

INSTITUTIONAL DEVELOPMENT AND CAPACITY BUILDING :

A PROJECT OF INSTITUTIONAL LINKAGE

AND TECHNICAL COOPERATION

between

SURANAREE UNIVERSITY OF TECHNOLOGY , (SUT)

and

CANADIAN UNIVERSITIES TECHNOLOGY CONSORTIUM , (CUTC)

CANADA

FIRST PROJECT REVIEW COMMITTEE MEETING :

PROGRAM, PARTICIPANTS, WORKING PAPERS, MINUTES

AND RESOLUTIONS

28 - 30 November 1994

Suranaree University of Technology

Nakhon Ratchasima, Thailand

PROGRAM

TENTATIVE PROGRAM
FIRST PRC MEETING
28-30 November 1994, SUT

28 November: Monday

- 8:00-8:30 **Registration of Participants**
- 8:30-9:00 **Opening Ceremony**
- Welcome Remarks:
Dr. Sam-arng Srinilta, Vice Rector for Administrative Affairs (SUT)
 - Response: Dr. Stalin Boctor
Project Technical Advisor (CUTC)
 - Introduction of Participants
 - Appointment of Chair of the Meeting
- 9:00-9:15 Coffee Break
- 9:15-12:15 **Review of Project Progress Report July 1993-November 1994 (WP1)**
- Report of the First Mission (WP1.1)
- Report of the Second Mission (WP1.2)
- Review of Unaccomplished Activities
- Review of Financial Report July 1993-November 1994 (WP2)**
- 12:15-14:00 Lunch Break
- 14:00-16:00 **Proposal and Confirmation of Activities for 1995 (WP3, WP3.1)**
- 15:45-16:00 Coffee Break
- 16:00-17:00 **Proposal and Confirmation of Activities for 1995 (Continued)**
- 19:00 Dinner

29 November: Tuesday

- 8:30-10:30 **Review of Project Implementation Plan**
- Undergraduate Program (WP4)
- 10:30-10:45 Coffee Break
- 10:45-12:00 **Review of Project Implementation Plan (Continued)**
- Undergraduate Program (WP4)
- 12:00-14:00 Lunch Break
- 14:00-15:00 **Review of Project Implementation Plan (Continued)**
- ESL Program (WP5.1)
- 15:45-16:00 Coffee Break
- 16:00-17:00 **Review of Project Implementation Plan (Continued)**
- Joint Ph.D. Project (WP5.2)
 - Other Matters (WP5.3)
- 19:00 Dinner

30 November: Wednesday

- 9:30-10:00 Coffee Break
- 10:00-12:00 **Conclusion**
- Adoption of Minutes and Resolutions
 - Venue and Date of Next PRC Meeting
- 12:00-12:15 Closing
- 12:30-14:00 Lunch
- 14:00-18:00 Free Afternoon
- 18:00 Departure for Nakhon Ratchasima Airport
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PARTICIPANTS

FIRST PRC MEETING
28-30 November 1994, SUT

LIST OF PARTICIPANTS

Dr. Sam-arng Srinilta

Vice Rector for Administrative Affairs

Thai Project Technical Advisor

Thai Project Review Sub-Committee

Dr. Prasart Suebka

Vice Rector for Academic Affairs

Chair, PRSC, SUT

Dr. Weerapun Sriboonlue

Vice Rector for Planning Development

Project Manager, SUT

Dr. Kasem Prabripataloong

Dean, Institute of Resources Technology

Dr. Tavee Lertpanyavit

Dean, Institute of Industrial Technology

Dr. Terd Charoenwatana

Dean, Institute of Agricultural Technology

Dr. Vutthi Bhanthumnavin

Dean, Institute of Science

Mr. Suriya Smutkupt

Associate Dean, Institute of Social Technology

Dr. Ruben C. Umaly

Director, Centre for International Affairs

Project Coordinator, SUT

Canadian Project Review Sub-Committee

Dr. Stalin Bector	Chair, Department of Electrical Engineering, Ryerson Polytechnic University <i>Project Technical Advisor, CUTC</i>
Dr. Gerry E. Schneider	Associate Dean of Engineering, University of Waterloo <i>Chair, PRSC, CUTC</i>
Dr. William Caley	Associate Dean of Engineering, Technical University of Nova Scotia <i>Member, PRSC, CUTC</i>

Coordinators of International Undergraduate Program

Dr. Tavee Lertpanyavit	Chair, School of Mechanical Engineering
Dr. Sarawut Sujitjorn	Chair, School of Electrical Engineering
Mr. Robert H. Burgess	Chair, School of English

Support Staff

Ms. Jennifer Sherwood	Ryerson International, CUTC
Dr. Chalida Rojanawathanavuthi	Centre for International Affairs, SUT

Observers

Mr. Gerry Wright	Project Director, ARA
Dr. Archie Mckinnon	Project Monitor, Universalia
Dr. Opas Tantithakura	Walailuk University

WORKING PAPERS

SUT-CUTC Institutional Linkage and Technical Cooperation Project for Institutional Development and Capacity Building

1. Objectives

- a. To build institutional capacity for SUT in the areas of academic administration and management, academic program and curriculum, institutional support services, and establishment of an English as a Second Language Unit.
- b. To improve the flexibility and responsiveness of SUT to meet higher education demands in Thailand, Southeast Asia, and Indo-China through innovative programs including international applied science and engineering programs, joint research and Ph.D. programs and co-op student exchange program.
- c. To strengthen SUT's links with Thailand's productive sectors through the establishment of university-industry linkage programs including cooperative education programs, a university-industry training program, and technology cooperation initiatives.
- d. To develop mutually beneficial institutional linkages between SUT and CUTC's institutions through the various joint international initiatives described in b. above that can be sustained after the end of the project.

2. Duration: 1 July 1993 - 30 March 1998

3. Implementing Institutions

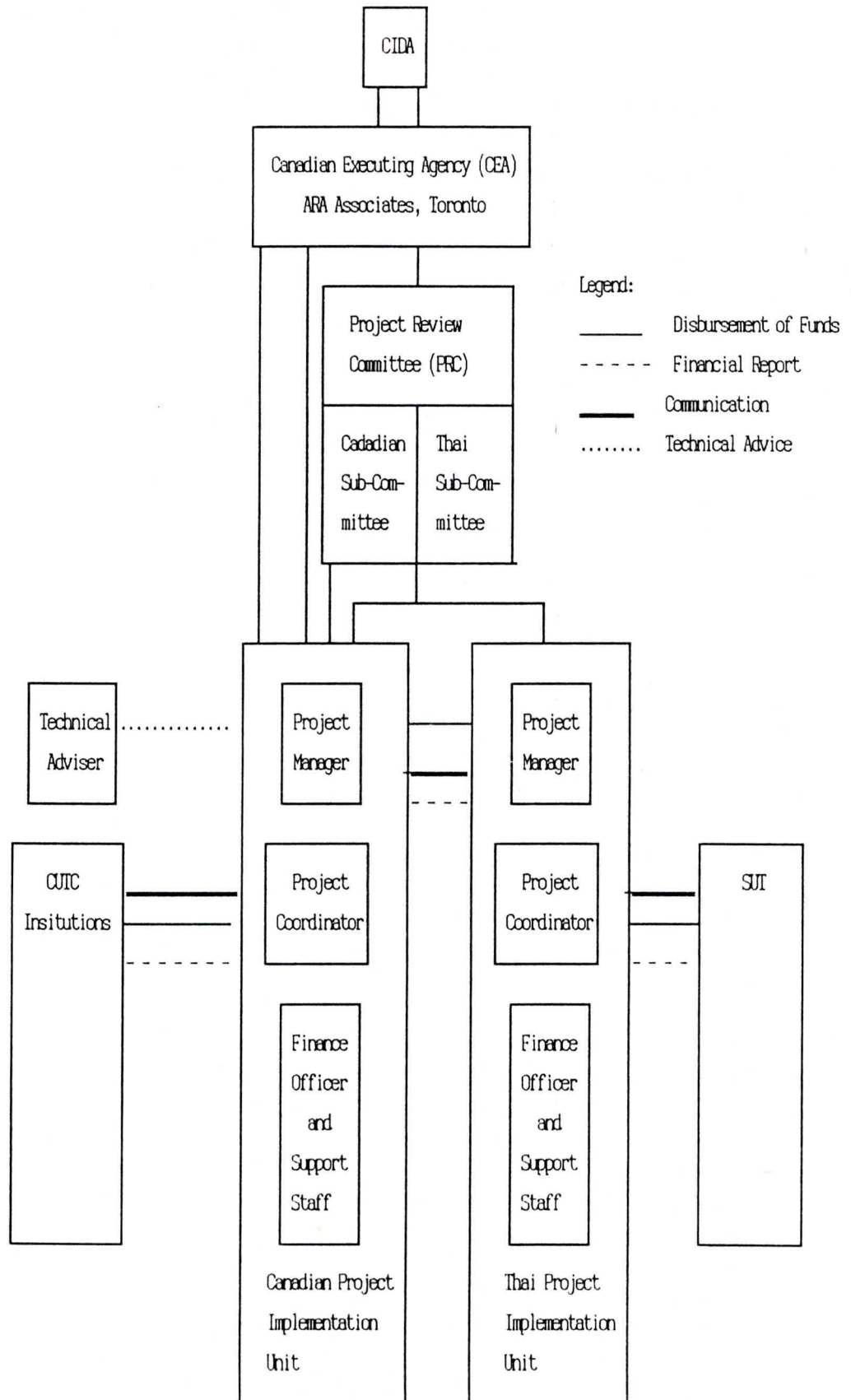
- a. Thai Institution: Suranaree University of Technology (SUT)
- b. Canadian Institution: Canadian Universities Technology Consortium (CUTC),
with Ryerson Polytechnic University (lead institution),
University of Waterloo, University of Guelph, and
Technical University of Nova Scotia as members

4. Funding Arrangement

<u>Source</u>	<u>Amount (Canadian Dollars)</u>
Canadian International Development Agency	995,484
Canadian Universities Technology Consortium	601,605
Suranaree University of Technology	3,931,345
Other sources	<u>432,535</u>
Total	<u>5,960,969</u>

5. Management

a. Organizational Structure



b. Project Review Committee

(1) Canadian Sub-committee

Dr. Gerry Schneider (University of Waterloo)	Chair
Dr. Jim Shute (University of Guelph)	Member
Dr. Bill Caley (Technical Univ. of Nova Scotia)	Member
Dr. Stalin Bector (Ryerson Polytechnic Univ.)	Member

(2) Thai Sub-committee

Dr. Sam-arng Srinilta	Technical Advisor
Dr. Prasart Suebka	Chair
Dr. Tavee Lertpanyavit	Member
Dr. Terd Charoenwatana	Member
Dr. Kasem Prabripataloong	Member
Dr. Vutthi Bhanthumnavin	Member
Dr. Weerapun Sriboonlue	Member
Dr. Ongkan Indrambarya	Member
Dr. Ruben C. Umaly	Member and Secretary

c. Project Manager

(1) CUTC: Prof. Samih Mikhail, Director, Ryerson International

(2) SUT: Dr. Weerapun Sriboonlue, Acting Vice Rector for Planning and Development

d. Project Coordinator

(1) CUTC: Mrs. Marsha McEachrane-Johnson, Associate, Ryerson International

(2) SUT: Dr. Ruben C. Umaly, Director, Centre for International Affairs

REPORT OF ACTIVITIES IMPLEMENTED

July 1993 - November 1994

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
1.1 Development of Academic Administration and Management Framework at SUT			
A1.11 Provision of customized training in Canada for 4 SUT academic coordinators. (6 weeks, Canada Jul-Dec 93)	A1.11 STATUS Study tour for 4 SUT academic administrators: 1) Dean, Institute of Resources Technology (Dr.Kasem) (6 weeks, Oct-Nov 1993) 2) Dean, Institute of Industrial Technology (Dr.Tavee) (4 weeks, Oct-Nov 1993) 3) Acting Vice Rector for Academic Affairs (Dr.Prasart) (4 weeks, September-October 1994) 4) Dean, Institute of Agricultural Technology (Dr.Terd) (4 weeks, September-October 1994)	All implemented, but 3 out of 4 spent only 4 weeks instead of the originally scheduled 6 weeks	

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
1.2 Development of Academic Programs and Curricula at SUT			
A1.21 Provision of customized training in Canada for 6 SUT faculty members and coordinators (12 weeks, Canada Jul-Dec/93)	A1.21 STATUS Study tour for 2 SUT Coordinators : 1) Chair, School of Food Technology (Dr.Suwayd) (4 weeks, Sept-Oct 1994) 2) Dean, Institute of Science as Coordinator of Basic Science courses (Dr.Vutthi) (4 weeks, Sept-Oct 1994)	Only 2 out of 6 originally planned went to Canada and only 4 weeks instead of the originally scheduled 12 weeks	Proposal: For personnel from the Registrars office and Center for International Affairs to be among the SUT personnel to train in Canada.

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
1.3 Development of Institutional Support Services at SUT			
A1.31 Provision of customized training in Canada for 4 SUT support personnel in : - Library Automation (2) - Management Information Systems (1) - Scientific Equipment (1) (6 weeks, Canada Jul-Dec/93)	A1.31 STATUS Customized training for 3 SUT Support personnel in - Library Automation (1) (6 weeks, Oct-Nov 1993) - Management Information Systems (1) (4 weeks, Sep-Oct 1994) - Scientific Equipment (1) (6 weeks, Oct-Nov 1993)	Only 3 out of 4 originally planned went to Canada, the 1 left is for Library Automation. The MIS person spent 4 weeks instead of the originally scheduled 6 weeks.	

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
A1.32 Provision of technical services to SUT by Canadian consultants to develop SUT's institutional support services and information systems (MIS). (4 weeks, Thailand Apr-Jun/94)	A1.32 STATUS One Canadian consultant provided consultancies to develop SUT's institutional support services of the library automation system : 1. Dr.Richard Malinski (9 days, Nov-Dec 1993)	The consultant came to Thailand during Nov-Dec 1993 instead of April - June as originally planned and duration of stay is 9 days instead of the originally scheduled 14 days (2 weeks).	To send a Canadian consultant in Management Information Systems especially in Finance Management and Automation.

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
1.4 Establishment of English as a Second Language Centre at SUT			
A1.41 Evaluation of SUT English language capacity and needs by 1 Canadian ESL professor. (3 weeks, Thailand May-Jul/93)	A1.41 STATUS Evaluation of SUT English language capacity and needs by Dr. Margaret E. Morriss (19 days, July-Aug 1993)	All implemented as originally scheduled. The mission report has been most successful and fruitful.	
A1.42 Study tour for 2 SUT English language teachers in Canada (4 weeks, Canada Sept-Dec/93)	A1.42 STATUS Acting chair, School of English and a faculty member of the school accomplished their study tour (Dr. Puangpen and Ms. Owens) (4 weeks, November 1993)	All implemented as originally scheduled. The mission report is also most successful and fruitful.	
A1.43 First English Language Course offering at SUT joint Canadian Thai team (4 weeks, Thailand July-Aug 1993)	A1.43 STATUS not implemented		To allocate funds for 3 Canadian Instructors in the delivery of ESL

SUMMARY : PROGRAMS AND ACTIVITIES, 1993-1994

PROGRAM 1 INSTITUTIONAL CAPACITY BUILDING

Activities	Number	Person
	Persons	Weeks
	R/P	R/P
A1.11 Study tour in Canada of 4 academic administrators	4/4	18/24
A1.21 Study tour in Canada for 6 SUT coordinators	2/6	8/72
A1.31 Customized training for 4 SUT support personnel	3/4	16/24
A1.32 Canadian consultants (2) to develop SUT's institutional support services and information systems	1/2	2/8
A1.41 Canadian consultant to evaluate SUT's English language capacity and needs	1/1	2.7/3
A1.42 Study tour of 2 SUT English language teachers in Canada	2/2	8/8

R = Reality

P = Planned

REVIEW OF THE PROJECT'S PROGRAMS, ACTIVITIES AND DELIVERABLES :

FIRST MISSION TO CANADA: 1993

PROGRAM 1: INSTITUTIONAL CAPACITY-BUILDING PROGRAM

ACTIVITY		DELIVERABLE	
Description	Date, Venue & Duration	Description	Date
1.1 Development of Academic Administration and Management Framework at SUT			
A1.11 Provision of customized training in Canada for 4 SUT academic coordinators	6 weeks, Canada, Jul-Dec/93	D1.11 * 4 trained SUT Academic Administrators in the areas of academic planning, policy development, system of governance, curriculum development, research Administration, Standards and Promotion, Admissions, Curriculum, Planning, etc. * Each Administrator will produce an academic administration and management manual for his/ her faculty.	Mar. 1994
A 1.11 Status (after 1 st mission) Study tour for 2 SUT Academic Administrators : 1) Dean, Institute of Resource Technology (Dr.Kasem)	Oct 2-Nov13 1993 (6 weeks)	D1.11 Accomplished except no academic administration and management manual was produced because it is not directly relevant and applicable to SUT system. The other out comes of this study tour are : - The agreed common first year course for all 3 I.P. Engineering programs. - The Curriculum for I.P. in Chemical Engineering between TUNS and SUT	
2) Dean, Institute of Industrial Technology	Oct2-Nov 1, 1993 (4 weeks)	Same as above except the Curricula for I.P.'s in Electrical and Mechanical Engineering have not been discussed.	

PROGRAM 1 INSTITUTIONAL CAPACITY-BUILDING PROGRAM (Continued)

ACTIVITY		DELIVERABLE	
Description	Date, Venue & Duration	Description	Date
1.3 Development of Institutional Support Services at SUT			
A1.31 Provision of customized training in Canada for 4 SUT Support personnel in : - Library Automation (2) - Management Information Systems (1) - Sceintific Equipment (1)	6 weeks, Canada, Jul-Dec /93	D1.31 • 4 trained SUT support personnel in the areas of library automation, management information system, and scientific equipment. • SUT personnel will develop a planning document outlining their respective departments/units strategic plans, organizational structure, equipment specifications, and systems and procedures.	April 1994
A1.31 STATUS(after 1st mission) Customized training for 2 SUT support personnel in Library Automation and Scientific Equipment			
1) Library Automation (Ms. Somsri)	Oct 2-Nov13, 1993 (6 weeks)	Study and training in the area of library automation and library and library networking system were accomplished	
2) Scientific Equipment (Ms. Apichai)	Oct15-Nov30, 1993 (6 weeks)	Study and training in electron microscopy laboratory which include how to set up, operate and giving services. The training also covered the spicimens preparation techniques both in biological science and material science.	

PROGRAM 1 INSTITUTIONAL CAPACITY-BUILDING PROGRAM (Continued)

ACTIVITY		DELIVERABLE	
Description	Date, Venue & Duration	Description	Date
1.4 Establishment of English as a Second Language Centre at SUT			
A1.42 Study tour for 2 SUT English language teachers in Canada	4 weeks, Canada, Sept -Dec /93	D1.42 • 2 SUT faculty members trained in Canada to develop and offer ESL programs. • Detailed curriculum plan for English language program at SUT.	Dec. 1993
A1.42 Status (after 1 st mission) Acting chair, School of English and a faculty member of the school accomplished their study tour (Dr. Puangpen and Ms. Owens)	4 weeks Canada November 1993	D1.42 • Study tour activities : Discussion of curriculum needs with EFL teachers and engineering teachers visiting EFL learning resources centers throughout Toronto, and writing a curriculum for the English language component of the International Program. Output of the Study tour : " A proposed English Curriculum for the International Program" containing : statement of purpose, background information, course design constraints, curriculum overview course syllabus specifications of 6 courses : Intensive International English 1, International English/Liberal Arts 1-4 and Intensive Orientation.	Dec. 1993

SECOND GROUP OF MISSION AND STUDY TOUR IN CANADA OF SUT PERSONNEL
(SEPTEMBER–OCTOBER 1994)

1. TWO SUT ACADEMIC ADMINISTRATORS

DR.PRASART SUEBKA: VICE RECTOR, ACADEMIC AFFAIRS:

System of governance,
academic-support infrastructure and administrative systems and procedures,
student admission, guidance, counseling and graduation policies,
curriculum planning, development and administration,
postgraduate program planning and implementation,
international program planning and implementation,
institutional linkage policy, planning and implementation,
cooperative education administration and implementation,
research policy, administration and resource generation,
academic excellence enhancement and tenure system. and
Accreditation criteria and procedure.

**DR.TERD CHAROENWATANA: DEAN, INSTITUTE OF AGRICULTURAL
TECHNOLOGY:**

System of governance, Food Technology
curriculum, Cooperative education program, Research activities in Agriculture and Food
Technology and Science Park

2. TWO SUT ACADEMIC COORDINATORS

DR.VUTTHI BHANTHUMNAVIN : DEAN, INSTITUTE OF SCIENCE:

System of governance, basic science curriculum, graduate programs in pure and applied
sciences, research institutes/programs, science/industrial park, and international centers
and collaborative programs.

