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Royal Roads Military College

Calendar 1990-91

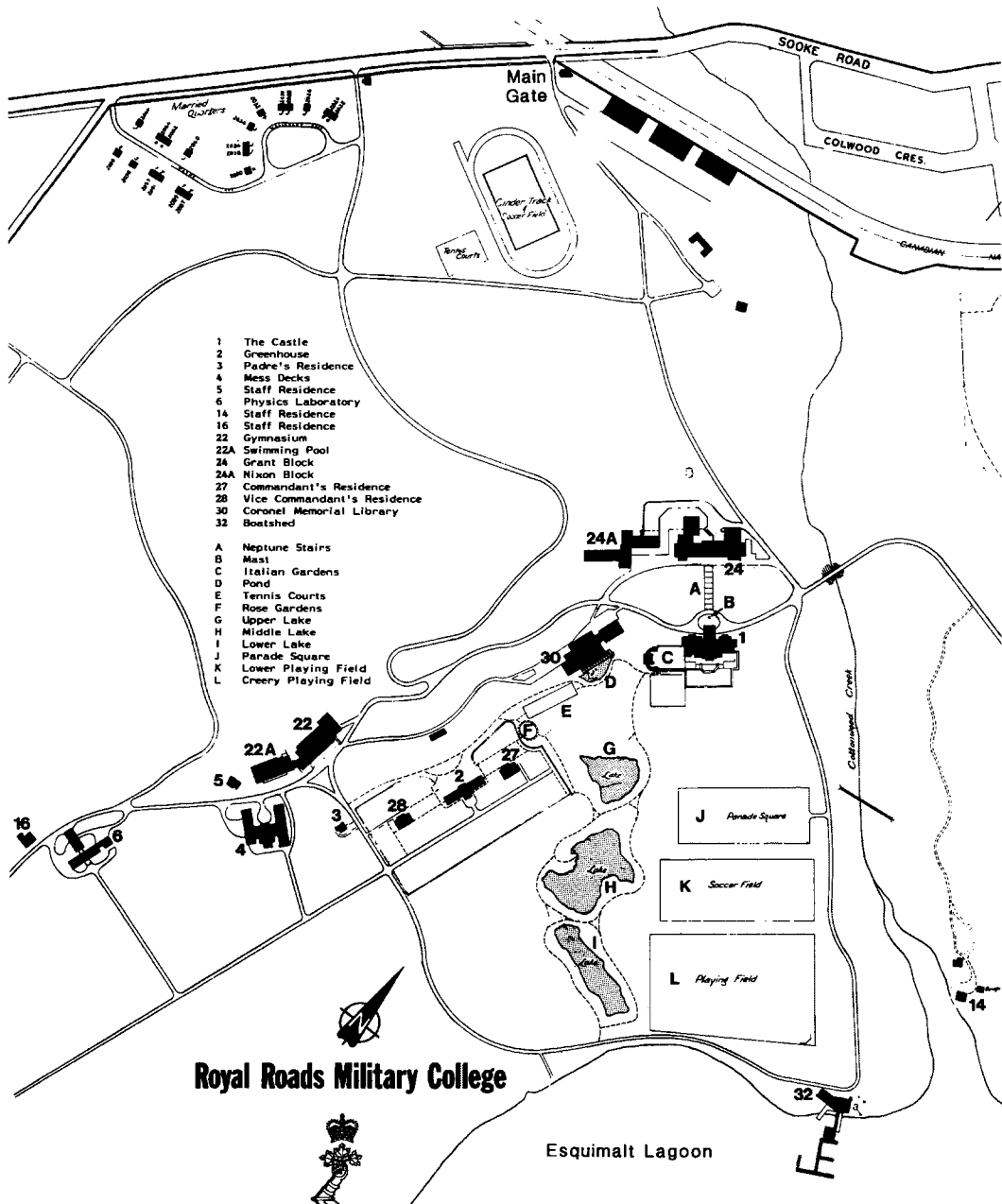
Victoria, B.C.

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1990		
JANUARY	FEBRUARY	MARCH
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
APRIL	MAY	JUNE
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
JULY	AUGUST	SEPTEMBER
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
OCTOBER	NOVEMBER	DECEMBER
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

1991		
JANUARY	FEBRUARY	MARCH
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
APRIL	MAY	JUNE
<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<b>S M T W T F S</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
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# ACADEMIC YEAR CALENDAR OF EVENTS 1990-91

## First Semester

Aug 18	Cadet Officers return
Aug 24	BOTC Graduation/Recruits arrive
Aug 25	Recruit Term commences
Sept 8	Recruit Term ends
Sept 10	Classes start
Sept 30	Open House
Oct 6-8	Thanksgiving Stand-down (no classes)
Oct 19	Fall Convocation
Oct 20	Freedom of the City of Victoria
Oct 26	Last day for course registration changes
Nov 12	Remembrance Day Stand-down (no classes)
Dec 7	Classes end
Dec 10-19	First semester examinations
Dec 20	Christmas Ball
Dec 21-Jan 5	Christmas Leave

## Second Semester

Jan 3	0900 – Results due Registrar
Jan 4	1030 – Faculty Board/Faculty Council
Jan 6-12	Military Training
Jan 8-10	Supplemental Examinations
Jan 14	Classes start
Feb 16-18	Stand-down (no classes)
Feb 22	Last day for course registration changes
Mar 23-31	Reading Break (no classes)
Apr 19	Classes end
Apr 23-May 3	Second semester examinations
May 4-6	Stand-down
May 6	0900 – Results due Registrar
May 7	1030 – Faculty Board/Faculty Council
May 11-14	Supplemental Exams
May 17	1000 – Spring Convocation and 1900 – Sunset Ceremony
May 18	1400 – Ceremonial Parade and 1900 – Graduation Ball
May 19	Successful cadets to summer duties



## **CANADIAN MILITARY COLLEGES**

### **ADVISORY BOARD**

#### **CHAIRMAN**

W.E. Ludlow, BSc, BEd, MEd, EdD

#### **VICE-CHAIRMAN**

T.P. Adams, BA, BComm

#### **PAST CHAIRMAN**

Captain (N) (R) M.L. Hadley, CD, BA, MA, PhD

#### **REGIONAL DIRECTORS**

Captain (N) (Retired) H.W. Plant, BA

N.E. Sliter, BA, MEd

L.J. Régimbal, BA, BSc

D.H. Robertson, BA

#### **MEMBERS**

R. Béchamp, rmc, BEng

J.L. Bolduc, rmc, BEng, MBA, PEng

J.H. Farrell, rmc, BA

J.S. Ferguson, CD

G.T. Haig, MC, CM, CD, QC

B. Howatt

J.M. Milner, BA, MA, PhD

K.M. Morris, BEd, MEd

Major-General (Retired) H.C. Pitts, MC, CD, rmc, psc, ndc, BA, DMilSc

R.F. Shannahan

W.E. Tatarchuk, CD, BPE, MPE

J.W. Tremain, rmc, BSc, PEng

J.R.L.B. Veilleux, CD, rmc, psc, BSc, PAdmin

#### **EX-OFFICIO MEMBERS**

Deputy Minister of National Defence

Chief of the Defence Staff

Vice Chief of the Defence Staff

Assistant Deputy Minister (Personnel)

