engineering Division	Engr. DAVID P MUNDO *Coordinator, CE Div.*
Response	Prof. YASUHO MAEDA *JICA Expert, ME*
	Prof. KUNIO KAWAKATSU *JICA Expert, ME*
	Dr. MASAZUMI KUMAGAI *JICA Expert, EE*
	Engr. SHIGEO IWAI *JICA Expert, CE*
Direction of IRTC in the next two years	Prof. JUZO YOSHIDA *Team Leader, JICA Experts, IRTC Project*
Presentation of Plaques of Appreciation	Dr. JOSE R. VERGARA
Cultural Presentation	KALINANGAN DANCERS
Cocktails	

ELIZABETH P. JAVIER
Emcee

MID-TERM ASSESSMENT OF THE I.R.T.C. PROJECT
March 5, 1985

I. Concept/Nature

The Mid-term Assessment of the IRTC Project is an undertaking that synthesized the output of the IRTC in reference to the long and short term training and research activities as a consequence of the transfer of technology provided by the Japanese Experts to the Filipino Counterparts. The presentation of the total output revolved around the theme: IRTC and Transfer of Technology.

In full recognition of the technology transfer, Technological University of the Philippines paid a tribute or "Isang Parangal" to this technical cooperation effort through the awards provided to Japanese Experts and volunteers. The flow of technology transfer from the Experts to the Counterparts to the trainors and students have brought about an improvement in the technical education in the university.

To effectively present the Mid-term Assessment of the IRTC Project, it was guided by the following objectives:

1. To describe the state and level of technological education in the TUP.

2. To identify some trends/interventions which have influence on technological education.

3. To describe the "resource potential" of IRTC as a venue for technology transfer.

4. To describe the role of IRTC in the expansion and improvement of technological education.

II. Implementation

1. A number of invited guests were present to monitor the mid-term assessment report of the IRTC officials and counterparts. These included, most especially, the members and representatives of the Steering Committee such as the officials from JICA, Japanese Embassy, JOCV and NEDA. Also present were high officials of TUP and other institutions/agencies.

The guests were acknowledged by a welcome message given by Dr. Galicano J. Datu, Vice President for Academic Affairs, TUP. The text of the message was as follows:

> This occasion which marks another milestone in the technical cooperation program between the Philippines and Japan, particularly, in the Integrated Research and Training Center of the Technological University of the Philippines and the

Japan International Cooperation Agency (JICA) in Manila, gives us a singular opportunity for us to come together and in ways more than one, together assess or discuss what our two units have done, are doing and have yet to do. On this auspicious event, therefore, allow me to welcome you to the Technological University of the Philippines, on behalf of the officers of the administration, the faculties, and the student body.

It is our hope that through our coming together in which we at the TUP will give a humble tribute to the men of the JICA who have been assigned to the IRTC, we shall have even in a small way repaid their cooperation by expressing our thanks for the kind assistance extended to us, the counterparts and through them, our students. In this exchange of pleasantries, I hope that more fruits shall be born out as we continue our joint efforts.

Again, welcome to TUP.

To mention specifically the special guests that had attended were:

1.	Mr. Yoshitaka Motoda	-	First Secretary, Japanese Embassy
2.	Mr. Kuniyoshi Matsuo	-	Director, Japan Overseas Cooperation Volunteers
3.	Mr. Yuji Okazaki	-	Japan International Cooperation Agency (JICA) Officer
4.	Dr. Jose Villanueva	-	President, Association of Southeast Asian Institutions of Higher Learning
5.	Dr. Demetrio Quirino	-	President, Philippine Association for Technological Education
6.	Ms. Marichu Suarez	-	representative of Mr. Romeo Reyes, National Economic and Development Authority
7.	Mr. Evan Garcia	-	Acting Director for Japan and Korean Affairs, Ministry of Foreign Affairs
8.	Dr. Edilberto Dagot	-	President, Philippine Normal College
9.	Mr. Jun Ichinose	-	JICA Coordinator, Tropical Medicine, Alabang

2. Dr. Jose R. Vergara, President, presented his vision on the "Technological Education and TUP." In this regard, Dr. Vergara underscored the trends in technology, its influence on the technological education in the present times and in the future, most especially to the Technological University of the Philippines.

The following was Dr. Vergara's delivered paper:

A few nights ago, last week a group of student leaders came to my office and asked an audience. I did not hesitate to accept them, and I told them to sit down and pretty soon we were engaged in a very lively discussion.

One of the issues that they have presented was based on the technology that we are having in the Philippines. They said that the technology that we have in the Philippines is wrong. The student leaders were telling me that the decision of the Filipinos in particular the decision makers on technology is wrong. So, I asked them why do they consider it wrong. They said that the technology being given to us by foreign countries is something that is not useful to us because it is not useful to these countries that is why it is being given to us. So I asked these students if they know how much we paid for the technology that they were mentioning. They could not tell me anything. I asked then to identify the technology that they said is useless, they could not identify it. So I gave them an illustration, a favorite illustration of mine and I said to them, supposing I said that we remove all the motor vehicles because you believe that those are useless technology that are made in Japan. Or the television and stereo sets that are made in Japan because you believed that anything that is foreign technology is useless. I asked then, "what will happen?" And they said that," Everything will be quiet, Sir, and everything will be monotonous, dull." So I said then, "Why do you say that this technology is useless? How can it be useless when you are using it? You cannot come to school unless you ride a vehicle that is made in Japan. You may call it a jeepney but actually the jeep is, - while it is assembled in the Philippines - its parts are made in Japan.

So, in other words, you can see how powerful the Japanese technology is all over the world. Because it is not only in the City of Manila that I am illustrating this matter. You may go to Jakarta, Kuala Lumpur, Bangkok, Singapore, Taiwan and others, you will notice that once this technology is removed or is absent, you can also note the progress of that country. So these students that confronted me could not find any loophole, they could not find anything so finally they said, "Why is it that we have a

nuclear technology?" Because they have been reading in the newspapers of the effect of nuclear technology. So I asked them, in all of the accident that you have read all over the world, the more popular on is three-mile island. So I asked them, "How many died in the 3-mile island accident? How many were affected?" They could not say anything. They could not support what they were saying.

So, which brings us to the problem of, what is technology? This is something that the Technological University of the Philippines, the Technological Institute of the Philippines of which our friend Dr. Quirino is also the President, Integrated Research and Training Center, the Polytechnics in the Philippines, the Technical Colleges and many others will have to identify, come to an agreement - just "What is technology?" We keep on meeting this word and our names are in fact technology. We've been coming across a very short definition that it is the application of science - yes - how? By training for skills and knowledge of the technology, so of the science so that it can be spread.

What is technology again as a commodity? Technology is actually something that is sold. Something that is developed and sold by advanced countries and addressed to other advanced countries. The making of advanced technology whether it is a communications, transportation, manufacturing, energy and other areas, the manufacturers and makers of these do not address their items to the third world not to the developing countries. Because they are being sold at a high cost. They are being addressed only to the wealthy countries. But where does that leave us? It can only leave us to something that has been identified as appropriate technology. What is appropriate technology? The word I think is very common to all of you, when you say what is appropriate is something that you can use. It is something that we can depend upon. In other words, it is something that is within your own reach, within your own resources. It is something that is useful, it is something that you can depend upon so that you can have a better quality of life. Now, you will note that in other countries they have such things as high technology or high tech. High tech. and the Philippine population do not go together. High tech is intended for advanced countries that have less population, that have to depend upon the use of robots, of all other machines that will replace men from doing monotonous work. So, what I am trying to say here is, what is appropriate to us is not appropriate for other countries or what is appropriate for other countries, such as high tech is appropriate for Singapore or to Taiwan or to Hongkong or South Korea but not certainly that it is appropriate for the

City of Manila, otherwise, this high tech will displace a lot of workers. So what can we do about these problems? These are issues. Technology is available, perhaps to utilize an analogy let us assume that this room is full of technology. There are shelves and shelves of technoloty here. You walk in and you look at the very nice packaging and the like, and you can say I like this and I like that and I like these items. Do you have a use for them? You begin to match your own resources to the technology that are going to buy. You know, its just like a supermarket where all these goods are located. Now, we have to select that and then we have to try whether it is really good for us or not. So, this is really something that we have to look into, the Technological University of the Philippines, as well as the other technical colleges and universities in the Philippines, to look into this appropriateness of a lot of technology that can become availabe to suit our own social and economic situations.

On the other hand, we have some things, such as, indigeneous technology. So you say, why don't we utilize our indigeneous technology? And so we say, yes, why not? So you start pounding your rice on a pestle and a mortar made of wood. I have seen this in the provinces when I was also a boy, we used to pound the rice, that before baking the rice at noontime, we have to get some palay and put it there in the mortar and we use a wooden pestle, so much so, that even my fingers were swollen with a lot of the friction between the pestle and my palm. And this is hard work. Now, is that indigeneous technology? Is that a thing that will give us better quality of life? Or perhaps, it would have been better if we could device a technology to improve upon the indigeneous technology that we have. Unfortunately, again the culture of the Filipinos do not seem to appear that we are very inventive. That even the Congress of the Philippines have to enact a law to force the Philippine Inventors Council. We have to generate interest in invention. The Filipinos as a person, as a people, are not very inventive, you can see that yourself around or even about our own culture. That even the diggings in Anthropology or in Archaeology we have not discovered the tool technology that was appropriate during the time of the early Filipinos. Even the few stone tools, that have been dugged out cannot say that we are advance in comparison with the stone tools that have also been discovered in Europe, in China, Japan or other countries, or even, for instance, the weapons of war. The weapons of war that we have in the Philippines, for instance, the bows and arrows or the spears that have been made and commonly what are they, than to sharpen the sticks. What I'm trying to say is that it is not

only that a Filipino military officer has invented an ammunition that can shoot from a 12 gauge gun and the propellent is about 22 grams of gun powder and the ammunition itself contains lipay. Lipay is a vine in the forest that I will warn you not to touch it, because its going to produce itchness and this military officer has discovered something indigenously out of our own local things and put it inside a 12-gauge shot shelve in order to disperse some unruly demonstrators that is what the newspapers are saying. Nevertheless, I have given you some thoughts about this technology.