DR. SUWAYD NINGSANOND: CHAIR, SCHOOL OF FOOD TECHNOLOGY:

System of governance, Food Technology
curriculum, Cooperative education program, Research activities in Agriculture and Food
Technology and Science Park

3. ONE SUT SUPPORT PERSONNEL (IN MIS)

MS.BUSAYA BURANASIN: LECTURER, SCHOOL OF MANAGEMENT

TECHNOLOGY:

General ledger and financial reporting cycle

Revenue cycle

Expenditure cycle

Resource management cycle, with emphasis on facilities and funds management

Cooperative computer system

ACHIEVEMENT OF MISSION'S GOALS

All of the anticipated outputs were achieved during the 4 weeks of missions. The mission also achieved the goals for the implementation of International Program:

- Four International Program Curricula
- Number of programs offering for 1st year and number of students in each program (both in Thailand and in Canadian partner Universities)
- Student's Fee
- Joint Ph.D. Program
- Availability of Faculty members (both Canadian and Thai sides)
- Remuneration external to the project

PROBLEMS AND SUGGESTIONS

- Lack of communications among partners.
- Strengthen the linkages, provide more understanding and increase communication and cooperation.

10/28/94

THAI CANADIAN HRD PROJECT

Project #L3004-91063

CIDA #900-14000

CIDA FUNDED BUDGET AND EXPENSES For the period July 15, 1993 - October 28, 1994
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Deliverable	Total Approved CIDA Budget	Total Expenses To-date	Balance CIDA Budget
1. Institutional Capacity Building Program			
A1.11 Training Academic Administrators	46,400	36,639	9,761
A1.21 Training Faculty Members	112,800	16,883	95,917
A1.31 Training Support Personnel	46,400	30,152	16,248
A1.32 Institutional Support Services	14,000	949	13,051
A1.41 Evaluate ESL Needs	8,800	9,095	(295)
A1.42 Study Tour ESL	18,400	16,501	1,819
A1.43 ESL Course Thailand	10,600	0	10,600
Program 1 Sub-total	257,400	110,289	147,101
2. International Academic Program			
A2.11 Academic Program Planning	84,800	3,734	81,066
A2.12 Curriculum Implementation	108,800	0	108,800
A2.21 Selection Supervisors/PHD	35,000	0	35,000
A2.23 PHD Research	70,000	0	70,000
A2.24 Thesis Defense	29,000	0	29,000
A2.31 Work Placements - Canada	9,000	0	9,000
Program 2 Sub-total	336,600	3,734	332,866
3. University-Industry Linkage Program			
A3.11 Training Co-op Program	11,600	0	11,600
A3.21 Industrial Training Framework	3,400	0	3,400
A3.31 SUT Expo	3,400	0	3,400
Program 3 Sub-total	18,400	0	18,400
4. Project Management			
A4.21 Canadian Management Team	160,800	52,200	108,600
A4.31 Project Review Committee - Thai	28,000	3,373	24,627
A4.32 Project Review Committee- Can	20,000	0	20,000
A4.33 Project Management	53,160	9,038	44,122
A4.41 Communication/Support	21,870	1,161	20,709
Program 4 Sub-total	283,830	65,773	218,057
Total All Programs	885,230	179,806	705,425
Inflation Provision	80,754	0	80,754
Subtotal	965,984	179,806	786,179
GST	18,500	0	18,500
Total CIDA Funding	984,484	179,806	804,678

PROJECT ACTIVITIES IMPLEMENTATION PLAN

PROGRAM 1: INSTITUTIONAL CAPACITY-BUILDING PROGRAM		1993		1994				1995				1996				1997				1998	
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.2 Development of Academic Programs and Curricula at SUT																					
A1.21 Provision of customized training in Canada for 4 SUT faculty members and coordinators				1*			2*	1													
A1.31 Provision of customized training in Canada for 1 SUT support personnel in : - Labrary Automation (1)						1*															
A1.32 Provision of technical services to SUT by Canadian consultant to develop SUT'S institutional support services and information systems (MIS).							1*														
A1.43 Joint offering of first English as a Second Language course at SUT by Canadian-Thai team.					1*																
PROGRAM 2 : INTERNATIONAL ACADEMIC PROGRAMS																					
2.1 International Applied Science and Engineering Undergraduate Programs																					
A2.11 Academic program, planning and coordination. Visit to Thailand by 4 Canadian academic coordinators before the start of the academic year in 1995 to assess all relevant issues concerning the planning and implementation of the four international undergraduate programs.					4*					2	2										
A2.12 Curriculum implementation of the international applied science and engineering undergraduate programs. Teaching and supervision assignments by 32 faculty members from CUTC institutions during the length of the program.						4*				5	4			5	2	4		5	3		
2.2 Joint Scholarly Research and Ph.D. Program																					
A 2.21 Selection of 10 Thai Ph.D. Students and formation of joint supervisory					5*																

PROGRAM 1: INSTITUTIONAL CAPACITY-BUILDING PROGRAM (continued)							1993		1994			1995			1996			1997			1998					
							2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
teams in Thailand. 5 Canadian Professors will undertake the assignment in Thailand.																										
A2.22 Provision of Ph.D. Courses in Canada and Confirmation of Research Methodology															10											
A2.23 Jointly Supervised Research Work in Thailand																		4	1	3	2					
A2.24 Thesis Defence in Canada																						6	4			
PROGRAM 3: UNIVERSITY-INDUSTRY LINKAGE PROGRAM																										
2.3 Co-op Students Exchange Program																										
A2.31 Provision of Work Placements and Supervision for 10 Thai students in Canada by CUTC															1	1										
A2.32 Provision of Work Placements and Supervision for 10 Canadian Students in Thailand by SUT																5		5								
3.1 Development of Cooperative Education at SUT																										
A3.11 Provision of customized training in Canada for SUT co-op program coordinator.																										
3.2 Joint University-Industry Cooperation & Training Initiatives																										
A3.21 Development with 1 Canadian consultant guidelines and framework for 4-6 joint industrial training seminars in Thailand.																										
A3.22 Provision of Industry Training Seminars in Thailand for personnel from the enterprises																					2	2	1	1		
3.3 Technology Cooperation Initiatives																										
A3.31 Technical services by 1 Canadian consultant to develop a plan for Canadian participation in SUT Expo in 1994-95																										
PROGRAM 4: PROJECT MANAGEMENT																										
A4.11 Provision of Project Coordination and Administration in Thailand							On Going for Life of Project																			

PROGRAM 4: PROJECT MANAGEMENT (continued)							1993		1994				1995				1996				1997				1998						
							2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21					
A4.21 Provision of Project Coordination and Administration in Canada												On Going for Life of Project																			
4.3 Project Supervision and Coordination																															
A4.31 Review Committee Trips to Thailand										2									2												
A4.32 Review Committee Trips to Canada														2									2								
A4.33 Project Management and Coordination											2				2				2					2							

Legend: x; x = Number of funded CUTC participants, y = Number of funded SUT participants

* activity not implemented

a:acti9394/no1

Activities to be Implemented 1995-1998

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
PROGRAM 2 : INTERNATIONAL ACADEMIC PROGRAMS			
2.1 International Applied Science and Engineering Undergraduate Programs			
A2.11 Academic program, planning and coordination. Visit to Thailand by 4 Canadian academic coordinators before the start of the academic year in 1995 to assess all relevant issues concerning the planning and implementation of the four international undergraduate programs.	• Delay in Implementation		
A2.12 Curriculum implementation of the international applied science and engineering undergraduate programs. Teaching and supervision assignments by 32 faculty members from CUTC institutions during the length of the program.	• Delay in Implementation		
2.2 Joint Scholarly Research and Ph.D. Program			
A 2.21 Selection of 10 Thai Ph.D. Students and formation of joint supervisory teams in Thailand. 5 Canadian Professors will undertake the assignment in Thailand.	• Delay in Implementation		
A2.22 Provision of Ph.D. Courses in Canada and Confirmation of Research Methodology	• Plan will start in 1995-1996		
A2.23 Jointly Supervised Research Work in Thailand	• Plan will start in 1996-1997		
A2.24 Thesis Defence in Canada	• Plan will start in 1997-1998		
PROGRAM 3: UNIVERSITY-INDUSTRY LINKAGE PROGRAM			
2.3 Co-op Students Exchange Program			
A2.31 Provision of Work Placements and Supervision for 10 Thai students in Canada by CUTC	• Plan will start in 1995-1996		

PLAN	REALITY	REMARKS	FUTURE ACTIVITIES
A2.32 Provision of Work Placements and Supervision for 10 Canadian Students in Thailand by SUT 3.1 Development of Cooperative Education at SUT A3.11 Provision of customized training in Canada for SUT co-op program coordinator. 3.2 Joint University-Industry Cooperation & Training Initiatives A3.21 Development with 1 Canadian consultant guidelines and framework for 4-6 joint industrial training seminars in Thailand. A3.22 Provision of Industry Training Seminars in Thailand for personnel from the enterprises 3.3 Technology Cooperation Initiatives A3.31 Technical services by 1 Canadian consultant to develop a plan for Canadian participation in SUT Expo in 1994-95	• Plan will start in 1996 • Delay in Implementation • Delay in Implementation • Plan will start in 1997 • Delay in Implementation		
PROGRAM 4: PROJECT MANAGEMENT			
A4.11 Provision of Project Coordination and Administration in Thailand A4.21 Provision of Project Coordination and Administration in Canada 4.3 Project Supervision and Coordination A4.31 Review Committee Trips to Thailand A4.32 Review Committee Trips to Canada A4.33 Project Management and Coordination	• On Going for Life of Project • On Going for Life of Project • Plan will start in 1994, 1996 • Plan will start in 1995, 1997 • Plan will start in 1994-1997		

PROGRAM 2: International Academic Program**2.1 International Applied Science and Engineering Undergraduate Programs**

International Program	Proposal	Resolution	Remarks
I. Implementation of International Program			
1.1 Implementation of Programs	All 4 programs start in 1995		
1.2. Timing of semester offerings for 1 st year	September 1995		
1.3. Number of students admitted			
a) at SUT	ChE: 60 EE: 30 ME: 30 FT: 60		
b) at CUTC After completion of end year at SUT	TUNS: 10-15 Ryerson: 10-15 *		
*After completion of 1 st year at SUT	Guelph: 8-10 Waterloo: 3-5		
1.4. Student's Fees			
Annual fee for contract students/CIDA supported requesting the Ministry's approval	C\$ 10,000 -14,000 CUTC will request the approval - collectively or separately?		
II Status of the 4 Curricula			
2.1 Completion of IP Curriculum			
a) ChE curriculum			
b) EE curriculum			
c) ME curriculum			
d) FT curriculum			
2.3 Course outlines			
a) ChE			
b) EE			
c) ME			
d) FT			
2.4 Course descriptions			
a) ChE			
b) EE			
c) ME			
d) FT			

International Program	Proposal	Resolution	Remarks
2.5 Textbooks a) ChE b) EE c) ME d) FT			
2.6 Accreditation by CEAB, MUA Engineerin Professional Association in Thailand	ChE: EE: ME: FT:		
III Teaching staff for 1st year (1995)			
3.1 Availability of Canadian Faculty Members	TUNS: Ryerson: Guelph: Waterloo:		see Appendix ?
3.2 Availability Thai Faculty Members			see Appendix ?
3.3 Remuneration external to project including travel and Living expenses	C\$ 2,500/month		

**Academic Program Curriculum
SUT
International Engineering Programs**

First Year

Term 1

		Lect	Tut	Lab	
MTH117	Calculus I	4	1		
MTH114	Linear Algebra	4	1		
CHY118	Chemistry	3		2	
PCS115	Physics (Mechanics)	3	2		
PCS120	Physics for Engineers	3		2	
CST100	Engineering Practice, Ethics & Technical Communications	2	1		
		19	5	4	= 28

Term 2

MTH227	Calculus II	4	1		
CPS210	Digital Computation & Programming	4		2	
CST	Impact of Technology on Society (one course from Electives Table B)	3			

For Electrical Engineering Students Only

PCS221	Applied Science	3		1 [†]	
ELE212	Electric Circuits	6	2	3	
		20	3	6	= 29

For Chemical Engineering Students Only

MEC170	Engineering Graphics	1		3	
CHY217	Organic Chemistry	3		2	
ELE210	Fundamentals of Electrical Engineering	3	1	2	
		18	2	9	= 29

For Mechanical Engineering Students Only

MEC126	Scientific Principles of Mechanical Engg.	2	1	1 ^{††}	
MEC170	Engineering Graphics	1		3	
ELE210	Fundamentals of Electrical Engineering	3	1	2	
		17	3	8	= 28

[†] Two Hour Laboratory session per alternate weeks

^{††} Four, 3 Hour Laboratory sessions spread out over the term

International Engineering Programs Course Descriptions

First Year

Fall

- **MTH 117: Calculus I** 4,1,0
Limits, inverse functions, differentiation, maximum and minimum problems, definite and indefinite integrals, fundamental theorems of integration, applications of integration including area, volume, moment, pressure and work.

- **MTH 114: Linear Algebra** 4,1,0
Systems of linear equations, matrix algebra and determinants, vectors in Euclidean space, lines, planes, spheres. Complex number algebra. Eigenvalues. Introduction to vector spaces, functions, inner products.

- **CHY 118: Chemistry** 3,0,2
Physical chemistry with engineering applications. Atomic structure, the mole, periodic table, atomic and subatomic structures, bonding, solid state. Ideal and real gas behaviour, phase equilibria and colligative properties of solutions, thermochemistry, chemical equilibrium, electrochemistry, radiochemistry. Materials selection, crystals and structure, mechanical properties.

- **PCS 115: Physics (Mechanics)** 3,2,0
Review of kinematics, particle dynamics, work, energy, conservation of energy, conservation of linear momentum, collisions, rotational kinematics and dynamics, conservation of angular momentum, equilibrium of rigid bodies.

- **PCS 120: Physics for Engineers** 3,0,2
Oscillations and simple harmonic motion, wave motion, travelling and standing waves, transverse and longitudinal waves, sound. Geometrical optics, reflection and refraction, physical optics, interference and diffraction. Quantum physics, quantization of radiation, the hydrogen atom.

- **CST 100: Engineering Practice, Ethics and Technical Communications** 2,1,0
Basic methods and principles used by engineers, including fundamentals of technical communications, measurements, analysis and design. Some aspects of the engineering profession, including standards, safety, intellectual property and ethics.

International Engineering Programs Course Descriptions

First Year

Winter

- **MTH 227: Calculus II** 4,1,0
Logarithmic and exponential functions, partial and total differentiation, integration techniques, sequences and finite series, power series, first-order differential equations with applications.
- **PCS 221: Applied Science** 3,0,1*
Electric, magnetic and thermal properties of material, photoconductivity and optical material. Quantum nature of solids, uncertainty principle and Schrodinger's theorem, electron populations within bands, electric current in solids, the P-N junction, the transistor.
- **ELE 210: Fundamentals of Electrical Engineering** 3,1,2
Introduction to electric and magnetic fields, basic circuit parameters and laws, basic dc circuits, amplifiers and operational amplifiers, transients in first order RL and RC circuits, ac voltage and v-i relationships of basic elements, basic ac circuits, power calculations in ac circuits.
- **ELE 212: Electric Circuits** 6,2,3
Basic circuit parameters and laws, analysis of direct current circuits including voltage and current sources, meters, transients in first order RL and RC circuits, magnetism and simple magnetic circuits, a.c. voltage and v-i relationships of basic elements. Analysis of steady state a.c. circuits, loop- and nodal-analysis techniques, basic network theorems, networks with controlled sources, resonance, power and power factor correction, magnetically coupled circuits, three-phase circuits.
- **CPS 210: Digital Computation and Programming** 4,0,2
This course introduces the student to the use of a modern computing environment for technical applications. The UNIX operating system, the X-Window system and common utilities such as text and graphics editors and processors are used. The bulk of the course will concentrate on the C programming language to develop good programming techniques. The topics covered include: basic numerical programming, input and output, character data, string data, arrays, pointers and simple linked lists. Documenting, debugging and software quality assurance are also covered.
- **CHY 217: Organic Chemistry** 3,0,2
Fundamental concepts of organic chemistry and the systematic nomenclature of organic compounds. Emphasis is given to structure and chemical reactions of hydrocarbons and derivatives of hydrocarbons that have commercial importance.
- **MEC 126: Scientific Principles of Mechanical Engineering** 2,1,1**
Physics principles most relevant to the discipline of Mechanical Engineering. Equilibrium and Elasticity of solid bodies. Hooke's law and bulk modulus. Statics and dynamics of fluids. Temperature scales and thermal expansion. Energy conversion and transfer and the laws of thermodynamics.
- **MEC 170: Engineering Graphics** 1,0,3
An introduction to the fundamentals of orthographics, isometric oblique and perspective projection, including computer aided projection and freehand sketching. Basic descriptive geometry principles are introduced to solve spatial problems involving points, lines, planes, curved surfaces, intersections and developments.

Table A
Humanities/Liberal Studies Electives
(all courses are 3 hours lectures/week)

ECN110	The Development of Microeconomics
ECN210	The Development of Macroeconomics
ECN503	Economics of the Third World Countries
ECN507	The History of Economic Thought
ECN508	Comparative Economic Systems
ECN607	Issues in the International Economy
ENG201	Narrative Forms
ENG504	The Modern in Literature
ENG505	The Creative Process
ENG604	The Contemporary in Literature
GEO106	Geographical Interpretations of the Human Environment
GEO507	Explorations of the Urban Environment
HST604	Uneasy Peace: International Relations 1945-1990
PHL101	Foundations of Rational Thought
PHL306	Contemporary Moral Issues
PHL709	Religion, Science and Philosophy
PHL808	Knowledge, Experience and Human Nature
POL106	Comparing Political Systems
POL206	Human Needs and Power: Comparing Nations
POL701	Political Ideas in Conflict
PSY105	Psychology of Human Behaviour
PSY308	Psychology of Thinking
PSY504	Social Psychology
PSY707	Models of Stress and Adaptation
SOC103	Understanding Society
SOC203	Social Class and Inequality
SOC501	Sociology of Work
SOC801	Social Change: International Perspectives

Table B
Impact of Technology on Society Electives
(all courses are 3 hours lectures/week)

ERS231	Environmental Issues in a Global Perspective
ERS241	Introduction to Environmental and Social Impact Assessment
GEOG368	Conservation/Resource Management of the Built Environment
PHIL207	Science, Technology and Society
SOC232	Technology and Social Change

International Engineering Programs
Course Description
Impact of Technology on Society Electives

- **ERS231: Environmental Issues in a Global Perspective** 3,0,0
This course examines the various political, economic and social factors in development and environmental concerns in various Third World countries. Special focus is on health-care systems, agricultural and forestry practices and policies, water management and resource ownership. Students are encouraged to study one country in some depth, and to submit seminars and projects.

- **ERS241: Introduction to Environmental and Social Impact Assessment** 3,0,0
An introduction to means of assessing proposed approaches to environmentally and socially significant problems and opportunities. Special emphasis on the nature and limitations of conventional means of assessing the impacts, and overall desirability of technologies, projects, plans and policies. Close examination of case examples.

- **GEOG368: Conservation/Resource Management of the Built Environment** 3,0,0
Consideration of the constraints and guidelines that an application of the principles of ecology place on the planning and management of resources within urban and urban shadow ecosystems. The theory and history of this subject will be discussed together with urban ecomanagement, the management of waste, urban open space and parks, rehabilitated sites, and environmentally sensitive areas.

- **PHIL207: Science, Technology and Society** 3,0,0
Alternative philosophical perspectives on problems raised by scientific and technological developments including moral issues (e.g. privacy and datagathering, "clean" vs. "dirty" energy). Also an examination of the nature and scope of scientific and technical knowledge as it bears on the responsibilities of scientists and engineers.

- **SOC232: Technology and Social Change** 3,0,0
This course relates the prospect of social change to issues such as the division of labour, automation, technology and ecology, "post-industrial" society, small scale technology, workers' control and the domination of nature.

International Engineering Programs
Course Description
Humanities/Liberal Studies Electives

- **ECN110: The Development of Microeconomics 3,0,0**
Prices, and the markets in which they are determined, play a vital organizing role in free-enterprise economics. Competition, freedom of choice, and private property rights together form the institutional foundations of these systems. This course examines the rationale for the market system with particular attention to its most prominent apologists and critics. The tradeoffs between efficiency, profitability, and social justice are explored, as are the consequences of monopoly & regulation.

- **ECN210: The Development of Macroeconomics 3,0,0**
The Great Depression and its attendant mass unemployment caused economists and policy makers to question previously unchallenged assumptions about the nature and workings of free-enterprise economies. This course examines the causes and consequences of unemployment, inflation, and growth in advanced industrial economies from the equally important viewpoints of technical efficiency and social equity. The rationale, nature, and consequences of government intervention are explored from quite different ethical positions.

- **ECN503: Economics of the Third World Countries 3,0,0**
Three quarters of the world's population live in the less-developed countries of the world. We need to know more about the economies of these countries. This course describes and explains the economic problems of the less-developed countries and how these may accelerate the process of economic growth and development. The important issue of the international trade and specialization as a vehicle for growth, along with topics such as the debt crisis and foreign aid, will also be discussed.

- **ECN507: The History of Economic Thought 3,0,0**
This course deals with the major figures in the development of economic thought from the medieval period to the present. Their ideas are presented in the context of the times which they lived and analyzed in relation to prevailing economic conditions. The relevance of these ideas to present-day debates is stressed throughout so that in the process the student will acquire theories and issues.