Chief Research and Development

#### **SECRETARY**

Major W.A. Harrod, CD, BEng

## OFFICERS OF ADMINISTRATION

CHANCELLOR AND PRESIDENT - The Minister of National Defence, The Honourable Wm H. McKnight, PC, MP

COMMANDANT AND VICE-CHANCELLOR - Colonel J.E.C. Naud, CD, pcsc, asc, BEng (RMC), AdeC

PRINCIPAL AND DIRECTOR OF STUDIES - J.S. Mothersill, BSc (Carleton), BSc (Eng), PhD (Queen's), PEng

### ACADEMIC WING

DEAN OF SCIENCE AND ENGINEERING - G.M. Lancaster, BSc (Liverpool), PhD (Sask)

DEAN OF ARTS - J.A. Boutilier, BA (Dalhousie), MA (McMaster), PhD (London) (Sabbatical 1990-91)

ACTING DEAN OF ARTS - A.G. Martel, BA (S.Fraser), MA (Fletcher), PhD (Toronto), FRHistS

DEAN OF GRADUATE STUDIES - D.P. Krauel, ndc, BSc (McMaster), MSc (Dalhousie), PhD (Liverpool)

REGISTRAR - Group Captain (ret'd) M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc (BritCol), AdeC\*

ASSISTANT REGISTRAR - Captain K.L. Beeman, BA (RMC)

RECORDS AND ADMISSIONS OFFICER - J.G. Wass, BSc (Calgary)

### MILITARY WING

VICE-COMMANDANT - Commander J.S.H. Gadd, CD, pcsc, BA (N.Brunswick), MPA (Golden Gate)

STAFF OFFICER CADETS AND MILITARY TRAINING - Major J.Y. Caron

DEPUTY STAFF OFFICER CADETS AND MILITARY TRAINING - Captain J.G. Dubé, CD, BA (RMC), MA (Brit Col)

#### SQUADRON COMMANDERS -

Lieutenant (N) S.L. France, BA (RRMC)

Captain W.A. March, BA (RMC)

Captain M.F. Macintosh, BA (RMC)

Captain J.G. Dubé, CD, BA (RMC), MA (Brit Col)

DIRECTOR OF ATHLETICS - Captain J.A. Kimick, CD, BA (RMC), BPE (Calgary), MSc (Ottawa)\*

ATHLETIC ADMINISTRATION OFFICER - Lieutenant K.W.A. Fogalin, BA (Western)

#### UNIVERSITY LIAISON OFFICERS-

Captain R.E. Cockram, CD, plsc, BA (RMC), MA (N.Brunswick)

Captain D.R. Strachan, BEng (Western)

### ADMINISTRATION WING

DIRECTOR OF ADMINISTRATION - Major A.J. Lavoie, CD, plsc, BEd (Alta), MPA (Victoria)

PERSONNEL ADMINISTRATIVE OFFICER - Captain L.M. Leboeuf, BBA (Mt. St. Vincent)

COMPTROLLER AND LOGISTICS OFFICER - Captain K.L. Moore, BA (RMC)

PUBLIC INFORMATION OFFICER - TBA

\* *Attended Royal Roads*

## **SENIOR STAFF**

### **CHAPLAINS -**

Chaplain (P) - Major A.G. Fowler, CD, BA (Mount Allison ), MDiv (Pine Hill Div. Hall)

Chaplain (RC) - Lieutenant (N) J.L. Domotor, BA (Oblate College, Wash., DC)

## **EMERITI**

H.R. Grigg, BSc, MSc, PhD, Emeritus Professor of Physics (1978)

G.F. Dalsin, BSc, MA, Emeritus Professor of Mathematics (1978)

W.G. McIntosh, BSc, PEng, Emeritus Professor of Engineering (1978)

A.G. Bricknell, BSc, MSc, PhD, ARCS, FCIC, FRIC, Emeritus Dean of Science (1979)

J.A. Izard, BEng, MAsC, PEng, Emeritus Professor of Engineering (1979)

D.W. Hone, BA, PhD, Emeritus Professor of Physics (1981)

J.K. Kinnear, BA, MA, Emeritus Professor of Physics (1981)

H. Montgomery, BA, MA, PhD, FCIC, Emeritus Professor of Chemistry (1982)

E.S. Graham, BSc, MSc, PhD, FCS, FOAS, Emeritus Principal (1984)

G. Morgan, BA, MA, PhD, MNI, CMMC, Emeritus Professor of Literature and Philosophy (1985)

W. Rodney, DFC and Bar, BA, MA, PhD, FRGS, FRHistS, Emeritus Dean of Arts (1988)

H.J. Duffus, ndc, BA, BSc, D.Phil, PEng, Emeritus Dean of Science and Engineering (1989)

J.W. Madill, CD, BSc, MSc, EdD, PEng, Emeritus Professor of Engineering (1989)

P. Smart, BEd, BSc, MEd, MPA, PhD, Emeritus Professor of Mathematics (1989)

E.R. Chappell, rmc, BSc, MAsC, MEIC, MCSCE, MCASI, PEng, Emeritus Professor of Engineering (1990)

## **ACADEMIC STAFF**

N. Arnold, BA, DipEd (Victoria), Language Teacher

M.R. Barr, BSc, MSc, PhD (Brit Col), Associate Professor and Head of the Department of Chemistry

G.M. Barrow, BASc, MAsC (Brit Col), PhD (Berkley), Professor of Chemistry

Major A. Battista, CD, BAdm (CMR), MA (RMC), Lecturer in History and Political Science

J.A. Bayer, BA (Brit Col), MA (Carleton), PhD (London), Associate Professor of Political Science and Head of the Department of History and Political Economy

G.W.S. Brodsky, CD, BA (Queen's), MA (Victoria), PhD (York, U.K.), Special Lecturer in Literature

A.G. Buckley, BSc (Calgary), MSc (Alta), PhD (Brit Col), Professor of Mathematics

J.R. Buckley, BSc (McMaster), PhD (Brit Col), Assistant Professor of Physics

J.S. Collins, BSc (Dalhousie), BEng, MEng (NSTechColl), PhD (Washington), MIEEE, MEIC, MCSEE, PEng, Associate Professor and Head of the Department of Engineering

M. Connor, BA (Victoria), Language Teacher

C.J. Damaren, BASc, MSc, PhD (Toronto), Assistant Professor of Engineering

J.G. Donnelly, BA (Ottawa), BPed (Montreal), Teach Cert (EN J. Cartier), Senior Language Teacher

P.J.S. Dunnett, BSc (Bradford), MA, PhD, (S.Fraser), Professor of Economics

L. Éléonore, BA (Sherbrooke), BSc, MA, MEd (Ottawa), Language Teacher

C.J. Fedorak, BA (S. Fraser), MA, PhD (LSE), Assistant Professor of History

Lieutenant Commander G.H. Fleming, CD, BSc (RRMC), MA, PhD, (USNPS), Assistant Professor of Physics