I should like to come at my last point about the role of IRTC. The role here that we could see as a matter of vision is something to tie or to develop a close linkage between this technology and the research that we have to perform. It is also very clear that faculties such as we have, they know how to teach, but they do not know how to research. This is a weakness in general of our faculty in the Philippines. In my 46 years of service in teaching, I have yet to see certain inclination of teachers toward research and if ever they do, they mostly are on social research but not on technological research. So this is something that we hope that the interest as well as the potential of every teacher as well as the students can be developed from this IRTC. So much so that in outlining the methods of work of IRTC, agreement is over our teachers can carry on hopefully that they will not leave us and go elsewhere. But the philosophy is that we must keep on and to continue of researches and also to provide certain dissemination of the researches made at the IRTC.

An so we hope and I look forward to the future that IRTC itself shall become the venue for the training, as well as, in the conduct of research in technology in the Philippines. To take that lead posture is this regard so that we shall be able to identify our own technological needs that may be utilized for our own development.

My friends, it is indeed a welcome thing that IRTC has started to open our eyes in this regard and we hope that we could work into a future of cooperative development between the Japanese government as well as the Philippine government because we really need their assistance in this regard. It is not only a matter of just the building and the equipment but we will need also the technical knowledge as well as the skills that will go in any transfer or in any dissemination of this technology. And I know that many things are moving and foregoing ahead that what I may have just said today is already obsolete by tomorrow.

So my friends, for tonight we honor our guests, our honorees. We hope that you may bring with you the Filipino technology and then send it back to us in an improved manner.

3. Prof. Perla S. Roxas reported "IRTC, A Resource Potential." Her paper presented the forms of the mode of transfer of technology in the IRTC being a resource center, in which case, she gave three forms:

a. Initial grant and donation of equipment, additional equipment that just arrived recently and other equipment that will still come later on, which the Center will use for research and experiment purposes.

b. Dispatch of long and short term experts that provided depth to the knowledge of the counterparts in their fields.

c. Provision of counterpart training to Japan that provided these counterparts to specialize specifically in their fields.

The whole report is provided hereunder:

Today, we have reached the mid-term or the mid-point of our project cycle. We started the five-year technical cooperation program in November, 1982 and the project is supposed to finish by 1987. So, we the counterparts of the IRTC feel that it is high time on this project period that we report a mid-term assessment. And we are fortunate to have invited with us members and representatives of our steering committee, we have the representative from NEDA, our representive Atty. Garcia from the Ministry of Foreign Affairs and of course our representative from JICA, Mr. Okazaki.

I would like to start by saying that the grant aids scheme given to us by the Japanese government through JICA was $8.5 M that was the building and equipment intended to promote and strengthen technological education in particular, engineering education in three major fields: Mechanical Engineering, Electrical/Electronics Engineering and Civil and Construction Engineering. But building and equipment alone per se will not give us much push to improve our technological education in the country. So, again, the Japanese government through JICA gave us support by way of a five-year technical cooperation program and this is in the form of different types of inputs which we would like to present.

The technology transfer, therefore, started in November 1982 and the mode of transfer are in these forms:

One, they gave us the equipment donation initially from the grant aid but in 1983, they gave us additional ¥121,330,609 equivalent to $0.4 M. To date in terms of resource potential these equipment include computers, we have now 20 including 2 units of Hewlett-Packard, a mini-machine center - a numerical control machine, AV equipment and almost all types of testing equipment and laboratory equipment that will help us do research in Engineering, in these three major fields. Also, in the next four years we will be receiving smaller doses of additional equipment.

The second form or mode of transfer is the dispatch of Japanese Experts. We have received 7 long-term experts, equivalent to 11 man years. One of them had gone back, Dr. Yamaguchi in Electrical/Electronics Engineering. And four of them are about to go back and they will be presented later. We also received short-term experts and these are 6 persons equivalent to 14 man-weeks. And it is in these short encounter with them that we learned the depth of discipline that the Japanese Engineers possess. In the Philippines we were trained to be Engineers but on a broader, general view. But we learned that in Japan, these short term Experts were riped. If they are experts let us say in concrete, they talk only of concrete, concrete and concrete, and they would not dare discuss any other topic outside of that depth of the technology. So in effect they gave us a view of how technological education, engineering education is done in Japan. We also received JOCV volunteers, these are very young volunteer experts. So far, we have received ten (10) persons, equivalent to 12-man years, in such areas as Mathematics, Chemistry, Physics and Computer. Right now we still have four with us in Computer, in the design and drafting, in Chemistry, in Physics and we are even happier to have one who is back with us not as a volunteer in the Philippines but as JICA coordinator and expert. So these are the inputs in terms of resources from the Japanese Experts.

Another mode of technology transfer is the provision of counterpart training in Japan. So far we have sent two engineers in Japan and they are back. One in Civil Engineering, finished a research and study program equivalent to one-man year at Nihon University . Another was trained at Tokyo Institute of Technology in Mechanical Engineering, equivalent to one-man year. These are non-degree programs but they are more on specific specialization in their fields of study. At present

we have three (3) in Japan on three fields also to stay and be trained there for one year.

So if we analyze, therefore, the inputs for technology transfer, they gave us the modern equipment, they gave us the experts and then they send counterparts to Japan.

For their part these long term and short term experts give us training in the equipment that we have here. They show us how experiments are performed, how recent principles are discussed, how we prepare our training materials. In effect, this five years is supposedly an input stage in which we counterparts are being primed to be the next resources who will transfer this technology to our students. However, our students have been clamouring for training, they keep asking the President why is the IRTC isolated, why can't we use the equipment and so we the counterparts decided in June 1983, we started the next mode of transfer. So initially, it is from the Japanese experts to us Filipino counterparts and now from us engineer-counterparts to our students and much more to our peers, to our fellow faculty and even to outside agencies. And this was done starting June, 1983, however, we did it on a very small scale basis because what we learned, we say this month, we will teach next semester, so we do it in fragments.

And so, we would like to say that in this mid-term assessment, from this project we have received so much. We could now say that the IRTC has so much resource potentials in advance technology particularly in engineering education. It could be called a model for a venue for technology transfer. But how could we make it work? How can it produce impact? Now this I think depends upon us, it depends also upon the academic community in TUP particularly the five colleges that provide us support, we have the College of Engineering (COE), College of Arts and Sciences (CAS), College of Industrial Technology (CIT), Graduate School and College of Architecture and Fine Arts (CAFA). So we would, therefore, like to say that so much has been started in the form of technology transfer. It is still too early to say, that we have produced a trend in terms of the improvement of technological education in TUP or in the country. But this evening we purposely invited the President of the Philippine Association for Technological Education (PATE), an association of engineering institutions in the Philippines for him to listen and to see how technology sharing can be availed of and we also invited the President of the Association of Southeast Asian Institutions of Higher Learning (ASAIHL), Philippine Council which in effect is an association of different univerisities in the Philippines offering both

technological education and other programs. So, we want the IRTC to project more and we want to listen to suggestions on how we the counterparts can better deliver the mechanism for technology transfer.

4. Three Filipino counterparts representing the three major Divisions in the IRTC, namely, Mechanical Engineering, Electrical/Electronics Engineering and Civil and Construction Engineering stated the present status of technology transfer in their respective field.

a. Engineer Nenet C. Graza, counterpart in the Mechanical Engineering Division presented the following:

For my purpose, I divided this total transfer of technology into two phases. The first is the transfer of technology from Japan to the Center; the second is the flow of technology from the Center, finally, to the Filipino people. Figure 1 shows a model of this technology transfer in the Mechanical Engineering Division of the IRTC

On the input side, there is the transfer of skills and concepts from the Japanese experts to the engineer-specialists of the division through structured developmental programs. These programs include formal training and site observations. Also, the programs can be conducted locally or in Japan. In addition to the pieces of equipment that were originally granted to IRTC, other pieces of equipment, machines, apparatus and materials are continuously being donated through the five-year technical cooperation program. This is to make the training packages made by the Specialists operational.

As output of the Division, there are trained trainors and students. Trainors' training is being conducted to enable other teachers to use the facilities of the Center for their own professional purpose, either in instruction or in research. The students' training, on the other hand, is being conducted at two levels, the Basic level and the Advance level. Students in the first level are trained on equipment/machine operation, while students in the second level are trained so that they can conduct independent study/research in any of the technologies included under the Division.

Figure 2 reflects the quantitative output and input of the Division. They are expressed in man-weeks. One training week is defined as a 24-hour week. One should always bear in mind that without the input from the Japanese experts, it would be very difficult to produce the output.