- **ECN508: Comparative Economic Systems**

Economic activity can be carried out either in a completely centralized system where a central authority decides what to produce and in what quantities, or in a decentralized system where market forces make these choices with a minimum of government interference. In between lies a continuum of possibilities. This course investigates a variety of economic systems presently in existence and analyzes the strengths and weaknesses of those tending toward centralized planning and those that tend toward the other extreme.

3,0,0

- **ECN607: Issues in the International Economy**

This course deals with international financial markets and the ways in which they affect national economies. By studying the operations of these markets it will be shown how significantly they constrain domestic policy-making, not only in a small open economy like Canada's but increasingly in all other economies as well. Attention is given to issues of current political concern, such as the Third World debt problem, the American trade deficit, the rise of Japan as a major international creditor, and the disintegration of the Communist system in Eastern Europe.

3,0,0

- **ENG201: Narrative Forms**

Stories are imaginative lies that teach us truths about ourselves and our culture. What counts for their popularity, and their different forms: the epic in the past, the novel in the present? This course attempts to answer such questions. We begin with the epic, and then consider novels as humorous as Huckleberry Finn or as experimental as The Wars. The course also includes short stories and narrative verse which sets tales to rhyme.

3,0,0

- **ENG504: The Modern in Literature**

The era between 1900 and 1945 experienced such a radical sense of its own difference from the past that it is still referred to as the Modern Age. It was an age of new thought, new fashion, and a new sense of the self. In literature, it was an age of experimentation. This course explores the literature and the cultural influences of the period. Such writers as Virginia Woolf and James Joyce will be studied.

3,0,0

- **ENG505: The Creative Process**

This upper-level course offers qualified students the opportunity both to study models of good writing and to develop their own creative abilities. Class discussions and one-on-one interviews with the instructor are designed to enhance the student's understanding of the creative process, to stimulate the imagination and to develop the individual abilities of each student. Areas of discussion include style; prosody; conflict, character, and dialogue; and revising and reviewing.

3,0,0

- **ENG604: The Contemporary in Literature** **3,0,0**
 Imaginative writing of the post-war period reflects the complexity of contemporary life. In themes as old as folktales and as current as new visions of space, writers express the dreams and terrors of post-nuclear life. It is an era in which values and beliefs have been challenged and conventional distinctions-illusion and reality, fact and fiction, the sacred and the profane-have been called into question by writers as diverse as John Fowles, Margaret Atwood, and Samuel Beckett.

- **GEO106: Geographical Interpretations of the Human Environment** **3,0,0**
 This course examines environmental and spatial aspects of human life, primarily at the scale of the individual, the neighbourhood and the community. Specific topics to be considered include sense of place, mental maps, territoriality, community dynamics, and human impacts on the landscape.

- **GEO507: Explorations of the Urban Environment** **3,0,0**
 This course examines the internal structure of the contemporary city from a geographic viewpoint. The course is issue-oriented and focuses on transportation, housing and other land use problems and solutions.

- **HST604: Uneasy Peace: International Relations 1945-1990** **3,0,0**
 The order established at the end of World War II is vanishing. What created that order? Why is their change? This course introduces students to the institutions, issues and ideas that have shaped international relations since 1945, and enables them to understand their significance for Canadians. The course will discuss such issues as the Cold War, decolonization, superpower conflict by proxy, and the emergence of new power centres in Europe and Asia.

- **PHL101: Foundations of Rational Thought** **3,0,0**
 The course examines the historical roots of rational thought in ancient Greece. Topics discussed: How ought we to live our lives? What is the nature of society and of the individual? What social arrangements (educational, political, commercial) best serve the ideas of justice and happiness? The course addresses these issues by critically studying Plato's Republic.

- **PHL306: Contemporary Moral Issues** **3,0,0**
 A one semester examination of several contemporary moral issues. Currently a selection is made from the following: environmental ethics, aboriginal rights, nuclear deterrence and disarmament, censorship and the problem of pornography. Issues change to keep the course contemporary; but whatever the issue, examination involves the clarification of central concepts and consideration of leading moral theories and relevant moral principles. Issues related to public policy and the law are raised.

- **PHL709: Religion, Science and Philosophy** **3,0,0**
 It has long been held, but not without controversy, that the study of science (including mathematics) opens the door to certain philosophical reflections which in turn lead to considerations of God and religion. In view and the controversy surrounding it. We shall focus on some of the more basic and historically significant of these philosophical concerns, making clear their relevance for both scientific and religious thought.
- **PHL808: Knowledge, Experience and Human Nature** **3,0,0**
 This course examines some main themes of contemporary epistemology, focussing on the relation of knowledge to language, science, culture and gender. Topics include: pragmatism; Wittgenstein and linguistic philosophy; the postmodernism and feminist epistemology; and some resulting issues concerning relativism and rationality.
- **POL106: Comparing Political Systems** **3,0,0**
 What do people expect from their political systems in the modern era? How do political systems meet the needs of their citizens? In this course, students will be introduced to the basic ideas, issues and institutions that constitute a political system. The focus will be on Canada in comparison with other countries.
- **POL206: Human Needs and Power: Comparing Nations** **3,0,0**
 What are the political and social challenges confronting modern political systems? What role do citizens play in shaping these challenges? How do different governments approach the demand for sustenance, order, community, equality and freedom within their countries? How do we evaluate these different approaches? In this course, we will examine these issues in the context of examples drawn from the West, the East and the Two-Thirds world.
- **POL701: Political Ideas in Conflict** **3,0,0**
 It is claimed that ideologies, as organized systems of belief with ready formulas for the manipulation of the masses, are, in effect, new orthodoxies. Socialism and liberalism appear as alternative reactions to the challenge posed by the industrial revolution. What is ideology? Is most political thought ideological? The areas studied are liberalism and classical economics.
- **PSY105: Psychology of Human Behaviour** **3,0,0**
 This course focuses on some of the ways in which psychologists view people. The behavioural, psychoanalytic, humanistic, cognitive, and psychobiological perspectives are evaluated through discussion of methodology, learning, motivation, and development.

- **PSY308: Psychology of Thinking** **3,0,0**
 Thought is central to our functioning in coping with both the physical and the social environment. In this course the student will study the basis of human cognitive processes such as problem-solving, decision-making and planning. Research and theories of how individual and social factors affect the efficiency of these processes will be examined, and the consequences of poor thinking processes for the individual and for society will be considered.
- **PSY504: Social Psychology** **3,0,0**
 An examination of social influence. Topics include the nature of groups, group processes; leadership; why people affiliate, aggress, conform; how attitudes develop and change.
- **PSY707: Models of Stress and Adaptation** **3,0,0**
 Every society produces stressors to which the members of that society must respond. In our society stress is commonplace, but the origins, effects and handling of stress are often poorly understood. Through the examination of psychological models of stress, this course seeks to make students aware of the stressors present in our society and of their own personal resources for adjustment and growth.
- **SOC103: Understanding Society** **3,0,0**
 This course provides an introduction to some of the major issues in the discipline of sociology. Topics to be covered include: the major theoretical debates of classical sociology; research methods and problems; culture and socialization; the evolution of human societies; and the structure of Canadian society.
- **SOC203: Social Class and Inequality** **3,0,0**
 This course examines the distribution of power and wealth in society. As a social reality, inequality leaves no one untouched; whether or not we are conscious of it affects all our experiences. This course traces the origins of social inequality and reflect on the various interpretations of social stratification. At the macro level analysis examines how patterns of inequality are reproduced and altered over time. At the micro level analysis consider how inequality shapes individual career choices and other experiences.
- **SOC501: Sociology of Work** **3,0,0**
 The purpose of this course is to examine work as a central social activity. Particular emphasis will be given to problems and conflicts arising from present forms of organization and authority in industrial and other workplaces. Topics to be considered include: historical development and effects of the division of labour; alienation and anomie, with special attention to work satisfaction and dissatisfaction.



SOC801: Social Change: International Perspectives

3,0,0

This course examines the process of social change as it is occurring in the third world. Focus is on the origins and consequences of underdevelopment, and how responses to it affects both the underdevelopment, and developed nations. Discussion will cover the impact of imperialism and neo-colonialism as well as the growth of national liberation movements. Analysis of the establishment and significance of the socialist world is presented, and in particular the reforms recently introduced there.

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: MTH 117: CALCULUS I
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Limits, continuity (4 lectures)
 2. Tangent to a graph, instantaneous velocity, the derivative (2 lectures)
 3. Differentiation formulas, rate of change (1 lecture)
 4. Derivatives of trigonometric functions (2.5 lectures)
 5. The Chain rule (1 lecture)
 6. Implicit differentiation, higher derivatives (1.5 lectures)
 7. Related rates (1.5 lectures)
 8. Differentials and linear approximations (1 lecture)
 9. Newton's method (1.5 lectures)
 10. Extrema of functions, mean value theorem (2.5 lectures)
 11. Use of derivatives in curve sketching (2.5 lectures)
 12. Applied min-max problems (2 lectures)
 13. Antiderivatives, sigma notation, area undergraph, integrals (2.5 lectures)
 14. Properties of the definite integral (1.5 lectures)
 15. Evaluation of areas and volumes (4.5 lectures)
 16. Average and mean value theorems (1 lecture)
 17. Calculus of exponential functions (5 lectures)
 18. Inverse trigonometric functions (3.5 lectures)
 19. Hyperbolic and inverse-hyperbolic functions (3 lectures)
9. PRESCRIBED TEXT(S):
 1. "Single-Variable Calculus", 2nd edition, by R.A. Adams, Addison-Wesley, 1990.
10. INSTRUCTIONAL HOURS PER WEEK: 4 hours lecture and 1 hour tutorial/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Tutorial assignments including problems based on the lecture topics.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.5 units
Mathematics = 4.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: MTH 114: LINEAR ALGEBRA
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Matrices and systems of linear equations (10 lectures)
 2. Determinants (5 lectures)
 3. Geometry, vectors, dot and cross products, projection, lines, points and lines, plans, etc... (18 lectures)
 4. Vector spaces (6 lectures)
 5. Complex numbers (3 lectures)
 6. Diagonalization by similarity (3 lectures)
 7. Orthogonal diagonalization (3 lectures)
9. PRESCRIBED TEXT(S):
 1. "Elementary Linear Algebra with Application Supplement", 4th edition, by S.I. Grossman, Saunders College Publ., 1991.
10. INSTRUCTIONAL HOURS PER WEEK: 4 hours lecture and 1 hour tutorial/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Tutorial assignments including problems based on the lecture topics.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.5 units
Mathematics = 4.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: CHY 118: CHEMISTRY
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Introduction, stoichiometry (3 lectures)
 2. Atomic structure, bonding (5 lectures)
 3. Electronic structure, atoms, ions, compounds (5 lectures)
 4. Liquids and gases, colligative properties, gas laws (3 lectures)
 5. Chemical equilibria, acids and bases (5 lectures)
 6. Thermochemistry (5 lectures)
 7. Solids, crystals and structure, mechanical properties, polymers (6 lectures)
 8. Radiochemistry (3 lectures)
 9. Electrochemistry, corrosion (4 lectures)
9. PRESCRIBED TEXT(S):
 1. "University Chemistry", 4th edition, by Mahan and Myers, Benjamin Cummings, 1987.
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture and 2 hours lab /week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Laboratory assignments based on the course topics.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.0 units
Basic Science = 4.0 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: PCS 115: PHYSICS (MECHANICS)
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Review of vectors (1 lecture)
 2. Kinematics (2 lectures)
 3. Dynamics (6 lectures)
 4. Work and energy (3 lectures)
 5. Conservation of energy (3 lectures)
 6. Linear momentum and collisions (3 lectures)
 7. Rotation of a rigid body (6 lectures)
 8. Angular momentum (5 lectures)
 9. Static equilibrium (2 lectures)
 10. Law of universal gravitation (2 lectures)
 11. Relativity (4 lectures)
9. PRESCRIBED TEXT(S):
 1. "Physics for Scientists and Engineers with Modern Physics", 3rd edition, by R.A. Serway, Saunders.
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture and 2 hour tutorial /week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Assignments include problems on the lecture topics.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.0 units
Basic Science = 4.0 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: **PCS 120: PHYSICS FOR ENGINEERS**
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Evolution of the concept of force (2 lectures)
 2. Forces and fields (14 lectures)
 3. Oscillations and waves (12 lectures)
 4. Radiation and quantization (9 lectures)
9. PRESCRIBED TEXT(S):
 1. "Physics for Scientists and Engineers", 3rd edition, by Serway, Saunders.
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture and 2 hours lab. /week. One term course.
11. COMPUTER EXPERIENCE: Data reduction using computer software will be introduced in the laboratory assignments.
12. LABORATORY EXPERIENCE:
 1. Measurements of electromagnetic fields (1 period)
 2. Standing waves (1 period)
 3. Rydberg's and Planck's constants (2 periods)
 4. Confirmation of Stefan's law (1 period)
 5. Tutorial assignment (1 period)
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.0 units
Basic Science = 4.0 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: CST100: ENGINEERING PRACTICE, ETHICS AND TECHNICAL COMMUNICATIONS
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Introduction to engineering; history
 2. Expt observation and measurement
 3. Data, histograms, graphs
 4. Accuracy of derived calculations
 5. Normal statistics, mean and variances
 6. Regulations and professional ethics
 7. Technical societies, copyright, trademarks
 8. Patents, safety, responsibility
 9. Safety and risk engineering
 10. Focus on engineering
 11. Ethics, harassment and prejudice
 12. Engineering report writing, style, standards and techniques
9. PRESCRIBED TEXT(S):
 1. "Introduction to Professional Engineering", 3rd edition, by Andrews and Ratz, Stanford Educational Press, 1993.
10. INSTRUCTIONAL HOURS PER WEEK: 2 hours lecture, 1 hour tutorial/week. One term course.
11. COMPUTER EXPERIENCE: Wordprocessors, spreadsheets, database managers, other.
12. LABORATORY EXPERIENCE: Assignment based on the lecture material.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 2.5 units
Engineering Science = 1.0 units
Complementary Studies = 1.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: MTH 227: CALCULUS II
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Functions of several variables, partial derivatives, differentials (3 lectures)
 2. Extrema of functions of two variables (2.5 lectures)
 3. Integration techniques (12.5 lectures)
 4. Numerical integration (1.5 lectures)
 5. L'Hospital's rule (2 lectures)
 6. Improper integrals (1.5 lectures)
 7. First-order differential equations with applications (14 lectures)
 8. Infinite sequences and series (7.5 lectures)
 9. Power series (6 lectures)
9. PRESCRIBED TEXT(S):
 1. "Single-Variable Calculus", 2nd edition, by R.A. Adams, Addison-Wesley, 1990.
10. INSTRUCTIONAL HOURS PER WEEK: 4 hours lecture and 1 hour tutorial/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Tutorial assignments including problems based on the lecture topics.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.5 units
Mathematics = 4.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: CPS 210: DIGITAL COMPUTATION AND PROGRAMMING
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Computer introduction, UNIX introduction (4 lectures)
 2. Pascal program organization, types, variables, assignment, sequential execution (4 lectures)
 3. I/O (2 lectures)
 4. Conditional execution, loops, branches (10 lectures)
 5. Arrays, higher dimensional arrays (4 lectures)
 6. Subprograms, procedures, functions (6 lectures)
 7. Records (4 lectures)
 8. Pointers (4 lectures)
 9. C language introduction, C program organization (1 lecture)
 10. Typing, I/O (2 lectures)
 11. Conditional execution, loops, branches (3 lectures)
 12. Functions, scope rules, storage classes (2 lectures)
 13. Arrays, pointers and strings (2 lectures)
 14. Bitwise operators (1 lecture)
 15. The preprocessor (1 lecture)
 16. Structures, unions, type def (2 lectures)
9. PRESCRIBED TEXT(S):
 1. "Pascal Programming and Structure", 4th edition, by S. Leestma and L. Hyhoff, McMillan.
 2. "A Book on C", 2nd edition, by A. Kelley and I. Pohl, Benjamin Cummings.
10. INSTRUCTIONAL HOURS PER WEEK: 4 hours lecture, 2 hours lab/week. One term course.
11. COMPUTER EXPERIENCE:

Each student is expected to write functional programs using Pascal and C. Eight programs on specific numerical analysis projects are assigned and submitted for grading.
12. LABORATORY EXPERIENCE:

Assignments based on course topics, with numerical analysis applications (12 periods)
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 5.0 units
Mathematics = 1.0 units
Engineering Science = 4.0 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: PCS 221: APPLIED SCIENCE
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/80
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/20
8. MAJOR TOPICS:
 1. Basic quantum mechanics (5 lectures)
 2. Quantum nature of solids (6 lectures)
 3. Properties of material (6 lectures)
 4. Electron population within bands (6 lectures)
 5. Electric current in solids (4 lectures)
 6. The P-N Junction (5 lectures)
 7. Transistors (3 lectures)
 8. Other solid-state devices (3 lectures)
9. PRESCRIBED TEXT(S):
 1. "Physics for Scientists and Engineers", 3rd edition, by Serway, Saunders.
 2. "Physics of Solid-State Electronic Devices", lecture notes by F. Bateman, Ryerson Bookstore, 1993.
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture and 2 hour lab. every alternate week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE:

Laboratory experiments deal with the lecture course material. Topics include: photoconductivity, current flow and temperature effects in P-N junctions, characteristics of various types of transistors.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 3.5 units
Basic Science = 3.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: ELE 212: ELECTRIC CIRCUITS
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/90
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/24
8. MAJOR TOPICS:
 1. Basic concepts of electric circuits (3 lectures)
 2. Resistance and Ohm's law (3 lectures)
 3. Simple resistive circuits (5 lectures)
 4. Practical sources (4 lectures)
 5. General resistive circuits (4 lectures)
 6. D.C. meters and principles/the oscilloscope (4 lectures)
 7. Capacitance and RC circuits (6 lectures)
 8. Magnetism (3 lectures)
 9. Inductance and transients in RL circuits (6 lectures)
 10. Alternating current and voltage (4 lectures)
 11. Steady state analysis of simple a.c. circuits (9 lectures)
 12. Power in a.c. circuits (4 lectures)
 13. Resonance in a.c. circuits (4 lectures)
 14. Loop and node analysis of general a.c. circuits (6 lectures)
 15. Network theorems for general a.c. circuits (4 lectures)
 16. Mutually coupled circuits and transformers (6 lectures)
 17. Three-phase circuits (6 lectures)
9. PRESCRIBED TEXT(S):
 1. "Electric Circuit Analysis", 2nd edition, by S.A. Bector, Prentice Hall, 1992.
 2. Laboratory Manual to accompany Bector's Electric Circuit Analysis, by M.T. Ghorab and S. Prabhu, Prentice Hall, 1992.
10. INSTRUCTIONAL HOURS PER WEEK: 6 hours lecture, 2 hour tutorial and 3 hours lab/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE:
 1. Analysis of simple series, parallel and series-parallel D.C. circuits (2 periods)
 2. Practical D.C. sources and voltage dividers (1 period)
 3. D.C. meters (2 periods)
 4. Introduction to the oscilloscope (1 period)
 5. The oscilloscope as a curve tracer (1 period)
 6. Transients in RC and RL circuits (1 period)
 7. Analysis of simple series, parallel and series-parallel a.c. circuits (3 periods)
 8. Filter network (1 period)
 9. The transformer and reflected impedance (1 period)
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 8.5 units
 Engineering Science = 8.0 units
 Engineering Design = 0.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: CHY217: ORGANIC CHEMISTRY
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 30
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 2
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15
8. MAJOR TOPICS:
 1. Structure and nomenclature
 2. Reaction pathways - radical reactions
 3. Reactions of functional groups
 4. Bulk industrial chemicals - isolation, preparation and uses
 5. High molecular weight organics
9. PRESCRIBED TEXT(S):
 1. Class notes
 2. P. Wiseman, "An Introduction to Industrial Organic Chemistry", Applied Science Publishers Ltd., 2nd edition, 1979.
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture and 2 hours lab/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE:

Eight labs: recrystallization of acetanilide, simple and fractional distillation, reactions of functional groups, isolation of caffeine from tea, stereochemistry, synthesis of aspirin, polymers and polymerization, dibenzalacetone by aldol condensation.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.0 units
Science = 4.0 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: ELE210: FUNDAMENTALS OF ELECTRICAL ENGINEERING
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 60/80
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 4
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/20
8. MAJOR TOPICS:
 1. Introduction to electric and magnetic fields (2 lectures)
 2. Basic concepts of electric circuits (2 lectures)
 3. Ohm's law, resistance and simple resistive circuits (5 lectures)
 4. Practical sources and general resistive circuits (4 lectures)
 5. Op.amps. (3 lectures)
 6. Capacitance and RC circuits (5 lectures)
 7. Inductance and RL circuits (5 lectures)
 8. AC voltage and simple ac circuit components (4 lectures)
 9. Steady-state analysis of simple ac circuits (8 lectures)
 10. Power in ac circuits (3 lectures)
9. PRESCRIBED TEXT(S):
 1. "Foundation of Electrical Engineering", by J.R. Cogdell, Prentice-Hall, 1990.
 2. Lab Manual for "Foundation of Electrical Engineering".
10. INSTRUCTIONAL HOURS PER WEEK: 3 hours lecture, 1 hour tutorial and 2 hours lab/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE:
 1. Analysis of simple dc circuits (3 periods)
 2. Practical sources and voltage dividers (2 periods)
 3. Introduction to the oscilloscope (2 periods)
 4. RL and RC circuit transients (2 periods)
 5. Analysis of simple ac circuits (3 periods)
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 4.5 units
Engineering Science = 4.0 units
Engineering Design = 0.5 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: MEC126: SCIENTIFIC PRINCIPLES OF MECHANICAL ENGINEERING
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 30/40
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 2
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/20
8. MAJOR TOPICS:
 1. Introduction
 2. Project description/expectations
 3. Review of statics
 4. Material mechanical properties
 5. Elasticity
 6. Truss analysis
 7. Fluid statics
 8. Fluid dynamics; Bernoulli's eqn
 9. Discussion of 'losses'
 10. The first law of thermodynamics
 11. Examples of first law analysis
 12. The second law of thermodynamics
 13. Applications of the second law
 14. Review
9. PRESCRIBED TEXT(S): Whatever text was used for Physics supplemented by notes.
10. INSTRUCTIONAL HOURS PER WEEK: 2 hours lecture, 1 hour tutorial, 1 hour (av.) project/week.
One term course.
11. COMPUTER EXPERIENCE: Use of wordprocessors, spreadsheets.
12. LABORATORY EXPERIENCE: Labs on airfoils, heat transfer, vibrations, and material properties.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 3.0 units
Engineering Science = 0.9 units
Basic Science = 1.5 units
Engineering Design = 0.6 units
17. AVERAGE GRADE/FAILURE RATE: New Course