P. Gardner, BA (Victoria), MA (Queen's), PhD (Brit Col), Assistant Professor of Economics

J.M. Gilliland, BSc, MA (Brit Col), PhD (Alta), Assistant Professor of Physics

A. Hadley, BA (Brit Col), DipEd (Victoria), MEd (Victoria), Senior Teacher and Head of Department of Second Language Training

Major L.C. Hillier, CD, BA (Manitoba), MSc (Acadia), Lecturer in Military Leadership and Applied Psychology

K.J. Keen, BSc (S. Fraser), MSc (McGill), MSc, PhD (Toronto), Assistant Professor of Mathematics

T.B. Killip, BA, MA (S.Fraser), Special Lecturer in Economics

D.P. Krauel, ndc, BSc (McMaster), MSc (Dalhousie), PhD (Liverpool), Associate Professor of Physics and Dean of Graduate Studies

J.L. LaCombe, BSc, MSc (Waterloo), PhD (S.Fraser), Associate Professor of Physics

G.M. Lancaster, BSc (Liverpool), PhD (Sask), Professor of Mathematics and Dean of Science and Engineering

B. Leclerc, BA, BEd (Laval), Language Teacher

Major L.P.K. LeGras, CD, pcsc, BA (Winnipeg), MASc (Waterloo), Assistant Professor and Head of the Department of Military Leadership and Applied Psychology

W.T. MacFarlane, BA (Sask), MSc (Alta), PhD (Oregon State), Associate Professor of Physics

Captain A.T. MacIntyre, CD, BA (Western), MA (Queen's) Lecturer in Military Leadership and Applied Psychology

M.S. Madoff, AB (Michigan), PhD (Brit Col), Associate Professor and Head of the Department of Literature and Philosophy

A.T. Malcolm, CD, pcsc, asc, BA, MA, PhD (Manitoba), Assistant Professor of Military Leadership and Applied Psychology

R.F. Marsden, BSc (RMC), PhD (Brit Col), Associate Professor of Physics

A.G. Martel, BA (S.Fraser), MA (Fletcher), PhD (Toronto), FRHistS, Professor of History and Acting Dean of Arts

## **SENIOR STAFF**

F. Milinazzo, BSc, PhD (Brit Col), Associate Professor of Mathematics  
Captain D.P. Mulders, BSc (RRMC), MMath (Waterloo), Lecturer in Mathematics  
P.G. Nixon, BA (Carleton), BEd, MA, PhD (Western), Assistant Professor of Political Science  
M.J. Press, BSc, MSc, (McGill), PhD (S.Fraser), Associate Professor and Head of the Department of Physics  
C.N. Ramkeesoon, BA (Wales), MA (Dalhousie), PhD (Western), Associate Professor of Literature  
K.J. Reimer, BSc, MSc (Calgary), PhD (Western), Associate Professor of Chemistry  
J. Robichaud, BA (Edmunston), BAEd (Montreal), LcTh (Laval), Language Teacher  
M.G. Robinson, BSc, PhD (Durham), Professor of Chemistry  
M. Savard, BA, MA (Ottawa), Language Teacher  
P.J. Schurer, BSc, MSc, PhD (Groningen), Professor of Physics  
D.J. Shpak, BSc, MEng (Calgary), PhD (Victoria), Assistant Professor of Engineering  
P. Smart, BEd, BSc, (Alta), MEd (Brit Col), MPA (Victoria), PhD (Walden) Special Lecturer in Mathematics  
R.C. Snell, BSc, MSc (Queen's), PhD (Brit Col), Associate Professor of Mathematics  
P.S. Sri, BSc, MA (Madras), MA (McMaster), PhD (Alta), Associate Professor of Literature  
M.W. Stacey, BSc (Brit Col), PhD (Dalhousie), Assistant Professor of Physics  
R.C. St. John, BA (Waterloo), MA, PhD (Western), Associate Professor of Military Leadership and Applied Psychology  
A. Tétreault, BA (Montreal), Language Teacher  
M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc (Brit Col), Associate Professor of Engineering and Registrar\*  
D.R. Toyonaga, BA (Ottawa), Language Teacher  
S.R. Waddell, BSc (Mount Allison) MSc, PhD (Dalhousie), Assistant Professor of Physics  
M.J. Wilmut, ndc, BSc (Sir Geo. Williams), MA, PhD (Queen's), Professor and Head of Department of Mathematics  
W.W. Wolfe, BSc (Brandon), MSc, PhD (Queen's), Associate Professor of Mathematics

## **CORONEL MEMORIAL LIBRARY STAFF**

CHIEF LIBRARIAN - S.E. Day, BA (Queen's), MLS (Toronto)  
HEAD, USER SERVICES - J.C. Inkster, BA (Brit Col), BA (Hons) (Carleton), BLS, MLS (Toronto)  
HEAD, TECHNICAL SERVICES - L.B. Jensen, BA, MLS (Brit Col),

**AUTOMATED DATA PROCESSING ORGANIZATION**

**DIRECTOR OF ADP FACILITIES-D.P. Krauel, ndc, BSc (McMaster), MSc  
(Dalhousie), PhD (Liverpool)**

**DIRECTOR OF COMPUTER SERVICES - J.L. Dorscher, BSc (Calgary)**

**APPLICATIONS PROGRAMMER/ANALYST - S.L. Lang, BSc (Victoria)**

**SYSTEMS PROGRAMMER/ANALYST- D.M. Pettyjohn**

**BULL HN INFORMATION SYSTEMS STAFF -**

**Operators/Programmers M. Lee, BSc (Victoria)**

**M. Chan, BSc (Victoria)**

**W. Baskett**

*\* Attended Royal Roads*

## ***SENATE***

### **SENATE OF THE ROYAL ROADS MILITARY COLLEGE**

#### **CHANCELLOR AND PRESIDENT**

The Minister of National Defence,  
The Honourable Wm. H. McKnight, PC, MP

#### **COMMANDANT AND VICE-CHANCELLOR**

Colonel J.E.C. Naud, CD, pcsc, asc, BEng (RMC), AdeC

#### **PRINCIPAL AND DIRECTOR OF STUDIES**

J.S. Mothersill, BSc (Carleton), BSc (Eng), PhD (Queen's), PEng

#### **DEAN, SCIENCE AND ENGINEERING DIVISION**

G.M. Lancaster, BSc (Liverpool), PhD (Sask)

#### **ACTING DEAN, ARTS DIVISION**

A.G. Martel, BA (S.Fraser), MA (Fletcher), PhD (Toronto), FRHistS

#### **DEAN, GRADUATE STUDIES DIVISION**

D.P. Krauel, ndc, BSc (McMaster), MSc (Dalhousie), PhD (Liverpool)

#### **REGISTRAR AND SECRETARY OF THE SENATE**

Group Captain (ret'd) M.D. Thom, CD, rmc, pfsc, aws, BASc (BritCol), AdeC

#### **ELECTED MEMBERS**

P.J. Schurer, BSc, MSc, PhD (Groningen) (to 1991)  
A.G. Martel, BA (S. Fraser), MA (Fletcher), PhD (Toronto), FRHistS (to 1992)  
F. Milinazzo, BSc, PhD (BritCol) (to 1993)

## **SENATE, FACULTY COUNCIL, FACULTY BOARD**

### **THE SENATE**

The Senate is empowered to grant degrees and honorary degrees, pursuant to The Royal Roads Military College Degrees Act, 1975, of the British Columbia Legislative Assembly and is composed of the Chancellor, the Vice-Chancellor, the Principal, the Deans, the Registrar and three members of the teaching staff of the College, each elected by the Faculty Board for a term of three years.