TRANSFER OF TECHNOLOGY MODEL

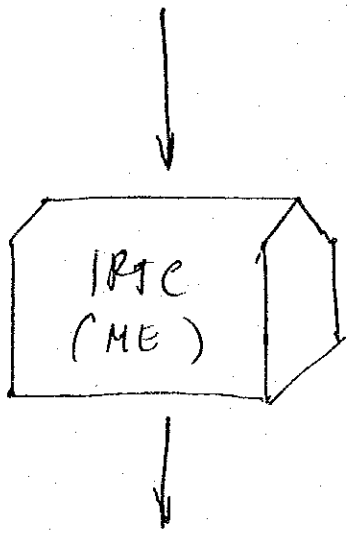
MECHAMICAL ENGINEERING DIVISION, I R T C

INPUT

1. STRUCTURED DEVELOPMENTAL PROGRAMS (Local and Abroad)

   a. Training by experts
   b. Site Observations

2. EQUIPMENT/MATERIALS



OUTPUT

1. TRAINED,

   a. Trainors (Instruction, Research)
   b. Students

      i. Advanced (Study/Research)
      ii. Basic (Machine Operation)

2. INSTRUCTIONAL MATERIALS

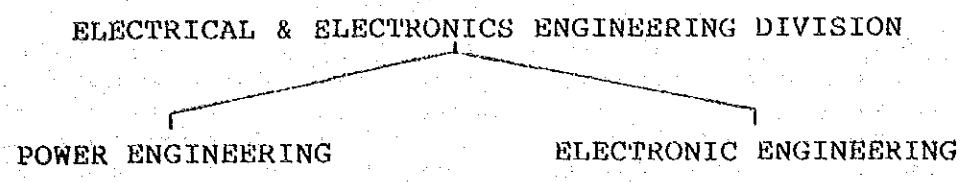
While the transfer of technology is very important, one should not forget the equally important exchange of goodwill occuring at the same time. Two groups of people with different cultures work in harmony while pursuing the most important goal of improving the quality of life through technology transfer. The members of the Staff of the Mechanical Engineering Division are grateful for the contribution of Prof. Maeda and Mr. Kawakatsu to the improvement of the state of technology in their area and they are hoping that the two experts had equally gratifying association with them. May they come back someday to share the fruits of their effort.

b. Engineer Marvil V. Graza, counterpart in the Electrical/Electronics Division stated the following:

In behalf of my colleagues in the Electrical and Electronics Engineering Division, I would like to present to you a summary of the state of technology transfer from June 1983 to February 1985.

The Electrical and Electronics Engineering Division, as its name implies, has two fields, namely, Electrical which connotes Power, and, the other Electronics. Our division offers training packages for Undergraduate's Basic Training on Electronic fundamentals, Undergraduate's Advanced Training on Power Engineering for Electrical Engineering and Trainors' Upgrading Training. Our average is 1 M-W/SEM for Trainors' Training, and 65 M-W/SEM for Advanced Training in Power, and 2970 M-W/SEM for Basic Training in Electronics. These packages utilize training software designed and developed by the EE Counterparts under the technical guidance of the EE Experts. In power, we have finished a manual for training on Electrical machines in the Electrical Engineering Laboratory, and, in electronics, we are about to complete the training manual for Basic and Advance Electronic Fundamentals. The output of this division can be attributed not only to equipment provided but also to the JICA experts through the technical cooperation provided by the Government of Japan in the achievement of a desired goal, transfer of technology.

As part of the Trainors Training Program, we have had two long-term experts and three short-term experts in the last two years. Our first long term EE expert, Dr. Shinji Yamaguchi, handles the trainors' training on Power Engineering and Basic Electronics. He also initiated the preparation of the manual for Power Engineering which was finally completed in January under the guidance of our second long-term EE expert, Dr. Masazumi Kumagai,



TRAINING PACKAGES OFFERED:

1. Undergraduate Basic Training

   Electronic Fundamentals - 2970 man-weeks/sem

2. Undergraduate Advanced Training

   Power Engineering - 65 man-weeks/sem

3. Trainors' Training

   Power Engineering - 1 man-week/sem

COUNTERPART TRAINORS' TRAINING:

1. Dr. Shinji Yamaguchi (long-term expert)

   - Power Engineering
   - Basic Electronics

2. Dr. Masazumi Kumagai

   - Logic Gates (as short-term expert)
   - Microcomputer Programming using the TK-85 Microprocessor
   - Electronic Fundamentals

3. Dr. Ken'iti Kido (short-term expert)

   - New Technology in Audio Frequency Acoustics

4. Dr. Yoiti Suzuki (short-term expert)

   - CP/M Operating System
   - Disk BASIC High Class Course
   - Basic Wordstar Course
   - BASIC & FORTRAN Compiler

formerly our first short-term expert on Logic Gates. As a long-term expert, he gave us training on Microcomputer Programming using the TK-85 Microprocessor, and, on Electronic Fundamental. Our second short-term expert was Dr. Ken'iti Kido who shared with us New Technology in Audio Frequency Acoustics, and, our latest short-term expert is Dr. Yoiti Suzuki who gave us training on the CP/M Operating System, Disk BASIC High Class Course, Basic Wordstar Course, and, BASIC and FORTRAN Compiler. Also, as part of the Trainors' Training Program, one of the EE counterparts, has been sent to Japan for a one-year training.

Within the last two years, we have learned and shared technology obtained from the technical cooperation provided by the Government of Japan through the Japanese International Cooperation Agency.

As a last statement, I would like to say that the Electrical and Electronics Engineering Division is indeed very fortunate to have Experts who are not only excellent in their own field but, also, experts who would exert extra effort in order to achieve the goal, Transfer of Technology.

c. Engineer David P. Mundo, counterpart in the Civil and Construction Engineering Division described the following:

In behalf of the Civil Engineering Division of the Integrated Research and Training Center, I wish to present the "technology transfer" in our division. Before proceeding, allow me to describe the scheme of technology transfer. First, there is a technical expert who will impart the technology to a second party, the counterpart. The counterpart will learn the technology by absorbing and understanding the theories and principles and who will later transfer this learned technology to others - specially the students. It is, therefore, clear that the expert and the counterpart play a very important role in this scheme. The basic training and teaching will be given by the expert through lectures and laboratory experiments involving the proper use and operation as well as maintenance of the existing testing machines, apparatus, and equipment in the center. As for the counterpart, he must have a good and solid background of the technology to allow him to learn and, later, to effectively transfer this learned technology to the students. To enrich his training, the counterpart must provide time for plant visits on field trips. And as a further enrichment, the counterpart are sent to Japan for specialized training for a period of one year in cooperation with the Japanese Government.

The functions of the IRTC include: (1) undertaking researches applied to engineering; and (2) conducting training programs. So far, the center has just started on the second function. The training programs are classified into: (1) Trainors' Training Program; (2) the Advanced Training Program; and (3) the Basic Training Program. In the Trainors' Training Program, the participants are faculty members who can readily transfer the technology to their students. In the Advanced and Basic Training Programs, the participants are the students. Its purpose is to strengthen the theories that the students have already learned in their classes by observing actual phenomenon through experiments and direct use of testing machines, equipment and apparatus, in which the Center is aided. In other words, the training is an "add-on" to the regular course work of the students. In the Advanced Training Program , the participants should be senior engineering students or newly graduates who are interested. In the Basic Training Program, the participants are technician students and new graduates of technician courses.

The Civil Engineering Division started with the transfer of technology since July, 1983, with the expert-counterpart training. In November, 1983, training programs were opened to the students and this had been continuing up to the present. During the said period, the division had some plant visits. The Laiban Dam Construction under the Kumagai-Gumi Construction Corporation was visited twice: first, in early August, 1983 during the tunnel breakthrough, and the second, during the whole third week of August, 1984, in which their field laboratory was used for a training in cement concrete and its aggregates, under a short-term Japanese expert, Engr. Mitsuro Kawakubo.

As of now, two of the counterparts in the Division have been sent to Japan for a year-long training. The first was sent on March 17, 1984 and had just completed his training yesterday, March 4. The second was sent last January 17. Upon their return, they are expected to have increased their skills and improved their knowledge in Civil Engineering. Regarding the student training programs, those that are given training already are from the TUP main and Cavite campuses. To summarize, the following are the number of trainees who have completed the program in Civil Engineering Division:

Basic Training Course	-	123	33 - Surveying 90 - Soil and Materials Testing
Advanced Training Course	-	28	- Surveying
Trainors' Training Course	-	6	- Concrete Design Mix

This is what had been accomplished by the Civil Engineering Division since the transfer of technology scheme was started. The Division does not intend to stop here and be contented but its staff are undergoing training in other areas of Civil Engineering Technology. We are grateful for the continued support and cooperation of the Japanese Government and the Technological University of the Philippines Administration.

5. The long-term Japanese Experts who became the instruments in the expansion and improvement of the technological education through the transfer of their invaluable knowledge on technology to the Filipino counterparts, were given proper introduction to the panel of steering committee representatives, officials of government and private institutions and other invited observers.

They were introduced in the following order:

1. Dr. Masazumi Kumagai
   JICA Expert in the Electrical/
   Electronic Engineering

2. Prof. Kunio Kawakatsu
   JICA Expert in Mechanical Engineering

3. Engr. Hideki Tanimoto
   JICA Expert and Coordinator

4. Engr. Shigeo Iwai
   JICA Expert in the Civil/
   Construction Engineering

5. Prof. Yasuho Maeda
   JICA Expert in the Mechanical Engineering
   and Team Leader in the IRTC for two years

Prof. Maeda gave his response on behalf of the other long-term JICA Experts to the status reports given by the Filipino Counterparts which concerned the state of transfer of technology in their fields.

The response of Prof. Maeda was presented as follows:

We came here to the Philippines to assist in the technological education in TUP in a way to upgrade a level of technology while training our counterparts, to get them familiar with the

operation of pieces of equipment donated by Japanese government through a grant fund.

Since then, two years have already passed.

Our efforts during this period have been centered mainly upon the problem to get the project started in a right way, implementing five years training program.

The biggest problem we have encountered up to now was to find the best way to help the Philippines upgrade and develop the expertise of the technology in the Philippines.

It was not so easy problem as we had deemed and presumed in Japan before we arrived at Manila, because the social needs or requirement for the technology upgrading and national expectations the government rests upon the technological education are quite different from those in Japan.

Some comment on the technological education system in Japan will be of some help to clarify these problems I mentioned right now.

In Japan, since the end of the second world war, when the new development of technology in US, or other western countries were introduced to Japan, the faculty of engineering department in the university has not been so much concerned with the vocational training as the engineering education.