COURSE INFORMATION SHEET

1. COURSE NUMBER & TITLE: MEC170: ENGINEERING GRAPHICS
2. CALENDAR REFERENCE: See attached course descriptions
3. CEAB COURSE TYPE: Program Compulsory
4. TOTAL NUMBER OF LECTURE SECTIONS: 1
5. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER SECTION: 30/40
6. TOTAL NUMBER OF LABORATORY/TUTORIAL SECTIONS: 2
7. MINIMUM/MAXIMUM NUMBER OF STUDENTS PER LABORATORY/TUTORIAL SECTION: 15/20
8. MAJOR TOPICS:
 1. Use of drawing tools; fundamentals of projection
 2. Auxiliary projection planes
 3. Axonometric projections
 4. Oblique projections
 5. Perspective projections
 6. Introduction to descriptive geometry
 7. Points, lines and planes
 8. Points, lines and planes (cont'd)
 9. Computer aided projection
 10. Applications of descriptive geometry
 11. Intersections
 12. Review
9. PRESCRIBED TEXT(S):
 1. "Engineering Graphics and Descriptive Geometry in 3D", 3rd edition, by G.F. Pearce, McGraw Hill, 1985.
10. INSTRUCTIONAL HOURS PER WEEK: 1 hour lecture, 3 hours lab/week. One term course.
11. COMPUTER EXPERIENCE: N/A
12. LABORATORY EXPERIENCE: Assignments based on the lecture material.
13. PROFESSOR-IN-CHARGE:
14. OTHER INSTRUCTORS:
15. TEACHING ASSISTANTS (NUMBER/HOURS):
16. CEAB CURRICULUM CATEGORY CONTENT: TOTAL NUMBER OF LOAD UNITS = 2.5 units
Engineering Science = 1.25 units
Engineering Design = 1.25 units
17. AVERAGE GRADE/FAILURE RATE: New Course

Academic Program Curriculum Including ESL

(Model II)

SUT

International Engineering Programs

Year 1

Term 1 (Fall)

MTH 117 Calculus I

Lect.	Tut.	Lab.
4	1	

MTH 114 Linear Algebra

4	1	
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CHY 118 Chemistry

3		2
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PCS 120 Physics for Engineers

3		2
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ESL 100

3		
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17	2	4 = 23
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Term 2 (Winter)

MTH 227 Calculus II

4	1	
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PCS 115 Physics (Mechanics)

3	2	
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ELE 210 Fundamentals of Electrical Engineering

4	1	2
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IT 1 Information Technology I (Computer Fund.)

2		2
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ESL 200

3		
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16	4	4 = 24
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Term 3 (Summer)

CPS 210 Digital Computation and Programming

4		2
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CST 100 Engineering Practice, Ethics and Technical Communications

2	1	
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CST Impact of Technology on Society ; One of :

3		
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Man & Society, World Community, Environment
and Development

ESL 300

3		
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A) For Electrical Engineering Students Only :

PCS 221 Applied Science

3		1
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ELE 212 Electric Circuits

3		2
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18	1	5 = 24
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B) For Chemical Engineering Students Only :

MEC 170 Engineering Graphics

1		3
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CHY 217 Organic Chemistry

3		2
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16	1	7 = 24
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C) For Mechanical Engineering Students Only :

MEC 170 Engineering Graphics

1		3
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MEC 126 Scientific Principles of Mechanical Engineering

2	1	1
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15	2	6 = 23
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TUNSGuelph

S Aug F W

Year 1 ESL1 1+ESL2' 2+ESL2'

2 3+ESL2' 4 WT1/V

3 5 Year II TUNSGuelph 5 TUNSGuelph 6

4 WT2/V TUNSGuelph 7 TUNSGuelph 8

Waterloo

S Aug F Dec W

Year 1 ESL1 1+ESL2' 2+ESL2'

2 3+ESL2' 4 WT1

3 5 WT2 Wat. 5A

4 WT3 Wat. 6A WT 4

5 Wat. 7A WTS Wat. 8A

**AVAILABLE COURSE DESCRIPTIONS AND SYLLABI
FROM RYERSON POLYTECHNIC UNIVERSITY**

CHY 118	:	Chemistry
CMN 705	:	Technical Communication in Electrical Engineering
CPS 210	:	Digital Computation and Programming
CPS 883	:	Compilers and Translators
CPS 888	:	Software Engineering
ECE 746	:	Power Systems I
ECE 846	:	Power Systems II
ELE 112	:	Electric Circuits I
ELE 212	:	Electric Circuits II
ELE 321	:	Field Theory I
ELE 322	:	Electrical Networks
ELE 324	:	Electronic Circuits
ELE 328	:	Digital Systems and Microprocessors
ELE 421	:	Field Theory II
ELE 423	:	Computational Methods
ELE 424	:	Electronic Circuits II
ELE 428	:	Engineering Algorithms and Data Structure
ELE 531	:	Electromagnetics
ELE 532	:	Signals and Systems
ELE 534	:	Advanced Electronics
ELE 538	:	Microprocessor Systems
ELE 548	:	Computer Architecture
ELE 630	:	Professional Engineering Practice and Ethics
ELE 635	:	Communication Systems
ELE 637	:	Electrical Machines
ELE 639	:	Classical Control Systems

ELE 648	:	Real-time Operating Systems
ELE 740	:	Thesis Project
ELE 745	:	Digital Communication Systems
ELE 755	:	Digital Coding of Waveforms
ELE 758	:	Digital Systems Engineering
ELE 829	:	System Models and Identification
ELE 840	:	Thesis Project
ELE 847	:	Advanced Electrochemical Systems
ELE 859	:	Digital Control Systems
ELE 861	:	Microwave Engineering
ELE 864	:	Electric Drives
ELE 865	:	Computer Communications
ELE 869	:	Fundamentals of Robotics
ELE 884	:	Photonics
ELE 885	:	Optical Communication Systems
ELE 888	:	Artificial Intelligence
MTH 126	:	Linear Algebra
MTH 127	:	Calculus I
MTH 227	:	Calculus II
MTH 313	:	Differential Equations and Transforms
MTII 523	:	Probability and Statistics for Engineers
PCS 123	:	Energy, Waves and Modern Physics
PCS 223	:	Mechanics
PCS 224	:	Applied Science

COURSE INFO SHEETS.: TUNS CHEM ENGR COURSES

ChE 0710	:	Communications
ChE 0720	:	Fundamentals of Chemical Engineering
ChE 0722	:	Mechanical Unit Operations
ChE 0802	:	Organic Chemistry
ChE 0804	:	Industrial Chemistry
ChE 0824	:	Heat Transfer
ChE 0830	:	Chemical Engineering Thermodynamics
ChE 0870	:	Environmental Engineering
ChE 1025	:	Separation Processes
ChE 1032	:	Kinetics and Ideal Reactors
ChE 1044	:	Computer-Aided Process Design
ChE 1050	:	Process Dynamics and Control
ChE 1326	:	Mass Transfer
ChE 1334	:	Chemical Reactor Design
ChE 1341	:	Process and Plant Design I
ChE 1352	:	Process Modeling, Simulation and Control
ChE 1356	:	Process Optimization
ChE 1372	:	Air Pollution Control
ChE 1391	:	Research Project I
ChE 1428	:	Transport Phenomena
ChE 1442	:	Process and Plant Design II
ChE 1454	:	Computer Process Control
ChE 1460	:	Fundamentals of Combustion
ChE 1462	:	Fundamentals of Combustion Engineering
ChE 1492	:	Research Project II
ChE 3301	:	Physical Chemistry

Laboratory Manuals from CUTC

Ryerson Polytechnic University

- PCS 010 : Physics Laboratory Manual for Engineering Students in the First Year.
- PCS 123 : Physics Laboratory Manual for Electrical Engineering Students in the First Year.
- Laboratory Manual for Doctors's : Electric Circuit Analysis

TUNS : Chemical Engineering

ChE 0802 : Organic Chemistry

Statement of Research Interest (TUNS)

- Dr.Paul Amyotte : Loss Prevention; gas and dust explosion, fluidization and drying process.
- Dr. A.M.Ai Taweel: Power Generation Systems, Processing fossil fuel; novel Multiphase Contactors; effluent treatment; effect of aggregate formation on dispersed-system characteristics; utilization of agricultural wastes.
- Dr.Michael J.Pegg : Process industries and combustion; gas, dust and hybrid mixture explosions; furnace trials.

Curriculum vitae : TUNS

- Dr.Douglas, Peter Lewis
- Dr.El-Masry, Ezz.I.
- Dr.Fels, Mort
- Dr.Gupta, Y.P.
- Dr.Kipouros, Georges J.
- Dr.Mckay, George D.M.
- Dr.Robertson, William

FOOD SCIENCE INTERNATIONAL PROGRAM

CURRICULUM DEVELOPMENT

	<u>SUT</u>	<u>U of G</u>
1. Courses Comparison	- Dean, Chair	- Dept. Chair, Program Advisor
2. Preparation of Agreed curri.& Agreement.	- Food Sci. School	- F.S Dept. (Articulation agreement)
3. Approval of curriculum	- Senate - SUT Boards	- Senate

INTERNATIONAL PROGRAM

FOOD TECHNOLOGY

	<u>SUT/THAI</u>	<u>SUT/INT'L</u>	<u>UG</u>
	176 Credits	147 Credits	40 Courses
♣ G.E	39	24	22 Courses/76 Credits at SUT
♣ Basic Sci	36	36	
♣ Food Tech	98	78	20 Courses at UG.
	{ ood 86 Coop 12		
♣ Electives	3	9	

Food Technology Curriculum

Total credits SUT/Thai = 176 credits

SUT/Int'l = 147 credits

		<u>International Program</u>	
General Education :	24 credits	Computer Prog. (IT II)	
		Economics	
		Environ & Devel.	
		Information Tech. I	
		Logical Thinking	
		Man and Society	
		Quality of Life Development	
		24 * World Community	
		39 * Communications (English)	
		(English 15 credits)	
Basic Science :	36 credits	Biology	(4)
		Calculus I	(3)
		Calculus II	(3)
		Chemistry I	(4)
		Chemistry II	(4)
		Microbiology	(4)
		Physics I	(4)
		Physics II	(4)
		Stat I	(3)
		Stat Methods	(3)
		- Elective at UG	
		- Compulsary at SUT	

Majors : core :	24 credits	Analytical Chem	(4)
		Biochemistry	(4)
		Engineering Graphics	(2)
		Intro cell Biol.	(3)
		Organic Chem	(4)
		Physical Chem	(4)
		Prin. Food Sci and Tech	(3)

Specialized :	48 credits	Food Analysis	(3)
		Food Chem.	(4)
		Food Engineering Prin.	(4)
		Food Industrial Plant	(3)
		Management	
		Food Microbiol	(4)
		Food Packaging	(3)
		Food Proc. I	(4)
		Food Proc. II	(4)
		Food Product Dev.	(4)
		Food Technology Project	(3)
		Fundamental Nutri.	(3)
		Quality Assurance	(2)
		Quality Control	(3)
		Sanitation and Plant	(3)
		Environment Management	
		Seminar	(1)

Electives in Food Technology : 6 credits

Free electives : 9 credits

International Program
Bachelor Degree in Food Science/Technology

	SUT	UG code	U of G
<u>Semester I</u>			
1	Calculus I	(3)	63-120
2	Chemistry I	(3)	19-100
	Chemistry I Lab	(1)	
3	Logical Thinking	(3)	Psychology
4	Physics I	(3)	76-100
	Physics I Lab	(1)	
5	Principles of Biology	(3)	15-221
	Principles of Biology Lab	(1)	
Total 18 credits			
<u>Semester II</u>			
6	Calculus II	(3)	63-121
7	Chemistry II	(3)	19-101
	Chemistry II Lab	(1)	
-	Engineering Graphics	(2)	
8	Information Technology I	(3)	
9	Microbiology	(3)	65-100
	Microbiology Lab	(1)	
10	Physics II	(3)	76-101
	Physics II Lab	(1)	
Total 20 credits			
<u>Semester III</u>			
11	Computer Programming	(3)	
-	Introduction to Cell Biology	(3)	
12	Quality of Life Development	(3)	
13	Organic Chemistry	(3)	19-171
	Organic Chemistry Lab	(1)	
14	Principle of Food Science		
15	and Technology	(3)	
	Probability and Statistics	(3)	89-204
Total 19 credits			
<u>Semester IV</u>			
16	Analytical Chemistry	(3)	19-248
	Analytical Chemistry Lab	(1)	
17	Biochemistry	(3)	19-258
	Biochemistry Lab	(1)	
18	Introduction to Economics	(3)	
19	Physical Chemistry	(3)	19-288
	Physical Chemistry Lab	(1)	
20	Principles of Food Engineering	(3)	05-262
	Principles of Food Engineering Lab	(1)	
Total 19 credits			

Semester V

Food Processing I	(3) 42-316	Food Processing I	(4)
Food Processing I Lab	(1)	Food Chemistry	(4)
Food Chemistry	(3) 42-310	Free Electives	(6)
Food Chemistry Lab	(1)	Fundamentals of Nutrition	(3)
Free Elective	(3)		
Fundamentals of Nutrition	(3) 42-201		
Postharvest Changes of Biological Materials	(3)		
World Community	(3)		
Total 20 credits		Total 17 credits	

Semester VI

Food Microbiology	(3) 42-323	Communication Process	(3)
Food Microbiology Lab	(1)	Free Elective	(3)
Food Processing II	(3) 42-317	Food Microbiology	(4)
Food Processing II Lab	(1)	Food Processing II	(4)
Food Quality Control	(3) 42-412	Quality Assurance	(3)
Free Elective	(3)		
Man and Society	(3)		
Quality Assurance	(2)		
Total 19 credits		Total 17 credits	

Semester VII

Food Analysis	(3) 42-412	Food Analysis	(4)
Food Packaging	(3) 42-407	Food Packaging	(3)
Food Product Development and Marketing	(4) 42-470	Food Science Electives	(6-8)
Sanitation and Plant Environment Management	(3)	Processing Plant Technology	(4)
Seminar in Food Technology	(1)		
Statistical Methods	(3) 89-205		
Total 17 credits		Total 17-19 credits	

Semester VIII

Food Industrial Plant Management	(3)	Food Commodity Electives (6-8)	
Food Technology Electives	(6)	Food Product Development	(3)
Food Technology Project	(3)	Food Science Elective	(3-4)
Free Elective	(3)	Seminar	(2)
Environment and Development	(3)		
Total 18 credits		Total 14-17 credits	

Basic Courses Comparison

Basic Science	U of G/Food	SUT/Food	SUT/Eng
Mathematics	Cal I	Cal I	Cal I
	Cal II	Cal II	Cal II
	-	-	Algb
Chemistry	Chem I	Chem I	Chem
	Chem II	Chem II	-
	Org Chem	Org Chem	Org Chem
Physics	Phy I	Phy I	Phy (Mech)
	Phy II	Phy II	Phy (Eng)
Others			
Computer	IT	IT	IT
	Com Prog	Com Prog	Com Prog
Drawing	-	Eng Grap	Eng Grap

Food Technology Courses
(Description and Outline)

202 315 Food Industrial Plant Management

Prerequisite : None

Course Description : Principles of industrial management; make up and various functions in organizations; analysis of production capital and profit, production planning, controlling and increasing yields, inventory management, labor relationships, safety and maintenance management, laws related to food factories.

Course Outline :

1. Principles of industrial management (1)
2. Important roles and make up of organization (3)
3. Structure and organization of food industry (3)
4. Analysis for production cost and profit (6)
5. Techniques for production planning and control (3)
6. Techniques of improvement and productivity management (6)
7. Inventory management (2)
8. Personnel relations and labor relations (4)
9. Improvement of working methods in industry and safety in industry (3)
10. Maintenance management (2)
11. Laws related to food factories (3)

305 221 Food and Nutrition**3(3-0-6)**

Prerequisite : None

Course Description : Relationship between food and nutrition, food and food consumption, nutrients and their roles in the body, nutrient requirements, factors affecting nutritional diseases related to public health, nutritional status of the Thai population.

Course Outline :

1. Food and consumption (5)
 - 1.1 Composition and functions of food
 - 1.2 Digestion and absorption

- 1.3 Basic foods
- 1.4 Trends in food consumption
- 1.5 Developments in nutrition
- 2. Water (2)
 - 2.1 Role of water in the body
 - 2.2 Use of water by the body
 - 2.3 Deficiency and water requirements
 - 2.4 Water in foods
- 3. Carbohydrates (2)
 - 3.1 Role of carbohydrates in the body
 - 3.2 Use of carbohydrates
 - 3.3 Carbohydrates deficiency
 - 3.4 Carbohydrates in food and food fiber
- 4. Lipids (2)
 - 4.1 Role of lipids in food
 - 4.2 Utilization of lipids
 - 4.3 Lipids deficiency
 - 4.4 Lipids in food and cholesterol
- 5. Proteins (3)
 - 5.1 Role of proteins in the body
 - 5.2 Use of proteins
 - 5.3 Protein deficiency
 - 5.4 Proteins in foods
- 6. Minerals (4)
 - 6.1 Minerals in the body
 - 6.2 Macro-minerals
 - 6.3 Micro-minerals
- 7. Vitamins (4)
 - 7.1 Fat-soluble vitamins
 - 7.2 Water-soluble vitamins
- 8. Food nutrient requirements (5)

- 8.1 Factors influencing food nutrient requirements
- 8.2 Energy requirements
- 8.3 Protein requirements
- 8.4 Mineral requirements
- 8.5 Vitamin requirements
- 9. Nutritional status (8)
 - 9.1 Factors influence nutritional status
 - 9.2 Good nutritional status
 - 9.3 Malnutrition and nutritional diseases
 - 9.4 Eating habits and weigh control
 - 9.5 Estimation of nutritional status
 - 9.6 Nutritional status in Thailand
 - 9.7 Community nutrition

305 271 Postharvest Changes of Biological Materials 3(3-0-6)

Prerequisite : Biochemistry

Course Description : Biochemical and microbiological changes after harvesting of raw materials used in agro-industry, including meat, fish, fruits and vegetables. Includes proper handling for slowing changes that occur prior to processing.

Course Outline :

- 1. Importance of postharvest changes (1)
- 2. Changes in fresh milk (4)
 - 2.1 Fresh milk composition
 - 2.2 Changes in fresh milk
 - 2.3 Handling methods to slow changes
- 3. Changes in meat and poultry (6)
 - 3.1 Composition and structure of meats
 - 3.2 Changes in meats
 - 3.3 Handling methods to slow changes
- 4. Changes in fish and aquatic animals (6)

- 4.1 Composition and structure of fish and aquatic animals
- 4.2 Changes in fish and aquatic animals
- 4.3 Handling methods to slow changes
- 5. Changes in egg (3)
 - 5.1 Composition and structure of fresh eggs
 - 5.2 Changes in fresh eggs
 - 5.3 Handling methods to slow changes
- 6. Changes in cereal grains (4)
 - 6.1 Composition and structure of cereal grains
 - 6.2 Changes in cereal grains
 - 6.3 Handling methods to slow changes
- 7. Changes in legume seeds (4)
 - 7.1 Composition and structure of legume seeds
 - 7.2 Changes in legume seeds
 - 7.3 Handling methods to slow changes
- 8. Changes in fruits and vegetables (8)
 - 8.1 Composition and structure of fruits and vegetables
 - 8.2 Changes in fruits and vegetables
 - 8.3 Handling methods to slow changes

305 311 Food Microbiology

3(3-0-6)

Prerequisite : General Microbiology and General Microbiology Lab

Course Description : Types of food spoilage microorganisms in various foods, food poisoning microorganisms that exist naturally in various foods, examination and classification of various microorganisms in foods, useful microorganisms in food processing, utilization of genetic engineering for producing useful microorganisms, microbiological standards of foods.