### **THE FACULTY COUNCIL**

The Faculty Council is composed of the Principal as Chairman, the Registrar as Secretary, the Deans, the Heads of Departments, the Vice-Commandant, and other members of the Senior Staff designated by the Chairman. Its function is to determine all matters of an educational character including programs of study, course offerings, the conduct of examinations, the recommendation to the Senate of the candidates for degrees and diplomas, to award College medals, prizes and scholarships and generally to make such recommendations to the Commandant as may be deemed expedient for promoting the academic interests of the College.

### **THE FACULTY BOARD**

The Faculty Board is composed of the Principal as Chairman, the Registrar as Secretary, the teaching staff, the Chief Librarian, the Vice-Commandant, the Director of Administration, the Officers of the Military Wing, and other members of the Senior Staff designated by the Chairman. The function of the Faculty Board is to make recommendations to the Faculty Council on matters of an educational nature and grants final grades in course for all courses, subject to confirmation by Faculty Council.



## *GENERAL INFORMATION*

### **THE FACULTY COUNCIL**

#### **CHAIRMAN**

J.S. Mothersill, BSc (Carleton), BSc (Eng), PhD (Queen's), PEng, Principal and Director of Studies

#### **MEMBERS**

M.R. Barr, BSc, MSc, PhD (Brit Col), Associate Professor and Head of the Department of Chemistry

J.A. Bayer, BA (Brit Col), MA (Carleton), PhD (London), Associate Professor and Head of the Department of History and Political Economy

Major J.Y. Caron, Staff Officer Cadets and Military Training

J.S. Collins, BSc (Dalhousie), BEng, MEng (NSTechColl), PhD (Washington), Associate Professor and Head of the Department of Engineering

S.E. Day, BA (Queen's), MLS (Toronto), Chief Librarian

Commander J.S.H. Gadd, CD, pcsc, BA (N.Brunswick), MPA (Golden Gate), Vice-Commandant

A. Hadley, BA (Brit Col), DipEd, MEd (Victoria), Senior Teacher and Head of the Department of Second Language Training

D.P. Krauel, ndc, BSc (McMaster), MSc (Dalhousie), PhD (Liverpool), Dean of the Graduate Studies Division and Associate Professor of Physics

G.M. Lancaster, BSc (Liverpool), PhD(Sask), Dean of the Science and Engineering Division and Professor of Mathematics

L.P.K. LeGras, CD, BA (Winnipeg), MASc (Waterloo), Assistant Professor and Head of the Department of Military Leadership and Applied Psychology

M.S. Madoff, AB (Michigan), PhD (Brit Col), Associate Professor and Head of the Department of Literature and Philosophy

A.G. Martel, BA (S. Fraser), MA (Fletcher), PhD (Toronto), FRHistS, Acting Dean of the Arts Division and Professor of History

M.J. Press, BSc, MSc (McGill), PhD (S. Fraser), Associate Professor and Head of the Department of Physics

Group Captain (ret'd) M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc (Brit Col), AdeC, Registrar, Secretary of the Faculty Council and Associate Professor of Engineering

M.J. Wilmut, ndc, BSc (Sir Geo. Williams), MA, PhD (Queen's), Professor and Head of the Department of Mathematics

## COMMITTEES

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## **GENERAL INFORMATION**

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HATLEY CASTLE

## **GENERAL INFORMATION**

### **THE CANADIAN MILITARY COLLEGES**

There are three Canadian Military Colleges:

Royal Roads Military College, Victoria, B.C.

Royal Military College of Canada, Kingston, Ontario

Le Collège militaire royal de Saint-Jean, Saint-Jean, Québec

#### **ROLE**

The role of the Canadian Military Colleges is to educate and train officer cadets and commissioned officers for a career of effective service in the Canadian Forces.

#### **OBJECTIVES**

The objectives of the Canadian Military Colleges are:

- a. to prepare and motivate officer cadets for effective service as commissioned officers in the Canadian Forces by –
  - (1) providing a university-level education in appropriate disciplines designed on a broad base to meet the unique needs of the Forces;
  - (2) developing qualities of leadership;
  - (3) developing the ability to communicate in both official languages and to understand the principles of biculturalism;
  - (4) developing a high standard of personal physical fitness;
  - (5) stimulating an awareness of the ethic of the military profession;
- b. to improve the educational background of commissioned officers in the Canadian Forces by providing undergraduate and post-graduate courses in appropriate fields.
- c. to foster and encourage faculty participation in research in order to sustain academic excellence. Research with a defence focus is encouraged.

### **ROYAL ROADS MILITARY COLLEGE**

#### **HISTORICAL SKETCH**

The story of Hatley Park – rechristened Royal Roads from the offshore anchorage in the Straits of Juan de Fuca – has its beginnings in the singleness of purpose and dogged determination of one man. No history of the estate would be complete without some mention of the man in whose mind Hatley Park was conceived and through whose efforts it was brought to birth.

The Honourable James Dunsmuir was born at Fort Vancouver, Washington on 8 July 1851, the oldest son of Robert Dunsmuir, a Scottish miner who, at the time of his son's birth, was on his way from Ayrshire to "Vancouver's Island" to prospect for coal. It was not until 1869, however, when James was eighteen years old, that Robert, prospecting on his own, finally struck the rich seam of coal at Wellington, near Nanaimo, B.C. He raised sufficient capital, acquired 2,000 acres of land, and started operations which proved so successful that before long he had bought out the other three partners in the venture to become the sole owner. During this time, James himself had worked through all the stages of mining and had risen to the position of

manager in his father's business. Under his management, the daily output of coal quickly rose from 30 tons to 1,500 tons. After his father's death in 1889, James devoted himself to the development of the collieries at Wellington and Cumberland, laid out the townsite of Ladysmith, and initiated the Ladysmith-Vancouver ferry service.

It was only natural that his prominence in business should lead him into politics. He was elected to the Legislature in 1898 and became Premier in 1900; but, having no taste for public life, he resigned in 1902. He later served as Lieutenant-Governor of the Province.

It was during the early years of this century that he purchased the Hatley Park estate comprising about 650 acres. The original Hatley Park house stood on the site that is now the parade ground. This house had been completely destroyed by fire while its owner was in England. Having amassed a huge fortune, James now turned his attention to the building and planning of the new estate to which he intended to retire.