Whereas, the industry, much expecting the achievement in engineering education of the graduates from these universities, has willingly taken over the vocational training of their employees fresh from school, in an effort to catch up with the state-of-art technology in the advance countries.

Even the vocational training in the technical high school has got so much science oriented since then, because the operation of the newly introduced equipment needs not so much the skill of the technician as the scientific mind.

Now, in the Philippines, all engineers and technicians are asked to increase national productivity so that it might get over and survive the economic difficulties the nation is now confronting with.

The role of the vocational training in the universities may be very important in this connection, because the development of the technical skill will contribute very much to the increase of productivity.

But the productivity depends not only upon the skill of technicians but also, in a greater extent, upon the creative power of engineers to develop the most needed production system to meet the social requirement in the country.

Increase of national productivity would not be brought about by mere importation of modern machines and equipment, which are developed in the advanced countries to upgrade the productivity there. They are not always suitable for the needs of the advancing countries, especially in terms of the cost of their maintenance due to the lack of domestic spare parts available in the advancing countries.

(What shall we do with the modern machine?)

After they have been introduced and the engineers, and technicians trained with their operations, they should be remodelled and redesigned, or localized in their design so that they might be adapted to the local manufacturing system, to make the local production of these equipment possible, even though it may be possible with some parts or component of it.

Through these active efforts on the part of the Filipino engineers, that will be very helpful for them to foster the creative power, the nation would be able to attain the national identity of technology, while sparing much cost of importation.

Otherwise, they will have always to lament or complain of the meagerness of national economy.

In this regard, Korea and Taiwan are good examples of the successful countries to have their technology upgraded.

Surely, it would be a great delight for the engineers as well as technicians to see their dreams come true in the form of material product after many steps of engineering experiments planned and conducted by the creative engineers, with the experimental apparatus designed and fabricated and set up by skilled technicains in the Philippines, whose skills are world-wide famous nowadays.

Their dreams could never be realized, if they devote themselves only to reading textbooks, solving the problems following the formula, without any challenge to an experimental work at own risks.

In this respect, they are the pioneers like an alpinist who wants to climb a mountain, which is not yet conquered. They should be trained and prepared for the climbing techniques while they are young, as the proverb goes:"Iron shall be forged while it is red-hot."

These considerations lead us to a conclusion that:

The vocational training curricula in IRTC shall be reorganized on the broader basis of science education, so that the students in the engineering course or technician course might have some opportunities to be exposed to the training on the design work for the development of new equipment or product, as well as some experimental works for the scientific analysis and assessment of the performance of an engineering system, more or less depending upon their grade, if they are to be qualified as a university graduate.

Before I conclude my speech, I would like to express my sincere gratitude for the kind help and cooperation extended by all officials concerned in TUP headed by Dr. Vergara and good help, advice and information given by our counterparts and technicians in IRTC, headed by Prof. Roxas, for the development of our project.

6. The "Direction of IRTC in the Next Two Years" was re-stated by Prof. Juzo Yoshida, the JICA Project Team Leader. Prof. Yoshida emphasized that IRTC will be a big aggregation of equipment for experiment and practice purposes after five (5) years. This fact, therefore, calls for a more strengthened technical cooperation between the Japanese Experts and Filipino counterparts so that the equipment will be put to effective experiment and practice uses.

Prof. Yoshida presented his concerns on the direction of IRTC in the next two years as follows:

You will find many equipment in the IRTC building. They can be classified into two (2) groups, the first group is called as "Practice Use" and were donated in November, 1982. The second group is called as "Experimental Use" which were donated in October, 1984. This project will continue up to November, 1987. So more equipment for experimental use will be added.

In contrast to "practice" which refers only to the use of the finished products, "experiment" refers to the testing and/or discovering principles of the phenomena. By executing many experiments, a student can have the knowledge of the principles relevant to actual matters. Furthermore by his own way, he can discover other special new concepts. Thus, experimental works mold the students into hopeful engineers with applicable capabilities. That is why the experimental work is considered as a very important part of industrial education in developed countries.

Then, at my welcome meeting here when I arrived at TUP last March, 1984, I said as follows, "there are two styles of education - one is TL-style that is 'teach and learn', the other one is the ES-style that is 'educe and study'." The first is passive and connect to what were preserved and to traditional products; and the second one is active and connect to development and innovations. Don't you think the first one correspond to practice and the other to experiment?

Of course both styles of education are necessary, but it may be clear that we must have the ES-style education much more than the TL-style education, because we want to strengthen the developmental force of industrial technology of the Philippines.

Then, I must emphasize to you that we need not only equipment, but also excellent teachers to work well. In case of ES-style education, teachers must educe the capabilities of the students. In the same way, in case of the education through experiments, its effectivity depends upon the way how the teachers encourage and motivate students and at the same time, how they present the contents of the texts to get satisfactory results. Various tests of this kind are now being prepared by the Experts and the Counterparts.

Now we are working to introduce the experiment and practice in engineering education. After five (5) years, IRTC will have a big aggregation of equipment for experiment and practice which can be compared to what the Japanese universities have. This must be a precious aggregation of equipment, for in the Philippines, these can be found in IRTC only. In addition, the Experts who are very experienced in technological and engineering field of Japan, are prepared and willing to advise the counterparts regarding the use, operation and principles of these equipment. Therefore, we have the possibility to construct the experiment and practice system here which is just the same as what they are implementing in some developed countries. Don't you think it is a satisfying event to attain this for the engineering education in this country?

You will not be able to hit this target by only waiting for two and a half years to pass. We have some problems now. One is lack of counterparts, the other is lack of budget. They always say that both of them are results of weak economic condition of the country. But, this project only has two and a half years left. The equipment will remain here, but they will be as good as nothing if there will be no proper advise from the Experts and also no cooperation and assistance from the Counterparts. We

will regret it if the training will not be completed on time because of these reasons.

I have delivered our status. In every way that we can, we would like to finish the project successfully. I would like to ask everybody from TUP and IRTC, that let us work with united efforts.

And I would like all who have concern for our project to have a warm heart, to encourage and assist us.

7. The Technological University of the Philippines presented awards of appreciation to the JICA Experts, JOCV and other officials of the Japanese Embassy and JICA. This was done in order to express the University's grateful recognition of them as instruments to the technology transfer which brought about technological education's improvement and expansion not only in the University but, as well as, in the country.

The following were presented the award:

1. Engr. Shigeo Iwai - CE JICA Expert
2. Dr. Masazumi Kumagai - EE JICA Expert
3. Prof. Kunio Kawakatsu - ME JICA Expert
4. Prof. Yasuho Maeda - ME JICA Expert
5. Mr. Masaaki Takahashi - JOCV Expert in Mathematics
6. Mr. Yoshitaka Motoda - First Secretary, Japanese Embassy
7. Mr. Kuniyoshi Matsuo - Director, JOCV
8. Mr. Akihiro Mitarai - JICA Resident Representative

フィリピン工科大学
総合技能訓練センター

2. プロジェクト実績表（プロジェクト期間）

破線：予定　実線：実績６０年１０月１５日現在

R／D署名　1982. 11. 3　1年目　2年目　3年目　4年目　5年目　1987 11. 2まで

1982　1983　1984　1985　1986　1987

11　1 3 5 7 9 11　1 3 5 7 9 11　1 3 5 7 9 11　1 3 5 7 9 11　1 3 5 7 9

一般事項

- 前田リーダー代理（機械科業務）
- 吉田リーダー
- 谷本調整員
- 教育機関視察（短期・準高級研修員）
- 計画打合せ
- 58年度供与機材(120 000,000円)
- 巡回指導
- 59年度供与機材(50,000,000円)
- 60年度供与機材（50,000,000円）
- 61年度供与機材

機械科

- 長期専門家：前田専門家（機械科全般・リーダー代理（1984. 3まで））／上崎専門家（金属材料）／機械設計／計測制御
- 短期専門家：川勝専門家（機械工作）／新川専門家（熱工学・流体工学）／熱工学
- 吉沢専門家(熱機関) 神本専門家(内燃機関)／上崎専門家（鋳造）／工作機械NC機械／SEM／計測工学／オートグラフ／情報処理／機械加工／非金属材料／機械加工／非破壊試験
- 供与機材：58年度供与機材 計測機械・NC機械／59年度供与機材 材料力学・計測機械・冷凍・工作機械／60年度供与機材 水力学送電機実験装置／未定
- C／P日本研修：機械工作／冷凍空調／内燃機関／流体工学 NC工作機械 内燃機関／前年に加え 特殊鋳造製法
- トレーサー向上訓練：学生高等基礎訓練に加え，鋳造 ⟷ 4〜7名
- 学生高等訓練：内燃機関・蒸気タービン 修了者12名／1983年後期と同じ 修了者6名／・機械工作 ・内燃機関 修了59名 ・冷凍空調／・内燃機関・NC工作機械・機械工作 ・蒸気タービン ・精密測定・鋳造／1985年分に加え 金属材料／流体工学／前年と同じ
- 学生基礎訓練：冷凍空調修了60名 機械工作修了85名／冷凍空調修了 48名／・鋳造工学 ・機械工作 ・蒸気タービン 修了177名 ・冷凍空調 ・内燃機関／（1984年に加え 計測機械 (2), 鋳造）／1985年と同じ／同左／同左