Course Outline :

- 1. Microorganisms involved with foods (4)
 - 1.1 Importance and types of microorganisms

- 1.2 Enumeration of microbial numbers
- 1.3 Sources of microorganisms
- 2. Factors affecting growth of microorganisms in foods (8)
 - 2.1 Food nutrients
 - 2.2 Water
 - 2.3 Natural inhibitors in foods
 - 2.4 Factors influencing microbial growth in foods
 - 2.5 Injury and revival of microorganisms
- 3. Foodborne disease microorganisms (6)
 - 3.1 Types of microorganisms
 - 3.2 Symptom and type of microorganisms
 - 3.3 Detection of microorganisms and their toxins
 - 3.4 Microorganisms used as indicators
- 4. Food spoilage microorganisms in : (5)
 - 4.1 Carbohydrate foods
 - 4.2 Fruit and vegetable products
 - 4.3 Meat products
 - 4.4 Seafood products
 - 4.5 Canned foods and finished foods tightly packed in plastic packaging
 - 4.6 Identification of microorganisms
- 5. Control of microorganisms in foods (6)
 - 5.1 Control by retarding growth
 - 5.2 Control by destruction
- 6. Microbial cultures used in the : (5)
 - 6.1 Fermentation industry
 - 6.2 Food additive product industry
 - 6.3 Vitamin and amino acid product industry
 - 6.4 Enzyme product industry
 - 6.5 Analysis using microorganisms
- 7. Universal standards of food microbiology (2)

305 312 Food Microbiology Laboratory**1(0-3-0)**

Prerequisite : General Microbiology Laboratory

Course Description : Methods for determination of microorganisms in Foods.

Course Outline :

1. Isolation techniques and enumeration of microorganisms in foods and biochemical properties identification
2. Identification of *Coliforms/E. coli*
3. Identification of *Staphylococcus aureus*
4. Identification of *Vibrio parahaemolyticus/cholerae*
5. Identification of *Clostridium botulinum/perfringens*
6. Identification of *Salmonella*
7. Identification of *Listeria*
8. Identification of microorganisms in canned food
9. Identification of mycotoxins
10. Analysis using microorganisms (analysis of antibiotics or vitamins)
11. Study of morphology and property of microorganisms used in the fermentation industry
12. Determination of microorganisms using immunoassays

305 322 Food Chemistry**3(3-0-6)**

Prerequisite : Biochemistry

Course Description : Chemical properties of food components including water, carbohydrates, proteins, lipids, vitamins, minerals, pigments, flavoring agents and food additives, role of food components in determining the properties of foods.

Course Outline :

1. Water in food (2)
 - 1.1 Molecular structure
 - 1.2 Water holding and its effects on rate of chemical changes in foods
2. Carbohydrates (6)

- 2.1 Chemical properties, nutritional value and sensory properties
- 2.2 Change reactions under various conditions
- 2.3 Color change reactions in foods
- 2.4 Hydrocolloid used in foods
- 3. Proteins (6)
 - 3.1 Chemical properties, nutritional value and sensory of amino acids and peptides
 - 3.2 Types and properties and chemical reactions of important proteins in various types of foods
- 4. Enzymes (4)
 - 4.1 Types and properties of enzymes used in food processing
 - 4.2 Effects of processing on enzyme activity
 - 4.3 Use of enzymes in food processing
- 5. Lipids (4)
 - 5.1 Chemical properties, nutritional value and sensory properties
 - 5.2 Oxidative reactions of lipids
 - 5.3 Modification of lipid properties
- 6. Vitamins and minerals (4)
 - 6.1 Amount of vitamins and mineral in various foods
 - 6.2 Stability of vitamins and loss of minerals due to food processing
- 7. Flavor and color substances (4)
 - 7.1 Properties of flavors and colorings
 - 7.2 Changes in flavor and color in foods
- 8. Chemical additives in foods (6)
 - 8.1 Contaminants in foods
 - 8.2 Chemicals used to retard changes of foods
 - 8.3 Texture modifying agents
 - 8.4 Preservatives

305 323 Food Chemistry Laboratory**1(0-3-0)**

Prerequisite : Organic Chemistry, Biochemistry

Course Description : Chemical composition of food and the role of food composition in determining food characteristics.

Course Outline :

1. Separation and properties of carbohydrates from natural sources
2. Breakdown of starches (to simple sugars) and starch modification
3. Browning reactions and effect of chemicals on retarding color changes
4. Protein extraction and separation
5. Denaturation and renaturation of protein
6. Kinetics and increasing enzyme activity
7. Separation of lipid and pigments in oil
8. Oxidation and effect of antioxidants
9. Emulsion production and determination of emulsification ability of emulsifiers
10. Changes in pigments and flavoring agents
11. Hydrocolloid properties

305 331 Food Processing I**3(3-0-6)**

Prerequisite : General Microbiology

Course Description : Principles of food preservation, raw materials used in food industry; basic concepts in raw material selection and preparation; processes for changing raw materials to desired forms; machinery and equipment used for changing the form of raw material, use of chemicals in processing, food factory study tour.

Course Outline :

1. Principles of basic food preservation (5)
 - 1.1 Deterioration of foods
 - 1.2 Factors involved in processing for food preservation
2. Water in the food industry (2)

- 2.1 Sources of water
- 2.2 Additives in water
- 2.3 Water preparation for use in food industry
- 3 Raw materials (3)
 - 3.1 Properties of raw materials
 - 3.2 Size, selection and grading
 - 3.3 Cleaning
- 4. Changing forms of raw materials (9)
 - 4.1 Blanching
 - 4.2 Peeling
 - 4.3 Size reduction
 - 4.4 Mixing and agitation
 - 4.5 Emulsion and homogenization
 - 4.6 Separation and extraction
 - 4.7 Crystalization and purification
- 5. Uses of chemicals in food processing (7)
 - 5.1 Sugar
 - 5.2 Salt
 - 5.3 Acids
 - 5.4 Other chemical that aid in food processing and preservation
- 6. Uses of microorganisms and enzymes (6)
 - 6.1 Alcohol production
 - 6.2 Acid production
 - 6.3 Sauce production
 - 6.4 Immobilization of cells and enzymes
- 7. Packaging (4)
 - 7.1 Types and properties of packaging materials
 - 7.2 Edible packaging

305 332 Food Processing Laboratory I**1(0-3-0)**

Prerequisite : None

Course Description : processes and equipment used in food processing including preparation of water and raw materials, use of chemicals, use of microorganisms and use of enzymes in food processing.

Course Outline :

1. Determination of and improving the quality of water
2. Raw material preparation, blanching and peeling
3. Separation and protein and lipid extraction
4. Crystallization and purification (salt and sugar)
5. Uses of sugar (jams and preservation in sugar)
6. Emulsion and homogenization
7. Pickling and fermentation
8. Uses of immobilized enzymes and cells
9. Uses of chemicals to change texture
10. Determination of packaging quality (cans and plastic)

305 333 Food Processing II**3(3-0-6)**

Prerequisite : Food Processing I

Course Description : Processes and equipment used in food processing including heating, concentration, freezing, microwaves and irradiation, gases, food product storage, food factory study tour.

Course Outline :

1. Thermal processes (7)
 - 1.1 Pasteurization
 - 1.2 Sterilization
 - Heat penetration and process time calculations
 - Sterilization of food packed in cans, glass and plastic bags

- Aseptic packaging processes
- 2. Temperature reducing processes (2)
 - 2.1 Cooling
 - 2.2 Freezing
- 3. Water separation processes (8)
 - 3.1 Concentration
 - Evaporation
 - Freezing
 - Ultrafiltration and reverse osmosis
 - 3.2 Drying
 - Sun drying
 - Oven drying
 - Spray drying and film drying
 - Smoking
- 4. Irradiation processes and microwaving (3)
 - 4.1 Amount of radiation used
 - 4.2 Microwave systems
 - 4.3 Effect of radiation on food quality
- 5. Uses of gases in food industry (4)
 - 5.1 Super critical fluid extraction
 - 5.2 Modified atmosphere
 - 5.3 Others
- 6. Texture changes in food
 - 6.1 Texture changes in plant products
 - 6.2 Texture changes in animal products
- 7. Storage of processed food (4)
 - 7.1 Influence of storage condition on product quality
 - 7.2 Determination of storage time for products
- 8. Good Manufacturing Practices (2)
- 9. Other processing processes (2)

305 334 Food Processing Laboratory II**1(0-3-0)**

Prerequisite : Food Processing I

Course Description : Laboratory exercises emphasizing processes and equipment used in food processing including use of heat, low temperature, concentration, drying, texture modification and shelf-life extension of food.

Course Outline :

1. Cans, can sealers and retorts
2. Determination of processing time for canned food -
3. Freezing and freeze drying
4. Concentration
5. Oven drying and Sun drying
6. Spray drying and thin film drying and coagulation
7. Texture modification of food
8. Modified atmosphere
9. Determination of shelf-life of food

305 341 Food Engineering I**3(3-0-6)**

Prerequisite : Physical Chemistry or consent of lecturer.

Course Description : Units and dimensions, mass balance, gases and vapor pressure, energy balance, fluid flow, separation processes.

Course Outline :

- | | |
|--|-----|
| 1. Unit systems and dimensions | (2) |
| 2. Mathematic and graphic methods | (2) |
| 3. Mass balances | (6) |
| 4. Law of gases and vapor pressure value | (4) |
| 5. Energy balances | (5) |
| 6. Mass balance and energy balances | (3) |
| 7. Fluid flow and functions of pumps | (8) |
| 8. Mechanical and physical separation | |
| 8.1 Filtration | (2) |

8.2 Sedimentation (2)

8.3 Mechanical size reduction (2)

305 342 Food Engineering Laboratory I

1(0-3-0)

Prerequisite : Food Engineering I

Course Description : Experiments related to contents of Food Engineering I.

Course Outline :

1. Problem calculation : Units and dimension, mathematic and graphic methods
2. Fluid friction
3. Flow measurement
4. Flow pattern
5. Function of pumps
6. Filtration
7. Size reduction, and particle distribution
8. Cooling towers
9. Sedimentation

305 343 Food Engineering II

3(3-0-6)

Prerequisite : Food Engineering I

Course Description : Thermodynamics, heat transfer, mass transfer, specific unit operations.

Course Outline :

1. Thermodynamics and cooling (5)
2. Mass transfer
 - 2.1 Constant conditions (4)
 - 2.2 Variable conditions (3)
 - 2.3 Heat exchangers (3)
3. Mass transfer (6)
4. Specific unit operation
 - 4.1 Evaporation (3)
 - 4.2 Distillation (3)

- | | |
|----------------------------|-----|
| 4.3 Drying | (3) |
| 4.4 Washing and extraction | (3) |
| 4.5 Adsorption | (3) |

305 344 Food Engineering Laboratory II **1(0-3-0)**

Prerequisite : Food Engineering II

Course Description : Experiments related to contents of Food Engineering II.

Course Outline :

1. Dispersion of gasses through film sheets
2. Dispersion of solutions in gel
3. Drying systems
4. Single pass evaporation or multiple pass evaporation systems
5. Extraction systems
6. Heat exchanger systems
7. Distillation systems
8. Boilers
9. Cooling and freezing systems

305 351 Food Quality Control **4(2-6-4)**

Prerequisite : None

Course Description : Composition of food and its effects on quality, quality measurement, methods and standards used in quality control for each type of food industry; and statistical quality control.

Course Outline :

- | | |
|---|-----|
| 1. Introduction | (1) |
| 2. Principles of quality and quality measurement | (1) |
| 3. Color of food | (1) |
| 3.1 Type of color and color classification standard | |
| 3.2 Determination and color measurement | |
| 4. Viscosity and stability of food | (1) |

- 4.1 Standards of viscosity and stability
- 4.2 Determination of viscosity and stability
- 5. Texture of foods (1)
 - 5.1 Texture of foods
 - 5.2 Instrument and sensory
- 6. Flavors of foods (1)
 - 6.1 Factor affecting food flavors
 - 6.2 Methods for measuring food flavors
- 7. Size, shape and defects (1)
- 8. Chemical and microbiological quality (1)
 - 8.1 Chemical factors
 - 8.2 Microbiological factors
- 9. Statistical methods in quality control (6)
 - 9.1 Types of sampling for measurement
 - 9.2 Levels of quality acceptance,
 - 9.3 Determination of critical control points for producing foods acceptable
to the processor and consumer
 - 9.4 Quality control charts
- 10. Sensory evaluation (4)
 - 10.1 Sensory evaluation preparation
 - 10.2 Methods of sensory evaluation
 - 10.3 Statistical analysis of sensory evaluation data
- 11. Quality control in industry (6)
 - 11.1 Dairy industry
 - 11.2 Meat and egg industries
 - 11.3 Seafood industry
 - 11.4 Fruit and vegetable industry
 - 11.5 Cereal products industry
 - 11.6 Fats and oils industry

Laboratory :

1. Measurement of food color
2. Measurement of viscosity and texture
3. Measurement of size, shape and defects
4. Graphs for quality control
5. Graphs for control of production efficiency
6. Sensory evaluation preparation.
7. Various sensory methods and data analysis
8. Examples of quality control in food processing

305 424 Food Analysis**3(1-6-2)**

Prerequisite : Analytical Chemistry

Course Description : Principles for analysis of food components and food additives using scientific instruments.

Course Outline :

1. Determination of proximate composition of food : (3)
 - 1.1 Ash and minerals
 - 1.2 Moisture
 - 1.3 Lipid content
 - 1.4 Protein content
 - 1.5 Fiber
 - 1.6 Carbohydrate
2. Determination of sugar content : (2)
 - 2.1 Reducing sugars
 - 2.2 Methods for determining total sugar content
3. Analysis of food composition using chromatography (5)
 - 3.1 Column chromatography
 - 3.2 Paper chromatography
 - 3.3 Thin-layer chromatography
 - 3.4 Gas chromatography
 - 3.5 High performance liquid chromatography

3.6 Ion-exchange chromatography

4. Analysis of food composition using spectrophotometry (1)
5. Analysis of food composition using atomic absorption spectrophotometry(1)

Laboratory :

Methods for determination of :

1. Ash and minerals
2. Moisture
3. Lipid content
4. Protein content
5. Fiber
6. Carbohydrate content
7. Molecular weight of proteins
8. Reducing sugars
9. Total sugar by glucose oxidase and other methods
10. Column chromatography
11. Paper chromatography
12. Thin-layer chromatography
13. Gas chromatography
14. High performance liquid chromatography
15. Spectrophotometry
16. Atomic absorption spectrophotometry
17. Ion exchange chromatography

305 445 Process Evaluation and Improvement

3(2-3-4)

Prerequisite : Food processing II

Course Description : Process design, production lines, analysis of processes, feasibility study in process development and management of process development.

Course Outline :

1. Organization principles for process design (3)
2. Production assembly (6)
 - 2.1 Raw material and process flow
 - 2.2 Equipment arrangement
 - 2.3 Process simulation
3. Analysis of processes
 - 3.1 Efficiency of production
 - 3.2 Efficiency of machine
 - 3.3 New technology in processing
 - 3.4 Economic analysis
4. Feasibility study in process development (6)
 - 4.1 Technical principles
 - 4.2 Economics principles
5. Planning and managing of process control (3)

Laboratory :

Assignment of projects covering topics concerned with process development and evaluation.

305 452 Quality Assurance

2(2-0-4)

Prerequisite : None

Course Description : Principles of quality assurance, systems of quality assurance, management for quality assurance, quality assurance planning.

Course Outline :

1. General principles of quality assurance (2)
2. Quality assurance system (4)
 - 2.1 Total quality control (TQC and CWQC)
 - 2.2 Quality control for zero defects
 - 2.3 Quality assurance and just-in-time systems

3. Management of quality assurance in factory (6)
 - 3.1 Quality Management systems
 - 3.2 Quality Management techniques
 - 3.3 Quality Management capital
4. Quality assurance planning in the factory including specifications (6)

for control of :

 - 4.1 Raw material quality
 - 4.2 Product quality
 - 4.3 Quality in processing system
 - 4.4 Product storage
5. Quality assurance system of industrial plant following universal standards (6)
 - 5.1 ISO 9000
 - 5.2 HACCP
 - 5.3 Quality Management Program (QMP)
 - 5.4 Total Quality Management (TQM)

305 453 Sanitation and Plant Environment Management 3(3-0-6)

Prerequisite : Food Microbiology

Course Description : Sanitary requirements in the food industry, plant environmentally friendly management, establishment of a plant sanitation project, waste water and chemical residual management; laws related to food plant sanitation.

Course Outline :

1. Sanitary requirements in the food industry (12)
 - 1.1 Raw materials and certification of raw material suppliers
 - 1.2 Sanitary interior and exterior building design and equipment specifications
 - 1.3 Personnel hygiene
 - 1.4 Pest and insect control
 - 1.5 Packaging, storage and transportation
 - 1.6 Microbial control and cleaning processes

2. Plant sanitation administration (4)
 - 2.1 Training
 - 2.2 Organization
 - 2.3 Monitoring, control and evaluation
3. Environmental conditions inside the factory (5)
 - 3.1 Lighting and noise control
 - 3.2 Control of air quality
4. Energy conservation in food industry (4)
 - 4.1 Electricity energy
 - 4.2 Steam
 - 4.3 Air conditioning systems
5. Waste management (8)
 - 5.1 Waste and solid residuals
 - 5.2 Waste water
 - 5.3 Recycling industrial wastes
6. Legal requirement for plant sanitation and environmental protection (3)

305 454 Food Product Development and Marketing

4(3-3-8)

Prerequisite : Food Processing II, Quality Control

Course Description : Design of food products; new product development planning, food formulation, market testing, study of market forces and consumer behavior; marketing strategies, structure of marketing management organization structural arrangement.

Course Outline :

1. Creation of new food products (3)
 - 1.1 Design of food products
 - 1.2 Consumer acceptance of new products
 - 1.3 Market demand predictions for new products
2. New product development planning (5)
 - 2.1 Idea generation

- 2.2 selection and idea evaluation
- 2.3 Steps in new product design
- 2.4 Evaluation of new products
- 3. Food formulation (10)
 - 3.1 Specifications for food formulation
 - 3.2 Techniques for food formulation
 - 3.3 Testing of food formulations
 - 3.4 Techniques in marketing testing
- 4. Marketing study (10)
 - 4.1 Factor affecting marketing
 - 4.2 Food psychology and buying behavior of consumers
 - 4.3 Life cycle of food products
 - 4.4 Analysis and marketing research
- 5. Marketing strategies (8)
 - 5.1 Product layout
 - 5.2 Pricing
 - 5.3 Advertising
 - 5.4 Package design
 - 5.5 Merchandise distribution
 - 5.6 Use of marketing information systems

Laboratory :

Individual students will develop and test market for new food products.

305 461 Dairy Product Technology 3(1-6-2)

Prerequisite : Postharvest Changes of Biological Materials or consent of lecturer

Course Description : Milk and cream, cultures used in dairy products,
description of various dairy products.

Course Outline :

- 1. Introduction (1)
 - 1.1 Consumption and market trends

- 1.2 Liquid milk, cream, dairy products, processing and packaging
- 2. Dairy microbiology and safety (2)
 - 2.1 General dairy microbiology
 - 2.2 Growth of dairy microbes in milk and dairy products
 - 2.3 Inhibition and control of microorganisms in milk and dairy products
 - 2.4 Assuring quality and safety of milk and dairy products
- 3. Cheese (2)
 - 3.1 Origins of cheese products and consumption trends
 - 3.2 Classification of cheese varieties
 - 3.3 Raw materials and starter cultures
 - 3.4 Flavor and texture formation in cheese
 - 3.5 Manufacturing techniques
- 4. Yogurt products (3)
 - 4.1 Composition and nutritional value of yogurt
 - 4.2 Yogurt cultures
 - 4.3 General principles of manufacture
 - 4.4 Manufacture of fresh yogurt
 - 4.5 Manufacture of frozen yogurt
 - 4.6 Yogurt quality control
- 5. Butter, margarine and low-fat spreads (2)
 - 5.1 Composition and characteristics of butter
 - 5.2 Making butter
 - 5.3 Products based on blends of milkfat and other fats
 - 5.4 Reduced fat spreads
- 6. Liquid milk products (2)
 - 6.1 Yogurt
 - 6.2 Milk concentrates
 - 6.3 Recombined milk
- 7. Milk powder manufacturing
 - 7.1 Milk powder processing
 - 7.2 Milk powder properties

7.3 Milk powder types and uses

8. Ice cream and other aerated desserts (2)

8.1 Composition, raw materials and processing of ice cream

8.2 Composition, raw materials and processing of other products

Laboratory :

1. Analysis and evaluation of milk quality
2. Microbial quality control of milk
- 3.-4. Pasteurization
- 5.-6. Concentrate Processing
- 7.-8. Butter making
- 9.-10. cheese making
- 11.-12. Yogurt processing
- 13.-14. Ice cream processing
- 15.-16. Production of milk based products, pudding, mousse
- 17.-18. Utilization of whey

305 462 Animal Product Technology 3(1-6-2)

Prerequisite : Postharvest Changes of Biological Materials and Food

Processing II or consent of lecturer

Course Description : Raw materials used in animal product processing, storage to prolong shelf-life of meat, poultry, and eggs; processing of various meat and egg products; packaging materials and packing; quality control: chemical, microbial and sensory evaluation, by-products and utilization, and factory tour.