He commissioned Samuel Maclure, a Victorian architect, to design the "Castle", and Messrs Brett and Hall, landscape artists of Boston, Massachusetts, to plan the gardens and surroundings. Local stone, trimmed with Valdez and Saturna Island sandstone, was used in the building's construction. Its impressive exterior is matched only by the lavishness of the interior appointments; oak and rosewood panelled rooms, baronial fireplace, teak floors, and specially made lighting fixtures. James is quoted as saying: "Money doesn't matter just build what I want." The building is 200 feet long and 86 feet wide; the turret is 82 feet high. The wall surrounding the estate, also built of local stone, cost over \$75,000; the Conservatory, costing a like amount, was at one time filled with white orchids imported from India; a large banana tree grew in the centre under the dome. The rooms of the house were filled with flowers from the Conservatory throughout the year. Six miles of road interlaced the estate, and a hundred men were employed in the gardens. There were a number of other buildings on the estate to provide for the needs of the large household, but many of these have now been demolished: the vast refrigeration plant; the cow stables; the slaughter house and smoke house; the three silos, each of 100 ton capacity; the reserve water tank to the south of Belmont Drive; the old stable near the bridge to the east of the present fields; to say nothing of the Chinatown to accommodate 80 to 120 gardeners. There remain, however, the model dairy and the stables, which were of solid brick and concrete construction. The "Castle" was completed in 1908, and the Dunsmuir family took up residence in that year.

Early in 1910, James sold his collieries, his coal rights in the Esquimalt and Nanaimo Railway belt, and all his business connections therewith to Messrs. MacKenzie and Mann, railway promoters, for \$11,000,000. He thus separated himself from all former business with which the name of Dunsmuir had been associated. He then retired to enjoy his beautiful home, his yacht "Dolaura," his shooting, fishing, golf, etc. He died in May 1920, at the age of 69. His wife, formerly Laura Surles of Georgia, lived on at Hatley Park with her daughter Eleanor until she died in August, 1937. Eleanor died six months later.

For the next three years, the estate was left in the hands of a caretaker. In November 1940, it was purchased by the Dominion Government for \$75,000 to begin its career as a Naval Training Establishment. No time was lost; on 13 December

## **GENERAL INFORMATION**

1940, HMCS "Royal Roads" was commissioned as an Officer Training Establishment for short-term probationary RCNVR sub-lieutenants and operated as such until October 1942.

During this time, some 600 volunteer reserve officers underwent training. Then, on 21 October 1942, the training of regular force naval cadets was re-established in Canada, and the spirit of the old Royal Naval College of Canada was reborn with the establishment of the Royal Canadian Naval College at Royal Roads.

After a brief history of five years, the Royal Canadian Naval College became, in 1947, the RCN-RCAF Joint Services College. The following year, with the admission of army cadets, Royal Roads became a tri-service college; the Canadian Services College Royal Roads. In 1968, the name of the college was changed to Royal Roads Military College.

## **FACILITIES**

### **The Castle**

The Castle was completed in 1908. From 1941 until 1943 when Grant Block was completed, the Castle served as dormitory and mess hall for cadets and staff officers. It is now the administrative centre of the college. It houses the Commandant, Principal, Vice-Commandant, Registrar and staff, Director of Administration, Comptroller and Logistics Officer, Personnel Administrative Officer, Staff Officer Cadets, and the University Liaison Officers.

### **Coronel Memorial Library**

The library building was officially opened 1 November 1974 by the late Honourable Walter S. Owen, QC, LLD, former Lieutenant-Governor of British Columbia, and was dedicated to the memory of four members of the first class of the Royal Naval College of Canada who were lost in action at the Battle of Coronel on 1 November 1914.

Planned by Robert Harrison Associates of Vancouver, B.C., the building was designed to harmonize with its park-like setting, and to be adjacent to Nixon Block, the cadet dormitory. The library comprises 20,600 square feet, has a capacity of 100,000 volumes and includes faculty offices, a conference room and audio visual facilities for cadets.

The current library collection includes 100,000 bound volumes, a subscription list of over 400 periodicals, and a growing collection of microfilms, recordings, films, and videotapes.

### **Grant Block**

Grant Block, completed in 1943, is the major centre of academic instruction. It was named after Captain J.M. Grant, first Commanding Officer of HMCS "Royal Roads."

This building houses a large general chemistry laboratory, capable of accommodating 48 students, and smaller laboratories used for advanced chemistry

and chemical or biological oceanography experiments. The computer systems, a Coastal Marine Science Laboratory, an Applied Fluid Dynamics Laboratory, a Dental Clinic, a Medical Inspection and Treatment Area, and the cadets' dining facilities are also located in this building.

### **Computer Systems**

The main computer facility for teaching, research and administration at the college is based on a Honeywell-Bull DPS 8/52C mainframe with 18 megabytes of memory and 2.3 billion bytes of disc storage. The peripherals include video and graphics terminals, a Calcomp 1015 plotter and a mix of high and low speed printers. Software includes PASCAL, FORTRAN 77, BASIC, LISP, APL, IMSL, COBOL, PLOT 10, IGL, SPSS, ARES Data Base, etc.

The college has a variety of PC compatible 386 based systems for use in computer science laboratories and laboratories of other teaching disciplines. There are also a number of Apollo work stations on a network which is used by the Engineering Department for Computer Aided Drafting (CAD). A Hewlett Packard 835 and Vax based image analysis system are used mainly by graduate students for research and other related projects.

### **Physics Facilities**

Extensive alterations to two of the original buildings of the Dunsmuir estate have transformed them into the physics laboratories and little remains to betray their humble beginnings as the Tudor-style dairy and cattle barns. The buildings have been divided into a number of large rooms to accommodate each of the laboratory courses and a number of smaller rooms with special facilities for physical oceanography and computer science. Third and fourth year students also have opportunities to participate in projects in the research laboratories located in the Physics Building and Grant Block.

The teaching and research laboratories are well equipped with modern apparatus to demonstrate principles and conduct experiments in the fields of classical and modern physics, electronics, physical oceanography, and computer science. The laboratories have a number of terminals which are hardwired into the college computer and many of the experiments are based on microcomputers which are also used to acquire and analyze the experimental data.

### **Oceanography Research Vessel**

The TAYUT (Chinook Indian dialect meaning Inside-the-Bay) is a nine metre fibreglass hulled vessel of Fraser River gillnetter design suitably equipped to provide the advanced oceanography classes with practical experience in acquiring samples and data for laboratory work and research projects. The boat is powered by a 225-hp Volvo inboard-outboard engine, and the installed research equipment includes a depth sounder, hydraulic winch, radar, mini-range positioning system, digital conductivity temperature/depth probe, side-scan sonar, sub-bottom profiler, magnetometer, bottom coring and sampling devices. Data can be processed with onboard microcomputers or digitally recorded for further processing in the research laboratory. A new 12 metre vessel is scheduled to replace the TAYUT in late 1990.