電気電子科

- 長期専門家：山口専門家（電力工学）／熊谷専門家（電子工学）／唐沢専門家（電子工学）／自動制御／電子材料
- 短期専門家：熊谷専門家（電子回路）／鈴木専門家（コンピュータ）／山口専門家（電力工学）コンピュータ／論理回路／パソコン応用／無線通信／パソコン応用
- 供与機材：58年度供与機材 電気電子工学 コンピュータ 電力工学／59年度供与機材 電気電子工学科／60年度供与機材 電気・通信工学
- C／P日本研修：電子回路／コンピュータ／未定
- トレーサー向上訓練：電力工学 ⟷ 2名
- 学生高等訓練：電力工学 修了者10名／電力工学 受講者7名／電子工学 修了14名／電力工学・電子回路／前期と同じ／電力工学・電力回路 マイクロコンピュータ制御／前期と同じ／1986年と同じ
- 学生基礎訓練：基礎電気 修了者33名／基礎電気電子 受講予定 94名／基礎電気電子 修了66名／前年と同じ／〃／前年と同じ／〃／〃

土木科

- 長期専門家：岩井専門家（土質工学・測量）／山尾専門家（材料・コンクリート）／構造工学（予定）／（水理学？）
- 短期専門家：川久保専門家 コンクリート／アスファルト／材料工学（金属）
- 供与機材：58年度供与機材 測量・土質工学・材料実験等／59年度供与機材 材料工学／土質工学／60年度供与機材 構造工学／60年度供与機材 未定
- C／P日本研修：土質工学／材料工学
- トレーサー向上訓練：材料測量 6名／下と同じ
- 学生高等訓練：測量修了者10人／測量・土質試験 受講者 6人
- 学生基礎訓練：土質・材料試験 修了者57人／測量・材料試験 修了 53人／測量・材料試験 修了 15名／同上／同上

3. 学問体系化によるカリキュラム

（機械工学・電気電子工学）

＃済，＋現，％未　　L講義　X実験　P実習　E演習

機械工学カリキュラム

100　熱工学

＃％　101　熱力学　L

1. 熱と仕事
2. 熱力学第一法則
3. 熱力学第二法則
4. 相平衡
5. 不可逆過程
6. 熱伝導

＃％　102　熱機関工学　L,X

1. ボイラー
2. 蒸気機関
3. 内燃機関

％　103　伝熱工学　L,X

1. 熱伝導の基本
2. 自然対流
3. 強制対流
4. 熱交換

＃％　104　熱機関の実験と実習　P,X

P1. 内燃機関
P2. ボイラー及び蒸気機関
P3. 冷凍及び空調
X4. 熱交換

120　機械工学の基礎　L,E

％　121　機械設計

1. 基本規則及び図学
2. 機械の要素
3. 軸及び潤滑法
4. 軸受及び潤滑法
5. 摩擦伝導装置
6. 歯　車
7. 巻掛伝導装置
8. ブレーキ，はずみ車
9. ば　ね
10. 管，管継手，弁

E1. ブラケットの設計製図
E2. オルダム軸　〃
E3. サクション　ータ〃

＋　122　流体工学　L,X

1. 緒　論
2. 気液二相流
3. 連続式
4. ベルヌリの定理
5. 流速分布〔層，乱流〕
6. ニュートンの粘性法則
7. ハーゲン・ポアズイユの法則
8. デメンション解析
9. 図上積分法
10. 対数，LOG−LOG紙の利用法
11. オリフィス流量計
12. レーノルズ数の計算
13. 単位の換算
14. 実験式の換算

15. 対数平均
16. 重力換算計数
17. 流体に於ける頭損失

\+ 123 金属材料学 L,X
1. 金属の諸性質
2. 金属の変形
3. 合金状態図
4. 製鉄及び製鋼
5. 鉄－炭素状態図
6. 鋼の熱処理
7. 鋼の分類
8. 低合金鋼
9. 工具鋼
10. ステンレス鋼
11. 鋳　鉄
12. 非鉄合金材料

X1. 鋼の熱処理と組成及び機械的性質
X2. 鋼の熱処理と破面検査との関係
X3. 鋼の熱処理と疲れ強さとの関係
X4. 鋼の炭素量と組織及び機械的性質との関係
X5. アルミニューム合金に於ける析出硬化現象
X6. 鋼の溶接部の組織及び硬化変化
X7. ステンレス鋼のWELD－DECAY
X8. 鋳鉄の冷却速度と組織との関係

% 124 非金属材料 L
1. セメント，コンクリート
2. 耐火材及び保温材
3. 木材，皮，ゴム
4. プラスチック
5. 接着剤
6. 潤滑剤

% 125 計測工学 I,X
1. 測定と精度
2. 計測量の変換
3. 長さと角度の測定
4. 質量，力，時間，温度の測定
5. 流体の測定

X1. デジタル測長機
X2. 測微計
X3. 電気マイクロメータ
X4. ダイアルゲージ・テスタ
X5. 表面あらさ計
X6. 歯車ふれ試験機
X7. 工具顕微鏡
X8. 万能投影機
X9. オートコリメータ
X10. 電気容量計による計測
X11. 硬度試験〔ブルネル〕
X12. 〃 〔ショーア〕
X13. 〃 〔ピカース〕
X14. シャルピー衝撃試験
X15. ひずみ計

% 126 計測制御 L,X
1. 制御系，過渡特性

2. プロセス制御
3. サーボ機構
4. 自動調節
5. シーケンス制御

実　験

% 127 情報処理 LE
1. 緒　論
2. 計算器のしくみ
3. 基礎言語に依るプログラム
4. 数値計算
1. 内　挿
2. 積　分
3. 方程式
4. 微分方程式
5. コンピュータ応用システムの例

% 128 非破壊試験 LP
P1. X線検査
P2. 超音波探傷

140 機械工作法

141 機械実習 P
P1. 旋盤〔メートル〕
% P2. 旋盤〔インチ〕
% P3. シェーパ
% P4. プレーナ
# P5. フライス盤
+ P6. 工具研磨削盤
+ P7. 成形研削盤
+ P8. 円筒研削盤
# P9. ホブ盤
# 10. 歯切盤
+ P11. コンターリングマシン
# P12. 鋸　盤
+ P13. 帯鋸盤
+ P14. 放電加工機
# P15. 射出成形機
+ P16. ミニマシーニング・センタ

142 鋳造学 L,P
実　験
P 鋳物砂試験

＃済　＋現　％未　L講義　X実験　P実現　P実習　E演習

電気・電子工学カリキュラム

200 電気・電子工学基礎

＃ 201 電子工学の基礎 L X

X1. オームの法則
X2. キルヒホッフの法則
X3. 電源特性
X4. 低　抗
X5. 分圧器
X6. オッシログラフ
X7. L，C，R
X8. ＡＣ回路
X9. 共振回路
X10. ＲＣ回路，過渡現象
X11. ダーオード
X12. トランジスタ
X13. ＦＥＴ

％ 202 計　測 L,E

主として既設の測定器を中心として，計測器類の説明及び実習などを行なう事を予想している。

＃ 203 パーソナル・コンピュータ L,E

E1. アドバンスド・ベーシック プログラム
E2. ＣＰＭ入門
E3. 中級ＣＰＭ

＊印のついている大題目は，中にある課目数が少ないが，カリキュラム構成の必要からとりあげたものである。

220 電力工学

＃ 221 電気機械

X1. 直流発電機
X2. 直流電機機
X3. 同期発電機
X4. 同期電動機
X5. ワードレオナード
X6. ＡＣ，ＤＣ一般機械
X7. 電動発電機，自動制御
X8. 変圧器
X9. 鉄損測定
X10. 交流直特性曲線
X11. 単相，三相電力測定
X12. 発電機の効率

240 電子回路

241 アナログ電子回路 L,X

＃ 〔1〕 増幅器及び電源

X1. トランジスタ・アンプ
X2. ＦＥＴ・アンプ
X3. 低周波アンプ
X4. ＯＰアンプ
X5. 整流平滑回路
X6. 安定化電源

＋ 〔2〕 電子通信

X7. 同調増幅器
X8. 発振器
X9. 振幅変調
X10. 周波数変調
X11. 送信器，受信器
X12. カラーＴＶ

242　テジタル回路　L,X

＋　〔1〕パルス回路と論理回路

X1. トランジスタ・スイッチ

X2. 波形変換器

X3. マルチバイブータ

X4. ブロッキング発振器

X5. ＴＴＬ論理回路

X6. ＭＯＳ論理回路

〔2〕デジタル計算器の要素

X7. 論理回路の基礎

X8. 組合せ論理回路

X9. 順序論理回路

X10. ＡＤ変換器

X11. テジタルコンピュータ要素

X12. テジタルコンピュータの仕組み

260　コンピュータ

261　マイクロコンピュータ　L,E

＃　E1. TK85を用いた機械語の学習

＃　E2. 機械語に依るプログラミング

％　E3. TK85の制御系への応用

％　262　パソコン応用〔制御〕　L,E

％　263　パソコン応用〔CAD〕　L,E

280　自動制御

％　281　自動制御　L,X

X1. シーケンス制御

1. 電車走行負荷

2. エレベータ負荷

X2. サーボ機構

1. サーボ要素

2. シンクロサーボ系

X3. 計算器制御

1. 計算器

EY-YEACIO

2. インターフェース

ET-1／F

3. ボイラー負荷

ET-SEC2

X4. 半導体電力制御

1. SCR

2. UJT

300　電気通信*

％　301　無線通信　L,X

1. アンテナ

2. 電波伝播

320　電気材料*

％　321　電子材料

X1. 真空蒸着

X2. 光蝕刻

X3. 試作品の評価

4. カウンターパート訓練実績表

学科名　機械工学科

C／P 名	訓練内容	到達目標	達成度					総括・評価	その他問題点，備考
			A	B	C	D	E		
Mrs. N. C. Graza	機械工学の基礎		○						
(Engr.)	数　学		○						
	コンピュータプログラミング		○						
	エンジン性能試験		○						
	金属材料硬さ試験		○						
	金属材料組織学			○				現在訓練中	
	流体工学			○				現在訓練中	
Prof. Mr. Q. Almeniana	エンジン性能試験			○					
	鋳物砂試験		○						
	流体工学の基礎			○				現在訓練中	
	金属組織学			○				現在訓練中	
	金属材料熱処理		○						
	金属材料硬さ試験		○						
	走査電子顕微鏡取扱		○						
Engr. R. Hizon	ボイラーの運転操作		○						
	エンジン性能試験		○						
	鋳造技術		○						
	金属材料硬さ試験		○						
	流体力学			○					
	流体工学			○				現在訓練中	
	金属材料組織学			○				現在訓練中	
	走査電子顕微鏡取扱		○						