Course Outline :

1. Introduction (1)
 - 1.1 Objectives for processing of meat, poultry and eggs
 - 1.2 Importance of meat products and eggs
 - 1.3 Trends in processing of meat products and eggs

2. Raw materials and equipment for animal product processing
 - 2.1 Raw materials for animal products processing
 - 2.2 Estimating raw material composition from limited analytical data
 - 2.3 Supplemental materials, casings, binders and extenders, additives, spices and condiments
3. Processing of meat, poultry and eggs (8)
 - 3.1 Curing
 - Composition and function of curing ingredients
 - Color of cured meat
 - Curing methods
 - 3.2 Smoking
 - Composition of smoke
 - Smoking methods
 - Liquid and powdered smoke
 - 3.3 Canning meat products
 - 3.4 Production of ground and emulsion sausages
 - 3.5 Production of sectioned and formed/restructured meat
 - 3.6 Production of egg products
4. Quality control of meat, egg and their products (2)
 - 4.1 Control of chemical
 - 4.2 Microbial and sanitation control
 - 4.3 Sensory quality control
5. By-products and their utilization
 - 5.1 Meat fat
 - 5.2 Feeds
 - 5.3 Hides, skins and natural casings
 - 5.4 Miscellaneous products

Laboratory :

- 1.-2. Slaughtering and cutting carcasses
- 3.-4. Quality control : chemical, microbial, sanitation and sensory evaluation

5. Packaging materials and storage of animal meat, eggs and products
6. Curing ingredients and functions
7. Cured products
8. Sausages
9. Emulsified type products
10. Sausage evaluation
11. Restructured meat products
12. Canning meat products
13. Traditional products - Nham
14. Traditional products - meat balls (emulsion-typed meat balls)
15. Traditional products - puffed pork
16. Traditional products - emulsion-typed product
17. Salted and century egg processing

305 463 Fruit and Vegetable Product Technology

3(1-6-2)

Prerequisite : Postharvest changes of Biological Materials and Food Processing II
or consent of lecturer

Course Description : Handling and storage of fresh fruit and vegetable products, preservation and processing by various methods, and factory tour.

Course Outline :

1. Introduction (1)
 - 1.1 Importance of fruits and vegetables and their products
 - 1.2 Trends in processing, consumption and the fruit and vegetable market
2. Handling and storage of fresh fruits and vegetables (2)
 - 2.1 Mechanical injury
 - 2.2 Temperatures
 - 2.3 Controlled atmosphere
 - 2.4 Humidity
 - 2.5 Other factors
3. Effects of processing of fruits and vegetables (1)

3.1 Thermal processing

3.2 Freezing

3.3 Dehydration

- | | |
|--|-----|
| 4. Preparation of fruits and vegetables for processing | (2) |
| 5. Freezing fruits and vegetables | (2) |
| 6. Canning fruits and vegetables | (2) |
| 7. Drying fruits and vegetables | (2) |
| 8. Glazing and salting fruits and vegetables | (2) |
| 9. Sauce and juice production | (2) |

Laboratory :

1. Lowering temperatures of fruits and vegetables
- 2.-3. Storage and packaging materials
4. Blanching
- 5.-6. Peeling
- 7.-8. Freezing
- 9.-10. Drying using drum dryer
11. Canning
12. Glazing and salting
13. Yam making
14. Intermediate moisture fruit production
15. Sauce production
16. Fruit and vegetable juice production
- 17.-18. Drying using a hot air dryer

305 464 Bakery Product Technology

3(1-6-2)

Prerequisite : Food Processing II or consent of lecturer

Course Description : Properties of ingredients used for baked products, dough formation, processing methods, quality control and storage.

Course Outline :

- | | |
|--|-----|
| 1. New developments in the baking industry | (1) |
|--|-----|

2. Properties and functions of ingredients (3)
 - 2.1 Wheat flour and water
 - 2.2 Salt, sugar and fat
 - 2.3 Milk and eggs
 - 2.4 Leavening agents
 - 2.5 Flavor additives
 - 2.6 Chemicals for quality improvement
3. Equipment and techniques used in industry (2)
 - 3.1 Mixing and dough formation
 - 3.2 Fermentation
 - 3.3 Shape formation
 - 3.4 Baking
 - 3.5 Packing
4. Techniques of making products using yeast (2)
 - 4.1 Bread
 - 4.2 Doughnuts
 - 4.3 Danish pastry
5. Techniques of making products using leavening agents (1)
 - 5.1 Cakes
 - 5.2 Cookies
6. Techniques for making other products (1)
 - 6.1 Pies
 - 6.2 Pastry
 - 6.3 Pizza
7. Techniques of making fillings and cake frostings (1)
 - 7.1 Fillings for various baked products
 - 7.2 Cake frostings
8. Storage of bakery products (1)
 - 8.1 Retardation of quality changes
 - 8.2 Selection of packaging materials
9. Bakery manufacture management (1)

10. Trends in the baking industry (1)

Laboratory :

1. Introduction to equipment and techniques in the bakery industry
2. Formulation, calculation and processing
3. Pan bread making
4. Sweet breads, filled breads, buns and rolls
5. Fancy breads
6. Foam cake
7. Butter cake
8. Crispy cookies, butter cookies, sugar cookies
9. Soft cookies
10. Puff pastry (stuffed and non-stuffed)
11. Danish pastry and croissants
12. Pies, tarts
13. Cream puffs and eclairs
14. Doughnut, pancake, waffles
15. Pizza
16. Cake decoration equipment
17. Cake decoration
 - Fondant, fudge
 - Butter cream, whipped cream
 - Meringue-type
18. Fillings
 - Custards
 - Bavarian cream
 - Fruit fillings
19. Composition and simple cake decoration (layer cakes, cheese cakes, cup cakes)
20. Techniques of cake decoration for special occasions

305 465 Cereal and Legume Product Technology**3(1-6-2)**

Prerequisite : Postharvest Changes of Biological Materials and Food

Processing II or consent of lecturer

Course Description : Chemical composition and quality of cereals and legumes used for processing with emphasis on rice, corn, wheat, soybeans and mung bean; processing with emphasis on non-fat products; keeping quality of products, utilization of by-products, and factory tour.

Course Outline :

1. Chemical composition and use of properties by the food industry (3)
 - 1.1 Rice
 - 1.2 Wheat
 - 1.3 Barley
 - 1.4 Corn
 - 1.5 Soybeans and mung beans
2. Processing of basic products (2)
 - 2.1 Milling
 - 2.2 Wet and dry milling
 - 2.3 Separation of protein and starch
3. Cereal product technology (4)
 - 3.1 Noodle food products
 - 3.2 Bakery products
 - 3.3 Alcoholic products
 - 3.4 Other products
4. Legume product technology (2)
 - 4.1 Noodle food products
 - 4.2 Artificial meat products
 - 4.3 Fermented food products
 - 4.4 Other products
5. Storage of products (1)
 - 5.1 Slowing quality degradation

5.2 Selection of packaging materials

6. Trends in industry (1)

Laboratory :

1. Properties of small scale rice milling and cracking machines
2. Wet and dry milling
- 3.-4. Characteristics of starch granules and viscosity of starch and modified starch
5. Characteristics of regular rice flour
6. Cooking quality of regular rice and glutaneous rice
7. Fermented rice
8. Alcoholic products
9. Mung bean noodles and rice noodles
10. Separation of starch and gluten
11. Bread making
12. Wheat noodle making
13. Breakfast cereal products
14. Protein concentrate and protein isolate production
15. Water-holding capacity, fat-holding capacity, foaming and emulsion forming using proteins
16. Dried tofu, tube tofu and soy bean curd making
17. Peanut brittle making
18. Coated nut making
19. Peanut butter making
20. Puff products

305 466 Fat and Oil Product Technology

3(1-6-2)

Prerequisite : Food Chemistry and Food Processing II or consent of lecturer

Course Description : Classification and sources of fats and oils, physical properties of fats and oils, handling and storage. deterioration of crude oil and raw materials, refining

processes for fats and oils, technology of fat and oil products, roles of fats and oils in nutrition and health.

Course Outline :

1. Introduction (1)
 - 1.1 Definition of fats and oils
 - 1.2 Importance of fats and oils and their products
 - 1.3 Classification and sources of fats and oils
2. Physical and chemical products of fats and oils (2)
 - 2.1 Degree of crystallization and viscosity
 - 2.2 Density and expansion
 - 2.3 Melting point and crystallization
 - 2.4 Smoke point, flash point and fire point
 - 2.5 Emulsion and emulsifiers
 - 2.6 Acid value
 - 2.7 Iodine number
 - 2.8 Saponification number
 - 2.9 Peroxide value and TBA value
3. Handling, storage and deterioration of crude oil and raw materials (2)
 - 3.1 Handling and storage
 - 3.2 Deterioration of crude oil and raw materials
4. Processing and refining of fats and oils (5)
 - 4.1 Extraction of fats and oils from plant tissues
 - 4.2 Extraction of fats and oils from animal tissues
 - 4.3 Refining process
 - 4.3.1 Neutralization
 - 4.3.2 Degumming
 - 4.3.3 Bleaching
 - 4.3.4 Deodorization
 - 4.4 Structure modification of fats and oils
 - 4.4.1 Hydrogenation
 - 4.4.2 Interesterification

4.4.3 Winterization

5. Fat and oil products (3)
 - 5.1 Butter
 - 5.2 Magarine
 - 5.3 Shortening
 - 5.4 Salad oil and cooking oil
6. Role of fats and oils in the diet and health
 - 6.1 Nutritional function
 - 6.2 Safety of heated and oxidized fat
 - 6.3 Dietary fats and coronary heart disease
7. By-products from fat and oil industry (1)

Laboratory :

1. Acid value
2. Iodine number
3. Saponification number
4. Peroxide value
5. TBA value
- 6.-7. Extraction of fats and oils from plant tissues
- 8.-9. Extraction of fats and oils from animal tissues
- 10.-13. Refining of fats and oils
- 14.-15. Margarine production
- 16.-17. Low-fat spread production

305 467 Food Enzymes

3(2-3-4)

Prerequisite : Biochemistry

Course Description : Properties and classification of enzymes, sources of enzymes used in the food industry, enzyme kinetics, enzyme production, enzyme immobilization, utilization of enzymes in food industry, determining and controlling enzyme activity.

Course Outline :

1. Roles of enzymes in food technology (1)
2. Nature of enzymes (2)
 - 2.1 Nature of proteins
 - 2.2 Sources of enzymes
3. Enzyme production (3)
 - 3.1 Extraction
 - 3.2 Selection of chemicals and enzyme purification
 - 3.3 Purification steps
 - 3.4 Purity testing
 - 3.5 Storage of enzymes
4. Factors affecting enzyme activities (7)
 - 4.1 Conformation and structure of enzyme
 - 4.2 Enzyme kinetics
 - 4.3 Concentration of substrate and enzyme
 - 4.4 Enzyme inhibitors
 - 4.5 pH
 - 4.6 Temperature
 - 4.7 Cofactors
5. Properties and types of enzymes important to food industry (9)
 - 5.1 Classification of enzymes
 - 5.2 Enzymes used in various food industry
 - 5.3 Immobilized enzymes
6. Monitoring and controlling enzyme activity (2)

Laboratory :

1. Extraction of enzyme and purification
2. Enzyme kinetics
3. Factors affecting rate of enzyme activity
4. Role of enzymes in protein digestion
5. Role of enzymes in carbohydrate digestion

6. Role of enzymes in lipid digestion
7. Activities of glucose isomerase
8. Activities of glucose oxidase
9. Activities of immobilized enzymes

305 472 Food Packaging

3(2-3-4)

Prerequisite : Food processing II, Food chemistry or in consent of lecturer

Course Description : Types of packaging, properties of materials used as packaging, selection of packaging for various food products, calculation of shelf-life of food in packages, package testing, packaging systems and equipment for development of packaging.

Course Outline :

1. Roles of packaging (1)
2. Packaging and materials used (8)
 - 2.1 Types of packaging
 - 2.2 Properties of materials used
 - 2.3 Design
3. Packaging testing (2)
4. Packaging for various food products (7)
 - 4.1 Fruits and vegetables
 - 4.2 Meat and poultry products
 - 4.3 Dairy products
 - 4.4 Fish and seafood products
 - 4.5 Fat and oil products
 - 4.6 Beverage products
 - 4.7 Cereal products
5. Calculation of shelf-life of food using specific packaging (3)
 - 5.1 Analysis of factors affecting shelf-life
 - 5.2 Determination of shelf-life by simulation
6. Packaging systems (2)

6.1 Equipment and machines

6.2 Packaging lines

7. Trends in packaging development

Laboratory :

Testing properties of materials used as packaging by various methods, quality of packaging, packaging design, equipment and machinery in packaging systems.

305 481 Seminar I

1(1-0-3)

Prerequisite : None, must be at least third year student

Course Description : Student presentation of topics of interest or results of research projects including procedures and resulting data in food science and technology. Student must present the topic in class and submit a written report.

305 482 Seminar II

1(1-0-3)

Prerequisite : Seminar I

Course Description : Student presentation of topics of interest or results of research projects including procedures and resulting data in food science and technology. Student must present the topic in class and submit a written report.

305 483 Research Project

3(0-9-0)

Prerequisite : Must be fourth year student

Course Description : Laboratory research under faculty supervision of problems concerning food processing or determination of physical, chemical or microbiological properties of foods, product development or food quality. Submit report of collected and analyzed data.

305 491 Cooperative Education I**6(0-0-40)**

Prerequisite : Must be at least third year student

Course Description : Practical experience in a laboratory, factory, or government agency concerning research, production, marketing, determination of quality of foods.

305 492 Cooperative Education II

Prerequisite : Must be fourth year student

Course Description : Practical experience in a laboratory, factory, or government agency concerning research, production, marketing, determination of quality of foods.

ESL PROGRAM

ESL PROGRAM	Proposal	Resolution	Remarks
I. ESL Curriculum and Plan of Study II. English Proficiency Passing the TOEFL prior to departure for Canada III. Teaching Staff a) Availability of Canadian Faculty Members b) Availability of Thai Faculty Members	6 courses Waterloo: 600 Others: 560 SUT: 550 or APT (SUT) and Can Test Ryerson		See Appendix 5.1

YEAR 2

Int'l Eng 3	Trimester 1 (May 22 - Aug 18)	3 hrs/wk	39 hrs
Int'l Eng 4	Trimester 2 (Sep 18 - Dec 15)	3 hrs/wk	39 hrs
—	Trimester 3 (Jan 16 - Apr 15)	—	—

YEAR 3

Intensive Orientation	(July - August) in Canada	30 hrs/wk	180 hrs
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Total: 531 hrs

4. MAJOR SUT STAFF NEEDED

Year 1
(120 students)

	Trimester 1 (15 hrs/wk)	Trimester 2	Trimester 3
*Teachers needed:	6.3	.9	.9

Year 2
(240 students)

	Trimester 1	Trimester 2	Trimester 3
Teachers needed	7.2	1.8	.9

* Teachers needed are calculated based on group sizes. The 15 hour/week intensive course involves 3 hours each of oral, reading, writing, listening and computer/study skills. The listening, reading and computer/study skills components can be taught in groups of 40 students, yielding 3 groups taught for 9 hours/week: 27 teacher hours, or 2.7 teachers, if a teacher's load is 10 hours/week. The writing and oral components can be taught in groups of 20, yielding 6 groups taught for 6 hours/week: 36 teacher hours, or 3.6 teachers. Therefore, total teachers needed for the Intensive course with 120 students is 6.3 teachers. Note that the remaining courses are taught 3 hours/week, in groups of 40.

5. CANADIAN TEACHERS — UNKNOWN

OPERATIONAL AND IMPLEMENTATION ISSUES

6.1 Placement Procedure

Two placement instruments to admit students to SUT's International Program will be used: the TOEFL and the SUT International Program Placement Exam. This is to ensure that

- both Thai and foreign students are tested for English in the same way
- the inadequacies of the TOEFL as a predictor of academic success are overcome
- students are constantly monitored for English proficiency
- students whose proficiency matches that demanded by the courses are exempted

Thai Students

- take SUT Int'l Program Placement exam
- must score minimum 40% for acceptance

Foreign Students

- submit official TOEFL score from abroad
- must have minimum of 450 to be accepted

Two tests of English proficiency will be used to determine eligibility for completing the degree in Canada: we propose our SUT Academic Proficiency Test and CanTEST. Minimum requirements

will be set by the four universities in Canada, approximately an equivalent of 550 TOEFL. Students can be tested once in their first year to set goals, and again in the second year to complete selection.

6.2 Exemptions

1. International Program students will be exempt from the Intensive English I course if their
 - admission score on our Placement Exam is 75% or over
 - TOEFL score is 550 or over(estimate 10 - 20 % of applicants)
2. Students will be exempt from International English/Liberal Arts courses 1 - 4 only if they demonstrate by consistently high (85%+) scores on our Placement Exam that they have mastered the course contents.

6.3 Resources

A well-equipped resource center will be available to both students and teachers. It should contain a language lab for listening and pronunciation practice, a computer lab, a reading area with reference material and supplementary course material, a video section with field-related tapes and a conference room. There should be space to accommodate up to 60 students plus staff at one time. A duplicating service is also recommended.

7. STATUS OF NEGOTIATIONS WITH CANADA

As of November 30, 1993, the entire English language curriculum proposal was accepted and approved by Ryerson International in their capacity as representative for the Consortium. Dr. Stalin Bector suggested some content changes to International English/Liberal Arts 4, which were duly made.

8. OTHER INFORMATION

A complete draft form of the English language curriculum proposal is available for interested readers. The School of English needs to see complete curriculum proposals from every other school involved in this project, in order to ensure relevance and co-operation across the curriculum.

JOINT PH.D PROGRAM

JOINT Ph.D PROGRAM	Proposal	Resolution	Remarks
1. Number of scholarships	10		Can be adjusted
2. Specific areas of required specializations	ChE. 2		
	EnvE. 1		
	ME. 2		
	CE. 1		
	IE. 2		
	EE 1		
3. Timing of implementation	Polymer 1		
4. Availability of co-supervisors at-Thai Universities	September 1995		
5. Matching Ph.D areas with CUTC partner universities			
6. Timing for visits of Canadian co-supervisor			

School of English
Institute of Social Technology
October 20, 1994

1. PROPOSED ENGLISH CURRICULUM FOR THE INTERNATIONAL PROGRAM

2. OBJECTIVES

2.1 enable Southeast Asian students to study in an English medium program.

The primary objective of this program is to enable Thai and other Southeast Asian university students to complete their undergraduate engineering/food technology degrees in an English medium program. It is predicted that students here will require academic English courses to support them in their studies. As is reported in applied linguistics research, subject area courses do not necessarily help students increase their competence in English (Lightbown and Spada, 1994).

2.2 qualify those students who would like to study abroad

The secondary objective of this program is to give language support to those students who would like to complete their studies in Canada, at one of four universities of technology. Success in reaching this objective will be determined by the following means:

- GPA of 2.7 in engineering courses
- English proficiency
- the student's interest

It is predicted that English proficiency will be a standard test measure, such as the TOEFL. Canadian universities demand an entry level of 550 on the TOEFL.

2.3 provide professional support

The tertiary objective is to provide professional development to SUT's teachers of English, who will

- become more conversant in subject area specialisms, as adjunct relationships are fostered;
- aspire to the challenge of teaching entirely in an English medium program
- experience the gratification of teaching highly motivated and proficient students
- investigate the (computer-assisted) technology used to promote learner independence;
- further the goal of integration across the curriculum at SUT, finding areas of shared expertise with their colleagues in other disciplines

2.4 promote international understanding

The fourth objective is to promote the international co-operation envisioned by SUT, in bringing together students and teachers of various nationalities, especially in the forum of language, wherein cross-cultural issues and themes can be central to the curriculum.

3. CURRICULUM

Intensive English I	15 hours/wk	3 credits
International English/Liberal Arts 1	3 hours/wk	3 credits
International English/Liberal Arts 2	3 hours/wk	3 credits
International English/Liberal Arts 3	3 hours/wk	3 credits
International English/Liberal Arts 4	3 hours/wk	3 credits
Intensive Orientation for those accepted to Canadian universities (held in Canada)	30 hours/wk	non-credit

A typical student's English curriculum will follow this calendar:

YEAR 1

Intensive I	Trimester 1 (May - Sept)	15 hrs/wk	195 hrs
Int'l Eng 1	Trimester 2 (Sep - Dec)	3 hrs/wk	39 hrs
Int'l Eng 2	Trimester 3 (Jan - Apr)	3 hrs/wk	39 hrs

MINUTES AND RESOLUTIONS

MINUTES AND RESOLUTIONS OF THE FIRST PROJECT REVIEW COMMITTEE MEETING

28-30 November 1994

Suranaree University of Technology, Nakhon Ratchasima Thailand

1. Opening Ceremony

1.1 Welcome Remarks: On behalf of Dr. Wichit Srisa-an, the SUT Rector, Dr. Sam-arng Srinilta, Vice-Rector for Administrative Affairs and Thai Technical Advisor to the SUT-CUTC Project, welcomed the Project Review Committee members and observers to The First Project Review Committee (PRC) Meeting. Dr. Sam-arng wished the Committee a successful and fruitful discussion wherein activities and programs could be reviewed, issues from both sides could be cleared for improved implementation and management of the project. He also hope that the Canadian delegates could have some free-time to tour the campus and observe for themselves the extent of infrastructure development as well as to enjoy the cultural attractions of Nakhon Ratchasima and its environs. Lastly, Dr. Sam-arng reiterated the heartfelt appreciation and gratitude of SUT to CIDA and the Canadian partner institutions and their staff for the invaluable inputs and assistance, mutual cooperation, as well as efficient and effective management of the project.