## *GENERAL INFORMATION*

### **Nixon Block**

Nixon Block is the accommodation building. It contains 149 rooms, lounges, a dry canteen and four French classrooms. Squadron Commanders' offices are also located in Nixon Block.

This fine building was officially opened by Her Royal Highness, Princess Mary, the Princess Royal, on 17 October 1955. It bears the name of Commander E.A.E. Nixon, RCN, who was the Commanding Officer of the Royal Naval College of Canada when it was re-established in Esquimalt in September 1918.

### **Mess Decks**

The Mess Decks originally housed the stables of the estate. It was reconstructed in 1941 and used as accommodation for single members of the ship's company of HMCS "Royal Roads," below commissioned rank. It was also used as classroom space by the cadets before completion of Grant Block.

An indoor rifle range, Non-Commissioned Officers' Mess and the Cadet Gunroom are now located in this building. The Cadet Gunroom consists of a lounge, dance floor and games rooms. In addition, there is also a smaller separate lounge which is used as a "clubhouse" by college sports teams. On Friday nights, the Cadet Gunroom serves as a movie theatre while on Saturday evenings dances are frequently scheduled. The Cadet Gunroom is the centre for cadet social functions at the college.

### **Gymnasium**

The physical training centre, built in 1942, is of frame construction. The floor is marked to include basketball (one regulation and two lesser size courts), badminton (four courts), volleyball (two courts), and European team hand ball. A 1986 addition provides space for a wrestling/combatative room and a weight training room.

### **Swimming Pool**

The pool, built in 1957, measures 23 metres long, 10 metres wide, and 3 metres at the deep end where there are one-metre and three-metre diving boards. The water circulates through a closed filter system and the temperature is maintained at 28°C.

### **Tennis and Squash Courts**

There are five tennis courts and two squash courts for use by students and staff during recreational training and on weekends.

### **Sports Fields**

Within the scenic setting of the college grounds there are three soccer pitches, one rugby field, two ball diamonds, a 400 metre track, a 6.1 kilometre cross country course and a 10 kilometre Harrier course.

### **Ranges**

In addition to the indoor rifle range in the Mess Decks, there is an outdoor pistol range and a trap shooting range on the college grounds.

### **Boat Houses**

The boat house and jetty are situated on Esquimalt Lagoon and are the centre of all rowing and sailing activities. Special orders are published for the use of all boats at the boat house. An additional boathouse was constructed in 1989 to house the eight rowing shells used by the RRMC rowing teams.

### **OFFICER CADET ORGANIZATION**

The officer cadets are organized into a wing of four squadrons. This organization controls cadet life at the college, within certain limits laid down by the Commandant. Officer cadets of the Second, Third, and Fourth Years hold appointments from Cadet Section Commander to Cadet Wing Commander, and receive practical training in leadership by being responsible, under the guidance of Regular Force officers, for the discipline, progress, and efficiency of the groups under their command. To give as many officer cadets as possible an opportunity of receiving this valuable training, the slate of cadet officers is changed during the academic year at the discretion of the Commandant.

Most committees at the college dealing with cadets have strong cadet representation. This gives the representatives an insight into the problems of administering activities related to academics, administration, sports and entertainment, including the budgeting of funds.

### **RECREATION CLUBS AND REPRESENTATIVE TEAMS**

While all officer cadets take part in compulsory physical education and intramural sports programs, they are also encouraged to participate on one of the College representative teams that either participate in local civilian leagues, military interdivision competition and/or the British Columbia College Athletic Association (BCCAA). BCCAA participation varies from year to year and is based on the availability of RRMC players that can manifest teams to compete in a variety of sports. For example, the College Rugby team plays in the Lower Vancouver Island Tier 2 league; the male Volleyball team plays in the BCCAA; the rowers compete against universities in the area; the sailing and cross- country teams are in the North West Collegiate (B.C., Washington State, Oregon) and the Vancouver Island series respectively; and the College Soccer team plays in the BCCAA in the autumn and locally during the winter.

Royal Roads has a variety of recreational clubs which are supervised by the College Recreational Council chaired by the Staff Officer Cadets and Military Training (SOC&MT). Each club has an officer cadet president who reports to the SOC&MT through the Director of Athletics. College recreational clubs include:

Alpine Outdoors	Pistol & Rifle Shooting
Auto	Rowing
Camera	Scuba
Cycling	Skiing
Flying	War Gaming
Golf	Windsurfing
Karate	Magic Club

## **GENERAL INFORMATION**

Royal Roads also has a college yearbook, the "LOG," which is published by a committee of officer cadets under the supervision of a Senior Staff advisor.

### **ROYAL ROADS BAND AND PIPE BAND**

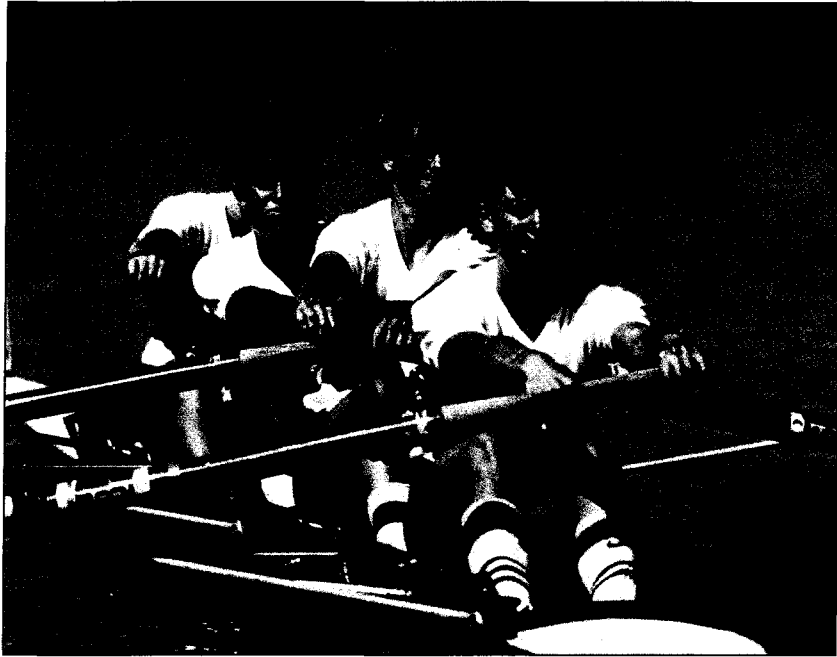
The Royal Roads bands serve two purposes. They serve as a recreational outlet for the musically inclined cadets and also lend themselves to performance of a military parade function. Under the direction of a professional musician from the Canadian Forces, the bands provide an excellent opportunity for those cadets with musical ability to continue their training. Although some musical experience is desirable, many cadets have joined with little knowledge of music and have learned to play an instrument well. The musical facilities and music library at Royal Roads enable the cadet bands to perform at parades, mess dinners, and concerts. Off-shoots of the band include a stage band and a rock band. Any cadet with musical training is strongly encouraged to join this group.