C／P 名	訓練内容	到達目標	達成度					総括・評価	その他問題点，備考
			A	B	C	D	E		
Engr. M. Gonzales	ボイラー運転操作		○						
	エンジン性能試験		○						
	鋳造技術		○						
	金属材料硬さ試験		○						
	金属材料組織学			○				現在訓練中	
	流体力学			○					
	流体工学基礎			○				現在訓練中	
Mr. N. Ramirez	鋳造技術		○						
	金属材料硬さ試験		○						
	金属材料組織学			○				現在訓練中	
	流体工学			○				現在訓練中	
	ＮＣマシン基本運転操作		○						
	精密平面削盤操作		○					本年供与機材	
	コッターマシン操作		○					本年供与機材	
Engr. R. Amonio	日本にて一年間研修			○					
	金属材料組織学			○				現在訓練中	
	流体工学			○				現在訓練中	
Engr. V. Angeles	ボイラー運転操作		○						
	エンジン性能試験		○						
	金属材料硬さ試験		○						
	鋳造技術		○						
	目下日本にて研修中			○				目下日本にて研修中	

C／P 名	訓練内容	到達目標	達成度					総括・評価	その他問題点，備考
			A	B	C	D	E		
Mr. R. Domingo	金属材料組織学			○				現在訓練中 （本年6月18日採用 UP卒 20才）	
	走査電子顕微鏡操作		○						
	ＮＣマシン基本操作		○					現在訓練中	
	流体工学			○					
Mr. G. Erguiza	金属材料組織学			○				現在訓練中 （本年6月25日採用 UP卒 20才）	
	走査電子顕微鏡操作		○						
	流体工学			○				現在訓練中	

学 科 名　電 気 電 子 工 学 科

C／P 名	訓 練 内 容	到 達 目 標	達成度 A	B	C	D	E	総 括 ・ 評 価	その他問題点，備考
Jerome dela Jorre	電気機械			○					日本研修1985,1月より
	ロジック回路			○					
	マイクロコンピュータ				○				
	電子工学基礎			○					
Maruil V Graza	電気機械		○						実験教科書1, 2, 5, 7章著 学生指導　COE
	ロジク回路			○					
	マイクロコンピュータ		○						実験教科書共著
	電子工学基礎			○					学生指導CIT, CIE
	パーソナルコンピュータ			○					
	アナログⅠ			○					
	アナログⅡ		○						
	電気工学基礎			○					
	デジタルⅠ			○					
Harry Alfonso Joson	マイクロコンピュータ			○					
	電子工学基礎		○						実験教科書2, 4, 6, 10, 12章著
	パーソナルコンピュータ			○					
	アナログⅠ		○						実験教科書1, 2, 3, 4章著
	アナログⅡ		○						
	電気工学基礎			○					
	デジタルⅠ			○					

C／P 名	訓 練 内 容	到 達 目 標	達成度 A	B	C	D	E	総 括 ・ 評 価	その他問題点，備考
Alen J Sandoval	（電気機械）		○						実験教科書3，4，6，8章著 学生指導
	マイクロコンピュータ			○					
	電子工学基礎		○						実験教科書1，3，5，7，8，9，11著 学生指導
	パーソナルコンピュータ			○					
	アナログⅠ		○						実験教科書5，6著
	アナログⅡ		○						
	電気工学基礎			○					
	デジタルⅠ		○						
Vicente Elizardy Pendang	（電子工学基礎）			○					学生指導
	アナログⅡ		○						
	電気工学基礎			○					
	デジタルⅠ		○						
	（電気機械）			○					学生指導
Noda Jose Juan Ignacio	（電子工学基礎）		○						学生指導
	アナログⅡ			○					
	電気工学基礎		○						
	デジタルⅠ			○					
	（電気機械）								学生指導
Alberto Cruz	全項目を受講								Technician
Tito Querido	全項目を受講								Technician

C／P 名	訓 練 内 容	到 達 目 標	達 成 度					総 括 ・ 評 価	その他問題点，備考
			A	B	C	D	E		
コンピュータ部門									
Edvin Weber Koh	マイクロコンピュータ		○						実験教科書共著
	パーソナルコンピュータ		○						
	デジタルI			○					

学科名　土木工学科

C／P 名	訓練内容	到達目標	達成度 A	B	C	D	E	総括・評価	その他問題点，備考
Warte Gutierg	土質工学	（岩井）	○					Text作成	
	測量工学	（岩井）	○						
	コンクリート	（山尾）	○						
Dabid Mundo	土質工学		○						
	測量工学		○					Text作成	
	コンクリート工学	（川久保）	○					Text作成	
	コンクリート工学	（山尾）	○						
Loreto Apilado	土質工学	（岩井）	○						
	測量工学	（岩井）	○						
	コンクリート工学	（川久保）	○						
	コンクリート工学	（山尾）	○						
Victor Macum	土質工学	（岩井）	○						
	測量工学	（岩井）	○					Text作成	
	コンクリート工学	（川久保）	○					Text作成	
	コンクリート工学	（山尾）	○						
Domnigo	コンクリート工学	（山尾）	○						
		全体的：基礎的理論及実験の指導が可能な程度の訓練，研究への入門						研修態度は頗る良好である上，自ら勉強を進めており申し分ない。	'83機材入手がおくれた為，土質工学は大幅に遅延した。

5. 学生訓練実績表

学科名　電気電子工学科

科　目	実施期間		訓練目標	結果総括	担当C／P	その他問題点，備考
学生基礎訓練 ○電子工学基礎	５８年１１月 ～５９年３月	３回　３３人	1. オシロスコープ 2. オームの法則 3. キルヒホッフの法則 4. 直列共振 5. 並列共振 6. メーター回路 7. 充放電特性の測定 8. ダイオード 9. トランジンタ 以上の訓練	満足すべき結果ときく	J. Dela Torre W. Lopez	
○　〃	５９年６月～１０月	８回　９４人	上記１から７までに加え，テレビ技術	満足すべき結果であった	J.Dela Torre H. Jonson	１６名途中で参加をやめた（７月以後のデータ） （残り９４人）
○　〃	５９年１１月 ～６０年３月	４回　４８人	1. オームの法則 2. キルヒホッフの法則 3. 電源特性 4. 抵抗 5. 分圧器 6. オシロスコープ 7. ＬＣＲ 8. ＡＣ回路 9. 共振 10. ＲＣ回路過渡現象 11. ダイオード 12. トランジスタ 13. ＦＥＴ 以上の訓練	満足すべき結果であった	J.Dela Torre H. Jonson	途中で参加をやめた学生がでた。
○　〃	６０年２月	１回　２０人	上記のうち，2, 4, 6, 9, 12	満足できない。 時間が少なく充分な測定が出来なかった。	A. Sandovai H. Joson	ＴＯＰカビテ分校の学生を対象

科　　目	実施期間		訓　練　目　標	結　果　総　括	担当C／P	その他問題点，備考
学生高等訓練						
○電力工学Ⅰ，Ⅱ	５８年１１月 ～５９年２月	１回　１０人	1. 直流発電機 2. 直流電動機 3. 同期発電機 4. 同期電動機 5. ワードレオナード 6. 同期発電気の並列運転 7. ＡＣ・ＤＣ一般機械 8. 電動発電機－自動制御 以上の訓練	満足すべき結果であった。 （理解し，装置を操作できる。）	M. Caima M. Graza	な　し
○　　〃	５９年６月～８月	１回　　７人	同　　上	満足すべき結果であった。	M. Graza A. Sanioral	な　し
○電子工学	６０年２月～３月	１回　１４人	1. チームの法則 2. キルヒホッフの法則 3. 電源特性 4. 抵抗 5. 分圧器 6. オシロスコープ 7. ＬＣＲ 8. ＡＣ回路 9. 共振 10. ＲＣ回路過渡現象 11. ダイオード 12. トランジスタ 13. ＦＥＴ 以上の訓練	満足すべき結果であった。	A. Sanoioval H. Joson	４人途中で参加をやめた。
トレーナー向上訓練						
○電子工学	５９年１０月	１回　　２人	1. 直流発電気 2. 直流電動機 3. 同期発電機 4. 同期電動機	満足すべき結果であった。	M.Graza A. Sanoioval	トレーナー（ＣＯＥインストラクター）訓練，非常に短期間で多くの訓練はできなかった。