1.2. Response of Canadian Representative

Dr. Stalin Bector, Chair of the Department of Electrical Engineering at Ryerson Polytechnic University and Project Technical Advisor, CUTC, gave the response remark on behalf of the Canadian partner institutions and CIDA. Dr. Bector expressed his and his colleagues very positive impressions and appreciation of the progress that SUT has made from the planning/mission stage to the early implementation stages. He has reiterated the good will on both sides in the cooperative endeavor of implementing the project and hopefully of its sustainability beyond the project life in 1998. Lastly, on behalf of the CUTC delegations, he invited all participants to the meeting to a dinner on Tuesday evening at Sima Thani Hotel.

1.3 Introduction of Participants

All the participants of the meeting briefly introduced themselves.

Among them were:

Dr. Sam-arng Srinilta	Vice Rector for Administrative Affairs <i>Thai Project Technical Advisor</i>
Dr. Prasart Suebka	Vice Rector for Academic Affairs <i>Chair, PRSC, SUT</i>
Dr. Weerapun Sriboonlue	Vice Rector for Planning Development <i>Project Manager, SUT</i>
Dr. Kasem Prabritputaloong	Dean, Institute of Resources Technology
Dr. Tavee Lertpanyavit	Dean, Institute of Industrial Technology
Dr. Terd Charoenwatana	Dean, Institute of Agricultural Technology
Dr. Vutthi Bhanthumnavin	Dean, Institute of Science
Mr. Suriya Smutkupt	Associate Dean, Institute of Social Technology
Dr. Ruben C. Umaly	Director, Centre for International Affairs <i>Project Coordinator, SUT</i>
Dr. Stalin Boctor	Chair, Department of Electrical Engineering, Ryerson Polytechnic University <i>Project Technical Advisor, CUTC</i>
Dr. Gerry E. Schneider	Associate Dean of Engineering, University of Waterloo <i>Chair, PRSC, CUTC</i>
Dr. William Caley	Associate Dean of Engineering, Technical University of Nova Scotia <i>Member, PRSC, CUTC</i>
Ms. Jennifer Sherwood	Ryerson International, CUTC
Dr. Chalida Rojanawathanavuthi	Centre for International Affairs, SUT
Mr. Gerry Wright	Project Director, ARA
Dr. Archie Mckinnon	Project Monitor, Universalia
Dr. Opas Tantithakura	Walailuk University

1.4 Election of Chair and Co-chair

Dr. Bector nominated Dr. Sam-arng as Chair of the meeting with Dr. Prasart as Co-chair. Their nominations were unanimously supported by the group. Dr. Sam-arng and Dr. Prasart accepted the nominations.

2. Review of Project Progress Report: July 1993 – November 1994 (WP1)

2.1 Presentation of Project Objectives and General Programs

Dr. Ruben Umaly, Director, Centre for International Affairs and the Project Coordinator, reviewed the objectives and various program components of the project. It was to serve as guidelines or framework for future discussions (Attachment 1).

2.2 Presentation of Project Progress Report

Dr. Weerapun Sriboonlue, Vice Rector for Planning Development and Project Manager, SUT, presented the activities implemented during the period under review as well as those whose implementation have been delayed or postponed for 1995 (WP1).

2.3 Report on First Mission to Canada

Dr. Kasem Prabritputaloong, Dean Institute of Resources Technology, presented the group report for the first SUT mission to Canada. This included the study visit of Dr. Kasem, Dean, Institute of Resources for 6 weeks and that of Dr. Tavee, Dean Institute of Industrial Technology for four weeks, both in October–November 1993. (Activity A1.11). The mission also included the customized training of SUT support personnel in library automation and on scientific equipment, specifically electron microscopy, both for 6 weeks and also during October–November 1993.

Dr. Kasem reported the successful implementation of all the activities and has expressed on behalf of the participants their appreciation for the warm welcome and efficient arrangements made by the Canadian partners and host institutions.

Dr. Tavee confirmed the comprehensiveness of Dr. Kasem's report.

Discussion :

- **Change from "customized training" to "study tours"**

It was agreed that activity A1.11, "provision of customized training in Canada for SUT academic administrators" be revised as "provision of study tours....," it being a more appropriate description of the activities undertaken. The term

"customized training" will be kept for Activity A1.31, ie. "provision of customized training in Canada for 4 SUT support personnel".

- **Length of study tours and customized training**

The proposed 12 weeks for study tours of academic administrators was considered too long while the customized training of SUT support staff of 6 weeks was too short for some. It was therefore proposed that study tours be only for 4-6 weeks while customized training can be longer depending upon the needs and complexity/scope of the training required.

- **Suggestions for improvement in the implementation of activities**

Mr. Gerry Wright, Project Director ARA, suggested that one of the areas of discussion of this PRC should be the means and ways of improving the planning, implementations, coordination and reporting of the remaining activities based on early experiences. This suggestion was supported by most participants.

2.4 Report on the Second Mission to Canada

Dr. Prasart reported the activities of the Second Mission (WP1.2). This included the study tours of Dr. Prasart, Acting Vice Rector for Academic Affairs and PRC Chair and of Dr. Terd, Dean, Institute of Agricultural Technology, both for 4 weeks in September-October, 1994 (Activity A1.11); study tours of 2 SUT faculty members and coordinators i.e. Dr. Suwayd, Chair, School of Food Technology and Dr. Vutthi, Dean Institute of Science, both for 4 weeks also during September-October 1994 (Activity A1.21); and a customized training of an SUT support personnel in Management Information Systems for 4 weeks also in September-October, 1994 (Activity A1.31). It was felt that the mission's goals and objectives were fully attained. The only problem reported was the sometimes inadequate communication among partners which caused some gaps in the desired program of activities by SUT and those organized by some partners or institutions.

Discussions:

- **Limiting the number of institutions to be visited**

It was mentioned by Ms. Jennifer Sherwood, Ryerson International, CUTC, that during the debriefing of mission participants in Canada, mention was made of the possibility of considering a visit to fewer institutions but for a longer period to allow more in depth assignment. Dr. Sam-arng commented that for the first trip, visits to several agencies may be more practical for

greater exposure to varied systems. It is during the follow-up or second visit, whenever possible, that more in depth assignment to a single partner institution could be made.

2.5 Review of Unaccomplished Activities and Suggestion for future Activities.

Dr. Bector presented WP 1.3 on Unimplemented Planned Activities. This included:

- Activity A1.21 Provision of customized training in Canada for 4 SUT faculty members.
- Activity A1.31 Training of SUT support staff in library automation
- Activity A1.32 Provision of technical services to SUT by Canadian consultant to develop the university's MIS
- Activity A1.43 Joint offering of first English as a Second Language course of Canadian-SUT team
- Activities for Program 2- International Academic Programs-i.e. both the Undergraduate International Programs in Applied Science and Engineering and Joint Ph.D. program have been delayed. The same is true for activities under Program 3 University-Industry Linkage Program. Activities for Program 4- Program Management are on going for the life of the project.

The remaining activities that were not implemented can be rescheduled for 1995-1996 without difficulties and with no serious effects on the programs. Additional training and study tours could also be planned since unused person-weeks and budgetary allocations are available.

2.6 Review of Financial Report (WP2)

Dr. Bector presented the CIDA funded budget and expenses for the period 15 July 1993 to 28 October 1994. It was suggested that the 1994 status of expenses and funding be reported and that additional columns on shared funding by SUT and CUTC be included. Unused budgets will be considered in the planning and implementation of future activities, both originally planned and additional. Mr. Wright informed the group that the next 18 month financial forecast is due the end of the year (31 December 1994).

3. Project Activities Implementation Plan: 1995-96 (WP3)

Dr. Bector reviewed with the Committee the following activities for 1995- 96:

Program 1 Institutional Capacity Building Program

- Activity A1.21 Provision of Study tour for 4 faculty members and coordinators

Proposal: Study tour of 4 weeks for Chairs of Schools of Electrical

Engineering, Mechanical Engineering, Chemical Engineering and Dean, Institute of Social Technology. Dr. Kasem suggested a second trip for him (3 weeks) to accompany the Chair of the School of Chemical Engineering for more detailed discussions of the Chemical Engineering Program. He suggested mid-February as date of implementation with 3-4 days at the University of Waterloo and the rest at TUNS. Dr. Tavee suggested early March for the visit of the Chair of Mechanical and Electrical Engineering as well as the Dean for the Institute of Social Technology.

Dr. Sam-arng informed the Canadian delegates of the untimely passing away of Dr. Roongtham Sujithamrak, Dean of the Institute of Social Technology.

- Activity A1.31 Provision of customized training in Canada for support personnel :

Proposal : Implementation of the remaining 6 person weeks training for an additional person in library automation. Question was however raised whether this is still necessary after the training of one personnel and the coming of a Canadian consultant. Three additional trainings are being proposed : one each for the Registrar's office, the Centre for International Affairs and the Centre for Computer Services. The proposed training is for 4 weeks in at most two institutions for activities in library automation, registrar's office management and computer services. The CIA personnel will be trained in all 4 partner institutions for one week each. Summer months May, June, July are suggested as time for implementation.

- Activity A1.32 Provision of technical assistance for SUT by Canadian consultant in MIS.

Proposal : Summer 1995 for 4 weeks

- Activity A1.43 First English language Course offering at SUT by Joint SUT-Canadian Team

Proposal : Assignment of 1-3 Canadian experts for 10-12 weeks. Alternative mechanisms of course implementation with expatriates available in Thailand can be considered or 1 Canadian can be assigned for a longer period of time with expenses for the extension period covered by SUT.

Program 2 International Academic Program

2.1 International Undergraduate Program

To be discussed on Day 2

2.2 Joint Research and Ph.D. Program

To be discussed on Day 2

2.3 Co-op Student Exchange Program

- Activity A2.31 Provision of 16-week placements and supervision in Canada.

Proposal : Postponement to 1997.

- Activity A2.32 Provision of 16-week placements and supervision in Thailand.

Proposal : Start first quarter or summer of 1996. Canadian students can serve as teaching assistants (TA) in laboratory courses of the International Undergraduate Programs. This can be coordinated with the visit of Canadian course coordinators or professors at SUT.

Program 3 University - Industry Linkage Program

- Activity A3.11 Provision of customized training in Canada for Co-op Program

Coordinator :

Proposal : To be implemented as soon as possible

- Activity A3.21 Technical services to develop guidelines and framework for industrial training in Thailand
- Activity A3.22 Technical services by Canadian consultants to provide training consultants in Thailand
- Activity A3.31 Technical services to develop the plan for Canadian participation in Worldtech'95

Proposal : It was suggested that the above 3 activities be considered in connection with Worldtech'95 and the establishment of Technopolis in 1996 at SUT as well as a seed or initial activities to promote multifaceted linkages between Thai and Canadian industries; Thai-Canadian industries and SUT-CUTC, etc. Dr. Kasem and Dr. Schneider have been requested to discuss the matter and report to PRC suggestions for its implementation.

After lunch, Dr. Kasem reported that contacts will be made with the Korat Federation of Industries and the Korat Chamber of Commerce for possible areas of interests for training and seminar. The report will be submitted to CUTC through Dr. Schneider. Coordination with SUT Subcommittee on Seminar for Worldtech'95 will also be made.

Program 4 Project Management

All activities under this program are to be implemented during the entire life of the

project. As part of the Project Implementation activity, it has been suggested that the Thai Project Manager also undertake a 4-week study tour of all the 4 Canadian partner institutions. Dr. Weerapun suggested March and that the visit be timed with the visit of CIA representative and the other chairpersons.

4. Comments of Canadian Consultants and PRC members on the Project

- 4.1 Dr. Boctor presented the excellent report of Dr. Margaret Morris on the " Needs Assessment for ESL Programs ". It included useful recommendations on the organization and implementation of activities of the proposed ESL Centre at SUT. Dr. Boctor does not have a copy of the report of Dr. Richard Malinski on his assignment to assist SUT in library automation.
- 4.2 Dr. Boctor presented the request of partner universities of submitting details of request for training (terms of reference, TOR) of SUT support staff and study tours of SUT faculty and administrators at least 3 months prior to their arrival in Canada to permit better planning and arrangement of activities.
- 4.3 Dr. Boctor reported on the positive prospects of project sustainability beyond the CIDA funding period because of the need of Canadian universities to internationalize their programs, i.e. the need to recruit foreign students and to foster collaborative research with foreign institutions and universities.
- 4.4. Dr. William Caley reported on the impact of the SUT-CUTC partnership on the curricula and graduate programs of TUNS specially in Chemical Engineering.
- 4.5. Dr. Schneider reiterated the expressed interest of the faculty members in participating in the International Programs and were greatly disappointed with the delay/postponement in its implementation. He also would like to express his gratitude and appreciation to the Thai hospitality extended to him and the other Canadian colleagues.
- 4.6 Ms. Jennifer Sherwood expressed her and the Canadian interest in the SUT-CUTC programs and would like to join Dr. Schneider in acknowledging the hospitality extended by SUT and the Thai people to the Canadian delegation.
- 4.7 Dr. Archie Mckinnon made comparison of the other Thai-Canadian HRD project and the SUT-CUTC partnership. He commended the new approaches to partnerships developed by the project based on mutual benefits and interests of linkage partners. He also commented on the changing global context of research and their impact on higher education.
- 4.8 Mr. Gerry Wright supported the comments of Dr. Mckinnon and pointed out the shift from universities to other institutions as source of new knowledge and

that universities are losing this monopoly.

5. Closing of Day 1

Dr. Sam-arng closed the day's session with very optimistic note on the sustainability of the SUT-CUTC partnership even after the CIDA funding. In line with the policy of the Ministry of University Affairs on the globalization/inter-nationalization of higher education in Thailand especially in the fields of science and technology, SUT is proud to present the SUT-CUTC model of partnership by which such national goals can be achieved.

6. International Undergraduate Programs : Issues/Resolutions

6.1 Implementation of the Program

ESL Program

Dr. Bector emphasized the equal importance of The English competency component of the program as there are specific TOEFL scores required for admission to Canadian universities. He presented two models of the ESL program for the first year of the International Program (Attachment 2).

Mr. Burgess expressed preference for Model II because of pedagogical reasons, i.e. the need for continuous English training during the year, and because of the inadequate knowledge of the degree of language competency of the incoming students. He suggested that an equivalent 500 score in the English placement test be used as basis for exemption in the summer intensive ESL 1 course whose goal is to raise the level of their TOEFL score to 560-600 during the first two years in preparation for admission to Canadian universities. An intensive ESL course of 10 weeks is suggested for those with placement score of less than 500.

Dr. Schneider prefers Model I for technical reasons but has no major objection to Model II.

The ESL 2 courses (9 credits) can be credited to satisfy MUA requirements for English courses in the curriculum. ESL 2 can be given grade credits in transcripts but not included in the degree requirement by CEAB. Two ESL courses can also be credited as 2 of the 8 liberal arts courses at Ryerson.

6.1.1 Implementation of the Programs

Only three programs will be offered during academic year 1995-96, ie. Chemical Engineering, Mechanical Engineering and Food Technology. The Electrical Engineering program is postponed for 1996 because of inadequate teaching staff. However, the first year courses in EE will also be offered as

electives in the third term. Those who take them may come to Ryerson after the first year. Sixty students will be admitted to each of the 3 programs.

6.1.2 Schedule of Courses : September 1995 as the start of the Academic Year for IUP. The academic schedule of the IUP shall be different from the regular SUT programs to allow some degree of flexibility of scheduling of courses, to permit assignment of Canadian professors, to provide some degree of rest for the students after continuous 5 terms prior to departure to Canada and to provide enough time to attend to visas and other travel documents for Canada.

6.1.3 Student Admission

- Number of students to be admitted at SUT

ChE : 60

ME : 60

FT : 60

- Number of transfer students to CUTC

TUNS : 10-15

Ryerson : 10-15

Guelph : 8-10

Waterloo : 3-5

- Admission to other Canadian universities may be sought if the number of the qualified students exceed the CUTC quota.

6.1.4 Admission requirements for Canada :

- A Cumulative Grade Point Average (CGPA) of 2.7
- A TOEFL score of 600 for University of Waterloo and 560 for the other universities
- Completion of all courses for the first 2 years at SUT for students entering the University of Waterloo, TUNS or University of Guelph, and the first year for Ryerson.
- A Certification of English Language Proficiency by the ESL Centre of SUT

6.1.5 Students' Fees

- The projected annual fee for visa students in Canada for 1995 is C\$ 10,000-14,000. This may be subject to change.
- CUTC will request the Ministry of Education of the provinces of Ontario and Nova Scotia for consideration of the SUT student to be under the category of "Contract Student" instead of "Visa Student".

A letter from CIDA certifying that the students are part of a CIDA project on HRD in Thailand will have to be obtained. The change in category will permit the Universities to retain the tuition fees paid by the student and would thus allow reduction in the tuition fees required. Ryerson will proceed with appropriate procedure on behalf of the CUTC institutions in Ontario while TUNS will write to the Ministry of Education of Nova Scotia.

- An approximate cost of C\$ 25,000 per year is projected to include tuition and other fees, medical insurance, lodging and living expenses.

6.2 Status of the Curriculum

6.2.1 Status of the 4 Curricula

The curricula, course outlines and course descriptions for the 4 programs are now available. Laboratory manuals for a few courses are also available.

Updated course outlines for ELE 210 and ELE 212 courses in the modified first year curricula will be provided by Dr. Bector.

6.2.2 Textbooks

Textbooks from various publishing companies in Canada or USA can be obtained in Thailand.

6.2.3 Accreditation

The accreditation requirements by CEAB, MUA and the Engineering Professional Association in Thailand have all been satisfied in the proposed curricula.

6.3 Teaching Staff for 1995

6.3.1 Availability of Canadian Staff

Dr. Bector informed the meeting of definite availability of 3 professors and possibly additional 4 professors can be easily identified. Among the definite ones are : 1 from TUNS to teach Organic Chemistry and Professional Practice and Ethics; 1 from Ryerson to teach Circuits and Foundations of Electrical Engineering and 1 for Computer Programming. The other candidates include one from Guelph for Food Technology; 1 for Physics (Semiconductors) and 1 or 2 for Engineering Graphics and Foundations of Mechanical Engineering.

6.3.2 Availability of Thai Faculty Members

The list of available Thai Faculty members is given as Attachment 3. Additional faculty members will be recruited as required.

6.3.3 Remuneration of Canadian faculty members

It is suggested that Canadian faculty members come for a period of 6 weeks with the first 4 weeks paid under the CIDA scheme and the additional 2 weeks to be paid by SUT. The suggested ceiling for remuneration is C\$ 2,500/month plus accommodations.

6.3.4 Mutual Decision on Choice of Canadian Professors

Agreement by both SUT and CUTC will be required in the choice and assignment of Canadian professors to the programs.

7. ESL Program

7.1 Placement Exam

A placement examination will be scheduled the first week of May 1995 to determine the English proficiency of applicants accepted to the International Undergraduate Program (IUP).

An equivalent score of 450 in TOEFL will be the cut off score for admission and 525 for exemption from the summer intensive course of 10 weeks (150 total hours) to be scheduled from mid May. The major aim of the intensive ESL course will be to enable the students to study in English. The specific TOEFL training will be planned by the end of the first year for the students to obtain a TOEFL of 560-600 at the end of the second year.

The ESL 2 courses (3 courses for 3 terms) shall be credited at SUT to meet the English language requirements of MUA but may or may not be credited in Canadian universities.

The course description for ESL courses will be prepared by the School for Languages for approval by the University Council. The suggestions given by the Canadian consultant will be reviewed.

7.2 Teaching Staff

For 180 students following a 150-hour, 10-week course, 8 additional lecturers will be required by the School for Languages. Alternatives for hiring staff were discussed. It includes requesting additional Canadian lecturers, hiring expatriates from Bangkok Language Schools, hiring part-time teachers and offering to Graduate Students from Canada a temporary teaching post.

7.3 Students exempted from ESL

Students with TOEFL score of 600 or above may be given advanced credits and not required to take ESL courses or they will be accelerated to take

Students with TOEFL score of 600 or above may be given advanced credits and not required to take ESL courses or they will be accelerated to take advanced ESL courses. These alternatives will be studied and a policy will be proposed to the University Council.

8. Joint Ph.D. Programs

8.1 Number of Students Required and Available

A total of 10 Ph.D. scholarships are available but provision for Canadian supervisors is only for 5. This implies that there will be 2 students per adviser. This arrangement may not be practical considering the varied fields of the students.

At present, there are eight (8) candidates ready to leave but still requiring admission. They are 1 in ME, 3 in Polymer Technology, 1 in EE, 1 in Electronic Engineering and 1 in Telecommunication. Those who will go to Canada on sandwich program and full duration of program must be identified.

It has been agreed that CVs and TOEFL scores of these candidates will be given to the 4 universities for evaluation and possible placement. It has been suggested to consider also prospective SUT faculty members admitted by some universities but not yet selected by the ministry.

8.2 Timing of Scholarships: Academic Year 1995-96

8.3 Availability of Co-Supervisors at Thai-Universities

Dr. Tavee reported the availability of at least 3 advisers from Chulalongkorn University.