### **CANADIAN FORCES COUNSELLING**

The staff of the college includes officers from the Canadian Forces who are responsible for career counselling and arranging for military training programs for all officer cadets. These officers are available to the cadets at all times to answer inquiries on military matters and to offer advice on military careers.

### **SUMMER TRAINING**

A major part of an RRMC cadet's military development takes place during the summer. Every summer, all officer cadets participate in up to 12 weeks of military training designed to prepare them to assume specific duties as officers of the Canadian Forces after graduation from the military colleges. While summer training is not the responsibility of the military colleges, the results are closely monitored and form part of a cadet's college training record.



**WOMENS' ROWING**



**WOMENS' VOLLEYBALL**



**UNIVERSITY DEGREE**



**QUEEN'S COMMISSION**

**ADMISSIONS TO ROYAL ROADS  
MILITARY COLLEGE**

**MEDICAL REQUIREMENTS**

The fundamental medical requirement for all admission plans is a sound, healthy body with normal mental and muscular co-ordination. Any condition that, as it exists, or owing to possible progression, may limit the candidate's career as a member of the Canadian Forces shall be cause for rejection.

**ADMISSIONS PLANS**

**THE REGULAR OFFICER TRAINING PLAN (ROTP)**

The Regular Officer Training Plan, which was introduced in 1951, gives young Canadians the opportunity of gaining a university education and a permanent commission in the Canadian Forces. Applicants who have been accepted for entry at the Canadian Military Colleges enrol in the Regular component of the Canadian Forces. Some candidates may be offered ROTP support at a civilian university, provided they have been admitted to that university to a program of study that is eligible for ROTP support. On successful completion of their training, officer cadets will be promoted to commissioned rank in the Canadian Forces.

Under this plan, the costs of tuition, uniforms, books and instruments, and other essential fees for the duration of the program of studies are borne by the Department of National Defence. In addition, an officer cadet is paid a monthly salary from which there are deductions for income tax, pension plan, supplementary death benefit contributions, and for rations and quarters charges. Free medical and dental care is provided through the entire training period. Annual leave with full pay is granted according to regulations.

An officer cadet is obliged to maintain a satisfactory academic, military, and physical standard throughout the program. An officer cadet who fails a year may, on the recommendation of the college and the element concerned, be permitted to attend a repeat year at his own expense (see the section on Fees and Allowances) and, if successful, be reinstated to full pay and allowances.

Upon successful completion of the academic and military program, officer cadets are awarded degrees from a Canadian Military College or a civilian university and are granted commissions as officers in the Canadian Forces. Graduates of the ROTP are obliged to serve a period of obligatory service (normally five years) in a Regular component of the Canadian Forces.

An officer cadet who is enrolled under the ROTP may apply for release without obligation up to, but not including, the first day of the second academic year. Thereafter, an ROTP officer cadet who seeks release shall reimburse the Crown for all expenses incurred by reason of attendance at a Canadian Military College or civilian university. If he is unable to pay the costs prior to release, he may sign a promissory note or he may elect to serve, as an officer cadet, a period appropriate to the indebtedness.

## **ADMISSION INFORMATION**

Regulations and procedures are established whereby Regular Force Officers may obtain release prior to reaching compulsory release age, unless a state of emergency exists. Former members of the ROTP are subject to the same arrangements, except that, in recognition of the subsidization that has been provided, release prior to completion of the Short Service Engagement will be considered only under special and unforeseen circumstances. Release in such circumstances will be subject to reimbursement of all or part of the cost of subsidization.

### **THE RESERVE ENTRY TRAINING PLAN (RETP)**

The purpose of the RETP is to provide a limited number of vacancies at the Canadian Military Colleges for those young Canadians who would like to have military training along with their education, but who are not prepared to commit themselves to a Service career at the time of entry. Since 1961, provision has been made to have up to 15 percent of the annual ROTP intake at the Canadian Military Colleges accepted as Reserve Entry cadets. Reserve Entry officer cadets receive the same education and training as ROTP officer cadets, but they are required to pay fees to defray the cost of tuition, clothing, books, instruments, laundry, dry cleaning, meals and accommodation during the academic year, according to the scale of fees set out in the section on Fees and Allowances. Reserve Entry cadets may transfer to the ROTP at any time during their college course, in which event they would pay no further fees and would receive the same financial benefits as ROTP cadets. Reserve Entry cadets are committed to serve in a component of the Active Reserve Force upon graduation and commissioning. RETP cadets are required to take summer training with their assigned occupation for which they receive pay and allowances at the same rate as a Second Lieutenant on Class B Service (refer to any Canadian Forces Recruiting Centre for the current rate).

The admission requirements for Reserve Entry cadets are the same as those for cadets who enter under the ROTP.

Attention is drawn to the Royal Military College Club of Canada Foundation Scholarship and other scholarships, which are found in the section on Scholarships, Prizes, and Awards.

### **THE UNIVERSITY TRAINING PLAN – NON-COMMISSIONED MEMBERS (UTPNCM)**

Since 1973, provision has been made by the Department of National Defence for serving non-commissioned members of the Canadian Forces who qualify for subsidization and who meet the requirements for admission to be selected as candidates for a baccalaureate degree at the Canadian Military Colleges. Depending on their level of academic standing, UTPNCM candidates may enter either at the First Year level or with Advanced Standing. Except for certain allowances made for age, service experience and marital status, these students must meet essentially the same academic and military training requirements as those students in the ROTP. The conditions governing eligibility, application, selection procedures and so on are set forth in CFAO 9-13, as modified by subsequent orders.

## **THE UNIVERSITY TRAINING PLAN OFFICERS (UTPO)**

The UTPO is a DND-sponsored subsidization plan open to commissioned officers serving in the Canadian Forces who are within two years of meeting course requirements for a baccalaureate degree at a Canadian Military College or other Canadian university. Thus all students admitted under this plan must enter as candidates with Advanced Standing. The conditions governing eligibility, application and selection procedures and so on are set forth in CFAO 9-40, as modified by subsequent orders. The UTPO supplements other means of obtaining career officers with university degrees.

Royal Roads currently offers BSc and BA degree programs of study. Science applicants should, as far as possible, have completed math, physics, and chemistry courses equivalent to those listed in the RRMC Calendar for the first two years of a Science or Engineering degree program. Military and Strategic Studies applicants should have completed history and political science courses equivalent to those listed in the RRMC Calendar for the first two years of an Arts or Science degree program. Applied Military Psychology applicants should have completed courses equivalent to the first two years of an Arts or Science program including courses in Introductory and Social Psychology (or their equivalents) and Statistics.

## **SPECIAL STUDENTS**

Members of the Canadian Forces, RRMC staff or the dependents of RRMC staff or students may take one or more courses at RRMC on a part-time basis. While credit may be granted for courses, special students cannot obtain degrees from RRMC, other than those accepted as Graduate Students. (See General Requirements – Graduate Programs in Graduate Studies section).