学科名　土　木　工　学　科

科　　目	実施期間		結　果　目　標	結　果　総　括	担当C／P	その他問題点，備考
学生基礎訓練 ○土質・材料試験	５８年１１月～ ５９年３月	5回　５５人	○土質試験及び材料試験について，概説，供試体の準備及び強度試験，土の物理的性質を求める試験，試験機器の説明及びメンテナンス，データ整理法を習得させる。	到達している機材及び理論的なものについては，ほとんどわかっているものと思う。	M. Gutierred L. Apilado V. Macam	○ＣＩＴ学生のＣＩＴでの講義に対する実験・実習の部分をIRTCが受け持ち，ＣＩＴのカリキュラムに合わせてIRTCの訓練を行なわなければならなかったため，Ｃ／Ｐによる学生訓練だけではなく，ExpertによるＣ／Ｐ訓練にも支障があった ○土質試験法については，試料・機材不足のため，１回目のみ実施
○材料試験法	５９年７月～１０月	3回　２７人	○上記の訓練を材料試験法に限って行なう。	レポートの提出結果により，ほぼ基礎知識ははいっている。	L. Apilado	○ＣＩＴカリキュラム変更のため当初予定の半分のコースが中止となった。 （材料試験については，ExpertによるＣ／Ｐ訓練は行なわれておらず，Ｃ／Ｐが独自に学生訓練を行なった）
○測量基礎	５９年７月１０月	2回　２６人	○トランシット，セオドライトの構造 ○測距，測角（鋼テープとトランシットセオドライトの習熟） ○トラバース測量と作図	ある一部の学生を除き，測量機具の使用法及び解析を把握している。	V. Macam	
○　〃	６０年２月	1回　７人	上記に加え，スタジア測量を習得させる。		E. Quitos	○ＴＵＰカビテ分校の学生を対象
○コンクリート設計	６０年２月	1回　８人	○骨材特性，セメント特性の理解 ○配合設計の理解	病気の者を除く学生は設計法（ACI）及び材料特性を理解している。	D. Mundo V. Macam	

科　　目	実施期間		訓練目標	結果評価	担当C／P	その他問題点，備考
学生高等訓練						
○測量機器	５８年１１月 ～５９年１月	１回　１２人	○トランシット，セオドライトについて機器の理解，取りあつかい方の習得，誤差に解する理解と調整方法，原理の理解 ○測量学概説の講義	ほとんどの生徒は合格点に達している。	D. Mundo	
○地形測量	５９年１月～３月	１回　１０人	○上記の訓練終了者を対象とし， 1. 測距，測角の実習 2. トラバース測量と，オフセット測量 3. 以上の応用として，ＴＵＰ構内の地形図を作成する。	テストおよびＴＵＰ内の地形図を作成している。	V. Macam	○学生の出席率は悪かった。 ○完全に訓練が終了する前に，訓練時間がなくなった。
○測量応用	５９年６月～	－	上記地形測量に加え，曲線設置。	未３－中断	D. Mundo	
○コンピュータ	５９年３月	１回　１１人	BASICによるプログラミングができるまで，PC-8001 を用いて実習を行なった。	イントロダクションのみにとどまり，応用まではいっていない。	D. Mundo	○ロハス所長の要望により開講。
トレーナー向上訓練						
○測量，材料工学	５９年１０月	６人	○測量機材の使用方法の習熟 ○材料（コンクリート）の骨材特性，セメント特性，配合設計についての理解	このコースの受講者に，測量機材及び骨材特性については，理解している。	D. Mundo L. Apilado V. Macam	○ＴＵＰ工学部の教字を対象に行なった。

6. 機 材 活 用 状 況 表

4） 機材リスト・活用状況

学科名	機材リスト	年度区分	活用状況 A	B	C	D	E	コメント	その他・問題点・備考
機械工学科	1. 精密旋盤	無償	○						
	2. 立フライス盤	〃	○						
	3. ホブ盤	〃	○						
	4. 高速歯切盤	〃		○					
	5. プラスチック射出成形機	〃		○					
	6. 工具研削盤	〃		○					
	7. 放電加工機	〃		○					
	8. 円筒研削盤	〃		○					
	9. 卓上ボール盤	〃	○						
	10. グラインダ	〃	○						
	11. シャルピー衝撃試験機	〃	○						
	12. ブリネル硬度試験機	〃						故障中	(株)島津製作所，到着時より故障，使ったことなし，メーカに再三連絡返事なし。
	13. ビッカース	〃	○						
	14. ロックウェル	〃	○						
	15. ショアー	〃	○						
	16. 非常用自家発電装置	〃	○						
	17. 教材用蒸気原動機実験装置	〃	○						
	18. マイクロメータ 一式 （フルサイズ）	〃	○						

学科名	機械リスト	年度区分	活用状況 A	B	C	D	E	コメント	その他・問題点・備考
機械工学科	19. 鋳造工場作業機械	無償						未設定，未利用	
	（造型機，ミキサー，ふるい機								
	プラスト，シェルモールド）								
	20. 鋳造砂試験装置 一式	〃	○						
	21. 電気炉	〃	○						
	22. 冷凍実験装置 一式 （3ユニット）	〃		○					
	23. 空調	〃	○						
	24. 内燃機関性能総合実験装置	〃	○						
	25. インジェクションポンプテスター	〃		○					
	26. エンジニアナライザー	〃	○						
	27. A アーク溶接機	〃	○						
	28. ガス溶接装置	〃						未使用	ガス並に溶接棒購入できず（資金なし）
	29. コンプレッサー	〃		○					
	30. カットモデル各種（エンジン・自動車構造等）	〃	○						
	31. 万能デジタル測長機	58年							
	32. 表面粗さ測定機	〃							
	33. 指針測微計 （3台）	〃							
	34. 電気マイクロメーター （2台）	〃							
	35. ダイカルゲージテスター （2台）	〃							

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
機械科(続き)	36. 歯車振れ検査器	58供							
	37. 歯厚マイクロメータ (4セット)	〃							
	38. デジタル容量計	〃							
	39. 小型工具顕微鏡	〃							
	40. 精密万能投影機	〃							
	41. オートコリメータ	〃							
	42. オプチカルパラレル及びオプチカルフラット	〃							
	43. サインバー	〃							
	44. 各種工具類	〃		○					
	45. 油圧式高速鋸盤	〃	○	○					
	46. 燃料噴射ポンプ (3台)	〃			○				
	47. NC工作機械及びテープ自動作成装置	〃			○	○			
	48. NEC・TK-85 -3	前田携行						使用予定なし	電気科に移管の上，利用方法を考えて貰ってはどうか。
	49. I/O ボード -1	〃							
	50. 刃物類	〃	○						
	51. 硬さ基準片 各種	59供	○						
	52. 火花試験標準片 各種	〃	○						
	53. ハードネテスター標準片 各種	〃	○						
	54. 顕微鏡組織標準片 各種	〃	○						

機械科(続き)	機械リスト	年度区分	活用状況 A	B	C	D	E	コメント	その他・問題点・備考
機械科(続き)	55. キャビネット類	59供	○						
	56. コッターマシン	〃	○						
	57. 水力学実験装置	〃	○						
	58. 走査顕微鏡	〃	○						
	59. 電解研磨装置	〃						新設の金属実験室に設置完了	
	0. 平面研削盤	〃	○						
	61. OHP及びカラーファックス	川勝行携	○						
	62. 写真現像機材	新川行携	○						
	63. 直流天びん	〃						故障中	㈱島津製作所，到着時より使用不能（未完成品）交換要求文書ＪＩＣＡ東京に発送済

学科名	機械リスト	年度区分	活用状況					コメント	その他・問題点・備考
			A	B	C	D	E		
電機電子工学科	1. 基本電子回路実験装置	無償	○						
	2. 半導体静特性測定回路	〃			○				
	3. トランジスタ入力回路実験装置	〃		○					
	4. 半導体応用装置	〃							
	5. 振動回路装置	〃		○					
	6. 増幅回路装置	〃		○					
	7. バイアス回路パネル	〃		○					
	8. AF増幅回路パネル	〃		○					
	9. 差動増幅回路パネル	〃							
	10. AM変調，復調回路実験装置	〃		○					
	11. AM送信，受信回路実験装置	〃		○					
	12. FM変調，復調回路実験装置	〃		○					
	13. パルス回路実験装置	〃		○					
	14. TVトレーニングシステム	〃	○						
	15. シーケンス制御トレーナ	〃							
	16. ロジック回路トレーナ	〃						60年度中に指導	
	17. ロジック回路実験装置	〃						60年度中に指導	
	18. フィードバック回路トレーナ	〃							
	19. マイクロ波測定トレーナ	〃							

学科名	機械リスト	年度区分	活動状況					コメント	その他・問題・備考
			A	B	C	D	E		
電気電子科（続き）	20. サーボ機構トレーニングシステム	無償							
	21. コンピュータトレーニングシステム	〃							
	22. コンピュータ基本実験装置	〃							
	23. インターフェース	〃							
	24. A／D変換実験装置	〃							
	25. A／D変換回路パネル	〃							
	26. オシコスコープ	〃	○						
	27. 自在計路器	〃		○					
	28. RCオシレータ	〃		○					
	29. AC電圧計	〃		○					
	30. 掃引ジェネレータ	〃			○				
	31. パターンジェネレータ	〃			○				
	32. デジタル計算機	〃							
	33. ひずみ計	〃		○					
	34. 電流計	〃		○					
	35. スライダック	〃		○					
	36. 電源	〃		○					
	37. M－G制御トレーニングユニット	〃		○					
	38. 〃 自動制御ユニット	〃		○					

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
電気電子科（続き）	39. 変圧機	無償		○					
	40. ワードレオナードトレーニングシステム	〃		○					
	41. DC・AC用M－Gトレーニングシステム	〃		○					
	42. 伝送回路テストシステム	〃							
	43. 電気式動力計	〃		○					
	44. L.C.R負荷抵抗機	〃		○					
	45. ポータブル発電機	〃							
	46. 同期発電機操作システム	〃		○					
	47. DC電源	〃		○					
	48. 誘導電導機 －2	58供		○					
	49. 単相誘導機 －3	〃		○					
	50. 三相誘導電圧調整器	〃		○					
	51. 変圧器 －4	〃		○					
	52. 直流電動機 －4	〃		○					
	53. 周波数分析器 FFM	〃	○						
	54. 騒音計及び付属品	〃		○					
	55. 電流計，電圧計，電力計 各種	〃		○					
	56. エプスタイン試験器	〃		○					
	57. 直流安定化電源	〃		○					