8.4 Matching Ph.D. Areas with CUTC Partners

This will be done by CUTC based on the CVs of the candidates.

8.5 Timing of Visits of Canadian Co-supervisors

It is suggested that up to 5 Canadian co-supervisors under the sandwich program come to SUT in May 1995 and discuss projects with the identified Thai co-advisers.

9. Other Matters

9.1 Possible Extension of Project

Although it is possible to request an extension for justifiable reasons, it is best that all planned activities be implemented before the end of the life of the project.

9.2 Form for reporting of SUT missions to Canada and of Canadian missions to SUT

There was no objection to the suggested format but it was suggested to wait for the questionnaire that will be formulated during the Project Steering Committee (PSC) meeting of the Thai-Canada HRD Project. The evaluation questionnaire can provide suggestions as to the kind of information needed for reporting and evaluation. The two forms can therefore be integrated.

The required schedule of report submission was given by Ms. Sherwood.

CUTC/SUT INSTITUTIONAL LINKAGE PROJECT
QUARTERLY REPORT SCHEDULE

<u>Report Type</u>	<u>Covering Time Frame</u>	<u>Due to ARA</u>
Semi-Annual	October 1 - December 31	January 31
Quarterly	January 1 - March 31	April 30
Semi-Annual	April 1 - June 30	July 31
Quarterly	July 1 - September 30	October 31

SUT should provide their input to the report 14 days before the report is due to ARA so that information could be included in the report.

9.3 Dr. Weerapun requested further discussion on: (1) other suggestions for the improvement of the management/implementation of the SUT-CUTC project; (2) additional option of CUTC institutions accepting regular students not for the joint degree but simply to get enrichment courses in Canada which can be credited at SUT; (3) Canadian impressions on the infrastructure and human resources available at SUT.

Firstly, Dr. Sam-ang assured the meeting that continuous monitoring and evaluation of the project will be done and that issues arising can be brought to the attention of the PRC either through referendum (correspondence) or actual additional meeting of the PRC if necessary. Modifications of the project document plan can be made upon agreement of SUT and CUTC with proper information to ARA.

Dr. Boctor, Dr. Schneider and Dr. Caley expressed their positive impressions on the acquisition of equipment for laboratories and the recruitment of new

faculty members. However, additional recruitment in some disciplines are still urgently needed to have the critical mass for an efficient delivery of programs. The group reiterated their initial concern for improvement in the individual faculty rooms in the Academic Building. More privacy and freedom to arrange one's room to fit the users personality/creativity are being suggested. This is helpful in boosting the moral of the staff.

10. Date and Venue of the Next PRC meeting

After much discussion, it was agreed upon that with the postponement of the originally scheduled first PRC meeting from April 1994 to November 1994, the second PRC meeting scheduled in Canada in April 1995 will be too close. It was therefore suggested to move the date to last week of August in 1995. This would allow reporting of the implementation of activities for the first half (January to July) of 1995 as well as the preparations for the implementation of the International Undergraduate Programs and the Joint Ph.D. programs in September 1996. The University of Waterloo has agreed to host the next PRC meeting with participation of 2-3 representatives from SUT paid under the project.

The Third PRC meeting is tentatively scheduled in the spring of 1996 at SUT.

11. Closing Remarks

Dr. Schneider, as Canada PRSC Chair, expressed the sincere appreciation and gratitude of the Canadian delegations to SUT for the hospitality extended to them. He also would like to commend Dr. Sam-arng for the very efficient and effective chairmanship and stewardship in the discussion and ultimately the resolution of issues deliberated. He is looking forward to the next meeting that will be hosted by his institution.

Dr. Sam-arng expressed the sincerest regret of Dr. Wichit Srisa-an, SUT Rector, who has sent a message of his inability to join the meeting as promised due to urgent business at the Ministry of University Affairs. Therefore, Dr. Sam-arng, on behalf of the Rector, would like again to thank CIDA, the Canadian delegates and the SUT staff for their contributions to the successful and fruitful meeting. He expressed the good feeling and pleasant experiences shared in the deliberation and the sincere bonds of friendship and cooperation strengthened during the deliberations. He hoped that important issues have been resolved and that plans for better implementation of the project could be accomplished. He reiterated his appreciation for being elected the Chair of the

meeting and he would like to apologize for any shortcoming at SUT. He is optimistic that inspite the second postponement of the offering of the EE program, it can be implemented in 1996. The SUT staff enjoyed the company and friendship of the Canadian delegates and SUT wishes them a pleasant stay in Bangkok or other places in Thailand and a HAPPY JOURNEY HOME !

ATTACHMENTS

Overall Project Objectives

The project objectives are the following :

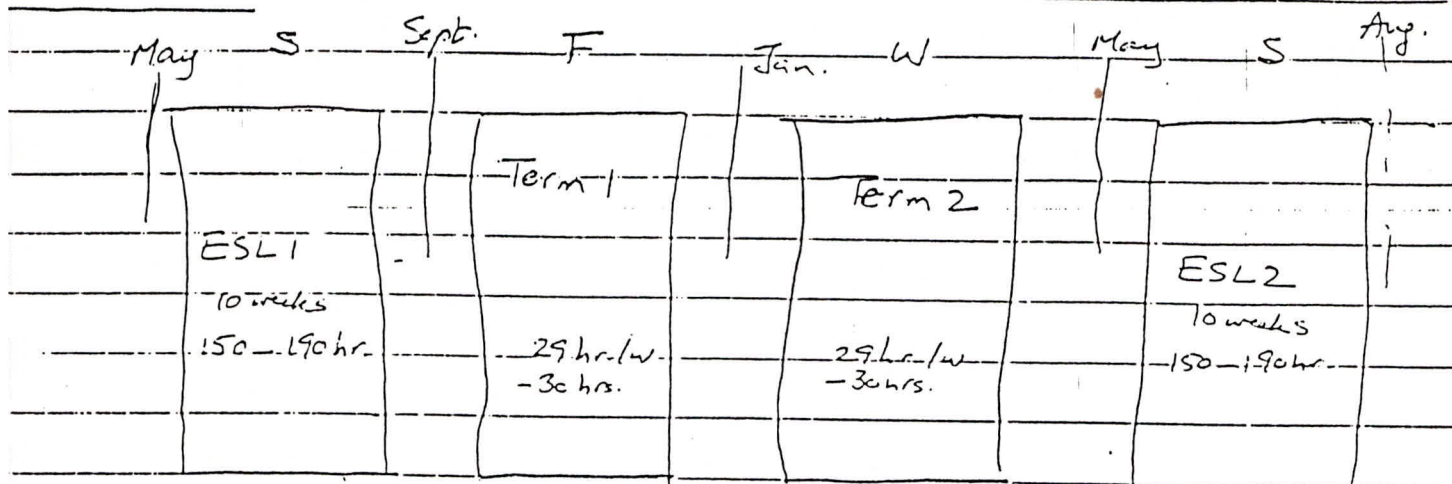
- (a) Institutional capacity building for SUT in the areas of academic administration and management, academic program and curriculum, institutional support services and the establishment of an English as a Second Language (ESL) Centre;
- (b) Improving the flexibility and responsiveness of SUT to meet higher education demands in Thailand and also in South East Asia and Indo-China through innovative programs including an international applied science engineering undergraduate program, a joint research and Ph.D. programs and a co-op student exchange program;
- (c) Strengthening SUT's links with Thailand's productive sector through the establishment of university-industry linkage programs including cooperative education programs, a university-industry training program, and technology cooperation initiatives.
- (d) Developing mutually beneficial institutional linkages between SUT and CUTC's institutions through the various joint international initiatives described in (b) above that can be sustained after the end of the project.

PROJECT PROGRAMS

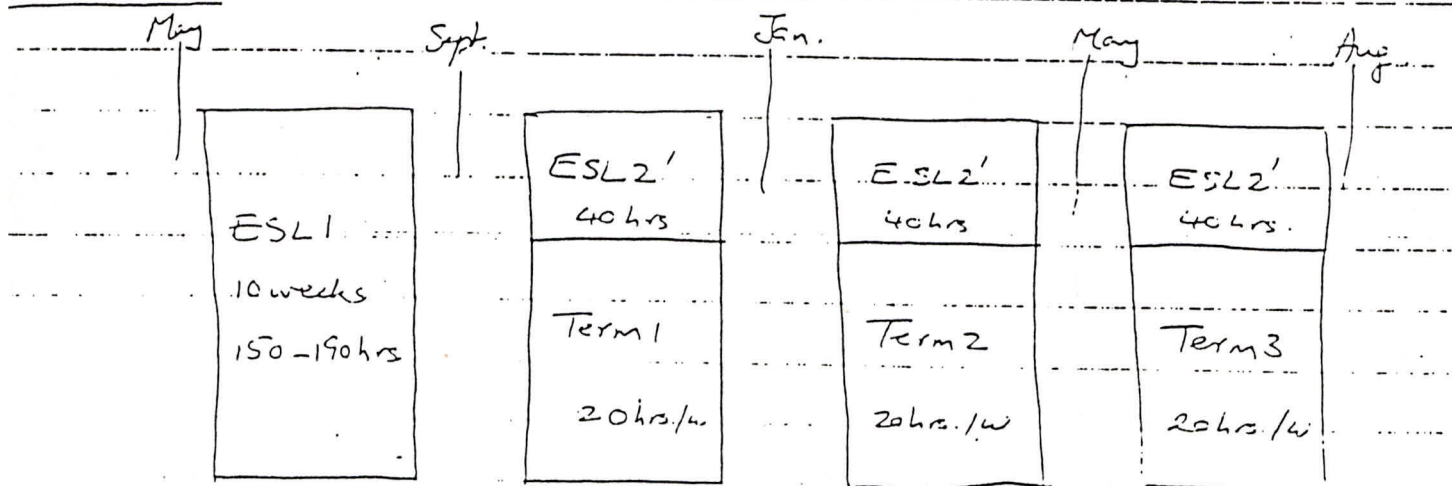
1. INSTITUTIONAL CAPACITY BUILDING PROGRAM
2. INTERNATIONAL ACADEMIC PROGRAM
3. UNIVERSITY-INDUSTRY LINKAGE PROGRAM
4. PROJECT MANAGEMENT

Year I International Programs

Model I

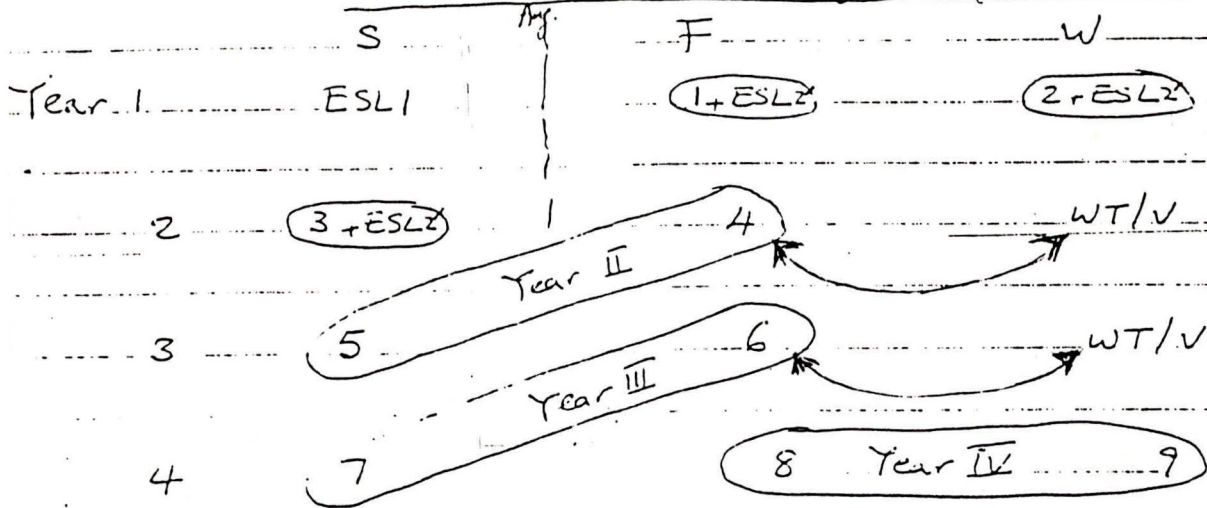


Model II

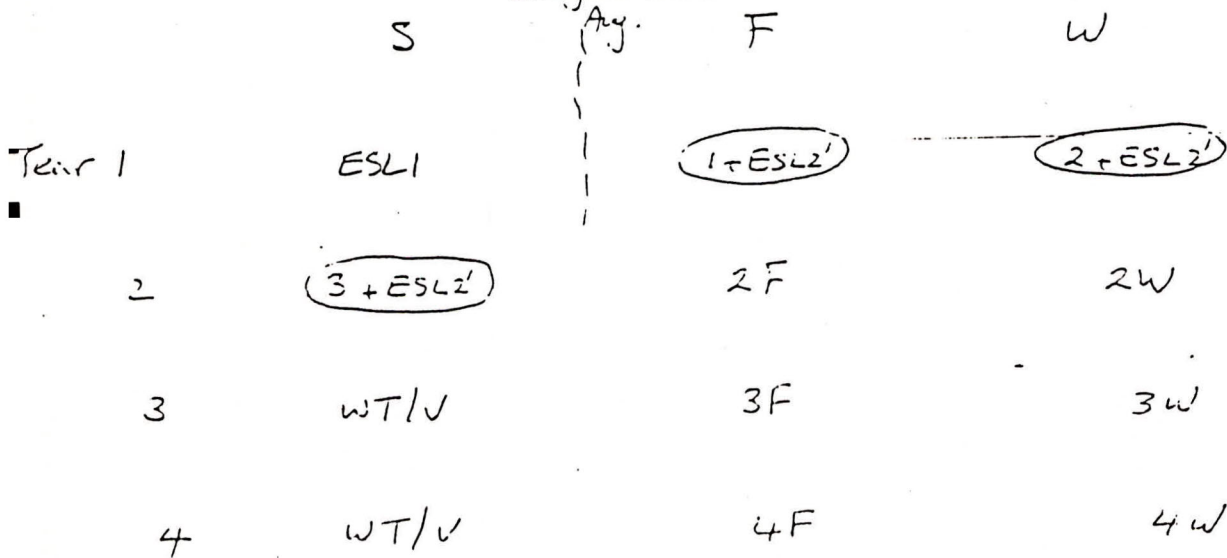


preferred model II

SUT International Programs / Model II



Ryerson



LIST OF SUT STAFF

I. Scientific Foundation

Chemistry :

Tritaporn Choosri	Ph.D (Inorganic Chemistry)
Santi Sakdarat	Ph.D (Organic Synthesis)
Kritsana Sagarik	Dr.rer.nat (Physical Chemistry)
Kunwadee Rangsiwatananon	Dr.rer.nat (Physical Chemistry)
Poonsook Sriyotha	Ph.D (Biochemistry)
Malee Tangsathikulchai	Ph.D (Fuel Science)
Wipa Suginta	M.sc. (Biochemistry)

Mathematics :

Pairote Satayatham	Ph.D (Mathematics)
Prapasri Asawakun	Ph.D (Mathematics)
Suwon Tangmanee	Ph.D (Mathematics)
Arjuna Peter Chaiyasena	Ph.D (Mathematics)
Eckart Schulz	Ph.D (Mathematics)

Physics :

Prasart Suebka	Ph.D (Physics)
Vutthi Bhanthumnavin	Ph.D (Laser Physics)
Arun Ekachai	Ph.D (Physics)
Weerapong Pairsuwan	Ph.D (Intermediate Energy Nuclear Physics)
Samnao Phatisena	Ph.D (Physics)
Songgot Tasanont	M.Sc. (Physics)

Biology :

Yuthana Smitasiri	M.S. (Zoology)
Nathawut Thanee	Ph.D (Ecological Entomology)
Onnop Wara-aswapati	Ph.D (Plant Biology)

Korakod Indrapichate	Ph.D. (Molecular Biology)
Panee Wannitikul	Docteur de troisieme Cycle
Sompong Thammathaworn	Doc.rer.nat (Botany)
Sureelak Rodtong	Ph.D (Microbiology)
Ruben C. Umaly	Ph.D (Radiation Biology-Botany)

II. Engineering

Sarawut Sujitjorn	Ph.D (Electronic and Electrical Engineering)
Virul Mangclaviraj	Diplom-Ingenieur (Sehr Gut)
Anant Oonsivilai	M.Eng. (Electrical Engineering)
Amnat Apichatvullop	Ph.D (Water Resources Planning)
Weerapun Sriboonlue	Ph.D (Civil Engineering)
Tavee Lertpanyawit	Dr.Eng
Tanongsak Bisarnsin	Ph.D (Civil Engineering)
Pornsiri Jongkol	M.Eng (Industrial Engineering)
Veerachai Manopichetwattana	Ph.D (Industrial Engineering)
Guntima Polprasert	M.Sc. (Chemical Technology)
Kasem Prabpripataloong	Ph.D (Chemical Engineering)
Chalongsri Wanitchakorn	Ph.D (Chemical Engineering)
Chaiyot Tangsathikulchai	Ph.D (Mineral Processing)
Chongchin Polprasert	Ph.D (Environmental Engineering)
Wut Dankittikul	Ph.D (Environmental Planning)
Chatchai Jothiyangkoon	M.Eng (Water Resource Engineering)
Manas Sathirachinda	Maître en Sciences Applique
Pailin Rerkjirasawat	M.S.(Metallurgy & Materials Science)
Aim-on Tassanasom	Dr. rer. nat. (Geology)
Narong Akkarapattanagoon	D. Eng. (Metallurgy)
Utai Meekum	Ph.D. (Chem.Eng)

Noppadol Kongsricharoern

D. Eng. (Env. Eng.)

Wimonlak Noobutr

M.S. (Polymer)

III. Food Technology

Suwayd Ningsanond

Ph.D (Food Processing)

Kanok-orn Intarapichet

Ph.D (Food Chemistry)

Andrew Kohnhorst

Ph.D (Food Science)

Sunthorn Kanchanatawee

Ph.D (Biotechnology and Bioprocess
Engineering)

Neung Teaumroong

Ph.D (Microbiology and Molecular
Biology)

Renu Khumlert

Ph.D (Postharvest Physiology)

Sureelak Rodtong

Ph.D (Microbiology)

IV. English

Puangpen Intaprawat

Doctor of Art (English)

Dhirawit Phinyonattakarn

Ph.D (Linguistics)

Robert Burgess

M.Ed. (TEFL)

Jeremy Ward

M.Ed. (Teaching English Overseas)

Catherine Owens

M.A. (Applied Linguistics)

George Woodington

M.A. (TESOL)

Alan Cooper

M.A. (Linguistic Philosophy)

Wantanee Poomcharoen

M.A. (Teaching English)

Nattaya Puakpong

M.A. (TESOL)

Maneeopen Apibalsri

Ph.D. (TESL)

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Chanchai Intaprawat

Ed.D. (Development Education)

Thai Tipsuwannakul

Ed.D. (Educational
Measurement&Evaluation)

Ongkan Indrambarya

Ed.D. (Doctor of Education)

Narumol Ruksasuk

M.A. (Library Science)

Wisitporn Wattanawatin

Docteur en Droit

Suriya Smutkupt

M.A. (Anthropology)

Busaya Buranasin

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Wilaiporn Taprasert

M.B.A. (Operations Management)

CUTC / SUT (THAILAND)
INSTITUTIONAL DEVELOPMENT AND COOPERATION PROJECT

GUIDELINES
FOR REPORT PREPARATION BY
CANADIAN CONSULTANTS AND THAI ACADEMIC
AND ADMINISTRATIVE FELLOWS

1. *General Guidelines*

- All reports represent the consultant's or fellow's individual account of their experience related to the specific assignment/activities in the project.
- All reports will be "activity-based", addressing important issues concerning each activity, or cluster of activities in the assignment.
- Every assignment has a defined set of activities which are related to a project "deliverable". The general definitions of the various project activities and deliverables are specified in Tables 7 and 8 and Appendix III and IV of the Project Submission.
- All reports will include the following sections:
 - Executive Summary
 - Consultant/Fellow Assignment Review
 - Appendices

2. *Executive Summary*

The executive summary of the assignment activities and outcomes should be easy to follow, preferably in a point by point format, or in a table format. Clearly it should include:

- Name, title and affiliation of the consultant or fellow
- Dates and venue of the assignment
- Summary (goals and objectives)
- Outcome(s) related to the activities

3. *Consultant / Fellow Assignment Review*

The assignment is usually broken down into defined activities. Each activity should then be reported on in the following format:

- a. Activity Descriptor
- b. Goals and Objectives of the activity as stated (or perceived)
- c. Outcomes and Achievements
- d. Activity Review
 - Describe all relevant issues related to the activity including some or all of the following:
 - Preparations required to carry out the activity
 - Constraints that may have been encountered, hindering the achievement of the objectives
 - Critical assessment of relevant factors, such as human resources, financial limitations, physical infrastructure, institutional environment, and socio-cultural customs that may have an impact on the achievement of the goals related to the activity
 - Recommendations relating to the outcome of the activity, relevant conditions and factors that could have an impact on the implementation of the goals and objectives.

The above mentioned activity-related items should be covered in one or at most two pages per activity.

4. *Appendices*

All activity-related relevant documentation and material that cannot be included in the activity review as outlined above should be categorized and included in the appendices.