学科名	機械リスト	年度区分	活動状況					コメント	その他・問題点・備考
			A	B	C	D	E		
電気電子科（続き）	58. 直流安定化電流 −10	58供	○						
	59. 回転計 −2	〃		○					
	60. すべり抵抗器 −2	〃		○					
	61. 記録計	〃		○					
	62. デジタルテスター −4	〃	○						
	63. ひずみ率計 −4	〃		○					
	64. ホイーストンブリッジ −2	〃		○					
	65. ダイヤル可変抵抗器 −2	〃		○					
	66. ユニバーサルカウンタ −3	〃		○					
	67. オシロスコープ（DC−150MHz）	〃	○						
	68. 〃 （DC− 15MHz）−3	〃	○						
	69. ファンクションジェネレータ −4	〃	○						
	70. 電子電圧計 −6	〃		○					
	71. ロジックアナライザ	〃			○				
	72. パターンジェネレータ	〃			○				
	73. デジタルマルチメータ −3	〃	○						
	74. 発電機式絶縁抵抗計	〃		○					
	75. 変流器	〃		○					
	76. 接地抵抗計	〃			○				

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
電気電子科（続き）	77. X-Yレコーダ	58供	○						
	78. 標準信号発生器	〃		○					
	79. スライダ	〃		○					
	80. トランス	〃		○					
	81. 相互誤差器	〃		○					
	82. H.P. パーソナルコンピュータ プリンタ，グラフィックプロッタ，メモリボード	〃	○ ○						
	83. NECパソコン（電気分） －2	〃	○						
	84. 電動タイプラタ	熊谷行携	○						
	85. TK－85 －3	熊谷行携	○						
	86. I／Oボード	〃	○	○					
	87. テープレコーダ	59供		○					
	88. P－ROM書込器	〃	○						
	89. 各種工具類	〃	○						
	90. 各種材料，消耗品類	〃	○						
	91. IC類，リニアIC	〃	○						
	92. 自動電圧調整器 －2	〃	○						
	93. レベルレコーダ	〃		○					
	94. デジタルマルチメータ －2	〃	○						
	95. ユニバーサルカウンタ －2	〃		○					

学科名	機械リスト	年度区分	活動状況					コメント	その他・問題点・備考
			A	B	C	D	E		
電気電子科（続き）	96. オシロスコープ　－3	59供	○						
	97. LCRメータ	〃		○					
	98. 周波数計　－2	〃		○					
	99. メーター類各種　計20	〃		○					
	100. 自動歪率計	〃		○					
	101. 低周波発振器	〃		○					
	102. すべり抵抗器　－2	〃		○					
	103. YHPコンピュータ付属品	〃	○					82と同じ	
	104. 同ソフトウェア　各種	〃	○						
	105. デジタルオシロスコープ	〃	○						
	106. カーブトレーサ	〃	○						
	107. 電源各種	〃	○						

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
土木工学科	1. 万能試験器	無償	○					試験機の検討について（オイルの消耗度）	
	2. 液性限界測定装置	〃		○					
	3. ホーバート型セメントペーストミキサ	〃	○						
	4. 突固め試験器	〃	○						
	5. 圧密試験装置	〃	○						
	6. コンクリートコアドリル	〃			○				
	7. モルタルフロートテーブル	〃	○						
	8. 油圧降下式ビカー針装置	〃	○					オイルに問題あり	
	9. スランプソー	〃			○				
	10. コンクリートミキサー	〃	○						
	11. ロスアンジェルス摩耗試験器	〃	○					この試験機はそうおんに問題あり	
	12. アスファルト用電気炉	〃	○						
	13. 小型電気乾燥炉	〃	○						
	14. オートクレーブ養生炉	〃			○				
	15. 2"キューブ用モールド，底版付	〃			○				
	16. 骨材比重試験器	〃	○						
	17. 遠心分離抽出器	〃		○					
	18. 伸度試験機	〃	○						
	19. セーボルト粘度計	〃	○						

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
土木科（続き）	20. コンクリートバイブレータ	無償	○						
	21. トランシット	〃		○					
	22. キャッピングセット	〃	○						
	23. コンプレッサー	〃	○						
	24. ブルーピングリング	〃		○	○				
	25. ティルティングベルー 一式 −6	〃		○					
	26. 平板アリダート 一式 −6	〃							
	27. テープ各種 30	〃	○						
	28. プラニメータ −6	58供			○				
	29. ポケットコンパス −3	〃			○				
	30. プレハブ倉庫，ロッカー類，作業台	〃	○						
	31. 台秤 −1	〃	○						
	32. デジタル式直読二皿秤 −1	〃	○						
	33. ジャッキ（10t） −1	〃	○						
	34. チエーンブロック（1.5t） −1	〃	○						
	35. PHメーター −1	〃	○						
	36. 力計 −3	〃	○						
	37. 各種工具，スコップ，ツルハシ	〃	○						
	38. デシケータ −3	〃		○					

学科名	機械リスト	年度区分	活動状況 A	B	C	D	E	コメント	その他・問題点・備考
土木科（続き）	39. カメラ（ニコン） −1	58供	○						
	40. ダイアルゲージ −10	〃	○						
	41. マイクロメータ，ノギス，メジャー等各種	〃	○						
	42. ビーカ，メスシリンダ，バット，容器類	〃	○						
	43. ハンドオーガ 一式 −1	〃		○					
	44. 標準貫入試験器 −1	〃	○						
	45. 砂置換式現場密度試験機 −1	〃	○						
	46. 平板載荷試験機 −1	〃	○						
	47. ポータブルコンペネトロメータ −1	〃			○				
	48. スウェーデン式現位置貫入試験機 −1	〃		○					
	49. 円筒打込み式サンプラ −1	〃		○					
	50. 土質試験スライド −1	〃	○						
	51. 大型電気乾燥炉 −1	〃	○						
	52. 三軸圧縮試験器 −1	〃	○	○					
	53. トリーマ −3	〃							
	55. 直接せん断試験器 −1	〃	○						
	56. 変水位透水試験器 −1	〃		○					
	57. 真空ポンプ，アスピレータ 一式 −1	〃		○					
	58. 大型圧密槽 −1	〃	○						

学科名	機械リスト	年度区分	活用状況 A	B	C	D	E	コメント	その他・問題点・備考
土木科（続き）	59. 室内ＣＢＲ試験装置 －1	５８供	○						
	59. 粒度分析用フルイ（１２種） －3	〃	○						
	61. 恒温水槽（温度調節器付） －1	〃	○						
	62. 蒸留水製造装置 －1	〃	○					多物に利用可能	
	63. フォールコーン試験機 －1	〃	○						
	64. ミハエリス曲げ試験機 －1	〃	○						
	65. 三連型わく －2	〃	○						
	66. コンクリート骨材試験ふるい（８種） －2	〃	○						
	67. 比表面積試験器 －1	〃	○						
	68. シュミットハンマ －1	〃		○					
	69. スランプ試験器 一式 －2	〃	○						
	70. チャブマンフラスコ 各種 －15	〃	○						
	71. 針入度試験器 －1	〃	○						
	72. アスファルト恒温水槽 －1	〃			○				
	73. マーシャル試験機 －1	〃			○				
	74. 軟化点試験装置 －1	〃			○				
	75. ＨＰコンピュータ及付属品 －1	〃	○						
	76. ＮＥＣパソコン（土木分） －1	〃	○						
	77. 標準砂（豊浦・オタク）計７袋	岩井携行	○						

学科名	機械リスト		年度区分	活状況 A	活状況 B	活状況 C	活状況 D	活状況 E	コメント	その他・問題点・備考
土木科（続き）	78. 標準セメント	30g×10	岩井携行	○						
	79. デジタル式直読上皿秤	−1	59供	○						
	80. 直示てんびん	−3	〃	○						
	81. 秤用テーブル	−1	〃	○						
	82. 掃除器	−1	〃	○						
	83. 大型電気乾燥器	−1	〃	○						
	84. デシケーの	−3	〃	○						
	85. メスシリンダ（ガラス製）5種	計40		○						
	86. セメントコンパレータテストセット	1式	〃							
	87. 各種ふるいセット	3式	〃	○						
	88. ふるい振とう機，電動ふるい機	各1	〃	○						
	89. ルーサイトエアメータ	−1	〃	○						
	90. ローリンメータ	−1	〃			○				
	91. 油圧プロクター貫入試験器		〃			○				
	92. ＡＳＴＭ型ボンド引抜装置，及び型枠（水平バー用3，垂直バー用3）		〃		○					
	93. 円筒供試体用型わく3種	計90	〃		○					
	94. 曲げ試験用供試体型わく	−4	〃							
	95. 圧裂用曲げ装置	−1	〃	○						
	96. 三等分曲げ装置	−1	〃	○						

学科名	機材リスト	年度区分	活用状況					コメント	その他・問題点・備考
			A	B	C	D	E		
土木科（続き）	97. 骨材単位容積重量測定容器 －2	59供	○						
	98. 比重測定試験様一式 －1	〃	○						
	99. コンクリート実験用器具一式 －1	〃	○						
	100. アスファルト針入度試験器 －2	〃		○					
	101. 伸度試験用型ワク及び台 －10	〃		○					
	102. 軟化点試験装置 －1	〃		○					
	103. エングラー度試験器 －1	〃		○					
	104. マーシャル試験用モールド －15	〃		○					
	105. モールドホルダー －1	〃		○					
	106. アスファルトミキサ －1	〃		○					
	107. アスファルト骨材用ふるい －1	〃		○					
	108. ハバード比重びん －10	〃		○					
	109. ワード比重びん －10	〃		○					
	110. 台ばかり，卓上用台ばかり 各1	〃	○						
	111. 運搬車，キャリア 各1	〃	○						
	112. 書庫，キャビネット 計5	〃	○						
	113. タイプライター式 －1	山尾携行	○						

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