## **ADMISSION REQUIREMENTS**

### **GENERAL REQUIREMENTS**

Applicants for admission to RRMC as officer cadets under the ROTP or RETP must:

- a. be Canadian citizens;
- b. have reached their sixteenth, but preferably not their twenty-first, birthday by 1 January of the year of entrance;
- c. be single;
- d. meet the appropriate physical standards for the Canadian Forces; and
- e. possess the academic qualifications as set forth below.

To qualify for admission to RRMC under the UTPNCM or the UTPO, candidates must be:

- a. Canadian citizens;
- b. serving members of the Canadian Forces;
- c. selected by the appropriate DND selection board; and
- d. accepted by the RRMC Admissions Committee.



## **ADMISSION INFORMATION**

### **ACADEMIC REQUIREMENTS**

#### **General**

In the first year, Royal Roads Military College offers programs of study in either Arts or Science/Engineering.

All candidates should be aware that the course requirements at Royal Roads are considerably more diversified than at a civilian university, and include two years of Mathematics and Science at the university level for an Arts degree, and two years of English and other Arts courses for a Science or Engineering degree.

It should also be noted that all programs of study at the Canadian Military Colleges are of four years duration beyond the normal secondary school level required for university admission, except for candidates entering the preparatory year at le Collège militaire royal de Saint Jean, where a five- year program is required. Candidates enter the preparatory year after completion of their penultimate year of high school.

An applicant for admission to either the Arts or the Science/Engineering program at Royal Roads Military College must have completed a matriculant year, at a level satisfactory to the college, with credits acceptable for admission to the appropriate faculty at a university in the province in which he has completed his secondary education. These levels at present are Grade 12 for all provinces except Ontario, where six Ontario Academic Courses (OACs) are required; and Quebec, where CEGEP 1 or equivalent is required.

In addition to meeting the requirements of the last year of school, applicants must show that they have sufficient educational background to undertake work at the college in English, Mathematics, Physics and Chemistry (see the Arts subsection following for exceptions to this requirement).

This background will normally be provided by completion of the high school curriculum in these subjects; however, consideration will be given to applicants who do not possess standing in these subjects.

Other college and university certificates of academic standing and matriculation certificates of recognized public examining bodies and schools will be assessed and accepted where work of a satisfactory standard and content has been completed, particularly for Canadian citizens applying from abroad, or with non-Canadian certification.

#### **Science or Engineering**

Specific course requirements at the matriculant level include standing in English or French, mathematics, physics and chemistry.

#### **NOTES:**

1. In most provinces, one matriculant level course in mathematics is required.
2. In Alberta, Math 30 is required and in addition, Math 31 is preferred.
3. In Ontario, candidates require six Ontario Academic Credits (OACs) including English, Calculus, Algebra/Geometry, Chemistry, Physics and one elective.
4. In Saskatchewan, both Algebra 30 and Geometry/Trigonometry 30 are required.

5. In Nova Scotia, Math 441 is required.
6. In Manitoba, Math Topics (Calculus) 305 is recommended in addition to the required Math 300.
7. In New Brunswick, Advanced Math 120 is recommended in addition to the required Math 121 or 122 (Math 121 preferred).
8. In Newfoundland, Level III Advanced Mathematics is recommended.
9. Superior candidates may be admitted lacking one of English, physics or chemistry.

### Arts

Specific course requirements at the matriculant level for admission to the Arts program of study at RRMCM include credits in English and mathematics and, in addition, in at least two of the following courses:

history, functions and relations, calculus, algebra, geometry/trigonometry, physics, chemistry, geography, economics, social studies, classical studies, biology, Russian, German, Spanish, Italian, or other language.

### NOTES:

1. The mathematics requirement is that high school graduation course that is a prerequisite for the study of calculus.
2. In Alberta, where two matriculant level courses are offered, Math 30 is required and Math 31 is recommended.
3. In Saskatchewan, both Algebra 30 and Trigonometry 30 are required.
4. In Ontario, six Ontario Academic Credits (OACs) are required as follows:  
English (Language and Literature)  
Calculus (Note a.)  
four electives (Note b.)  
Notes: a. Calculus is preferred although Algebra/Geometry is acceptable.  
Students with a credit in Finite Mathematics may be considered for admission provided they have obtained good standing in Grade 12 Mathematics.  
b. These electives may be selected from any OACs excepting Dramatic Arts, Family Studies, and Visual Arts. In choosing electives, an additional mathematics or science course is highly recommended.
5. In Nova Scotia, Math 441 is required.
6. In New Brunswick Math 121 or 122 is required (Math 121 preferred).
7. A laboratory science in the penultimate year is required.

Candidates for admission to the Royal Military College of Canada or le Collège militaire royal de Saint-Jean should consult the calendar of the appropriate college for full particulars of their admission requirements.

### TRANSFER CREDIT AND ADVANCED STANDING POLICIES

Transfer credits for university level courses equivalent to those of RRMCM will be permitted for all students. A student must have achieved a minimum of 60% standing in each course and must register in a normal course load for the semester.

One year of advanced standing based on course to course equivalency may be granted to ROTP, RETP and UTPNCM applicants. A minimum standing of 60% on all university courses attempted is normally required.

## **ADMISSION INFORMATION**

Two years advanced standing for admission to third year degree programs may be granted to UTPO and UTPNCM candidates with a minimum average standing of 60% in all university courses attempted. Any two year Arts, Science or Engineering program may be accepted for advanced standing provided the prerequisite courses for the degree program are satisfied.

In all cases no credit will normally be transferred for courses in which the mark obtained is less than 60 percent (C), or for courses which constitute part of a failed year. At the discretion of the Admissions Committee, full or part credit may be granted for recognized courses offered under the auspices of DND (as Staff College or the National Defence College); all such courses must be judged by the Admissions Committee to be equivalent in content to courses required by RRMCM for a degree.

Science applicants should, as far as possible, have completed mathematics, physics, and chemistry courses equivalent to those listed in the RRMCM Calendar for the first two years of a Science or Engineering degree program. Military and Strategic Studies applicants should have completed history and political science courses equivalent to those listed in the RRMCM Calendar for the first two years of an Arts or Science degree program. Applied Military Psychology applicants should have completed courses equivalent to the first two years of an Arts or Science degree program including courses in Introductory and Social Psychology (or their equivalents) and Statistics.

Admission with advanced standing may be granted to UTPNCM candidates (by notification to NDHQ) and to UTPO candidates by Certificates of Acceptability issued to the applicants. Such certificates will indicate the program of study approved and state clearly any conditions on which admission depends. Students who have completed (or will have completed) an acceptable number of appropriate course-credits at one or more recognized universities may apply for Advanced Standing.

## **ADMISSION PROCEDURES**

### **APPLICATION**

Application for admission under the ROTP or RETP should be made by 1 March of the academic year prior to entry. Applications are normally initiated through the Canadian Forces Recruiting Centre closest to the home of the applicant.

Application must be accompanied by a birth certificate and certificate of educational achievement, as specified in the instructions sent to all applicants.

Serving members interested in the UPTNCM or the UTPO should refer to CFAO 9-13 or CFAO 9-40 respectively.

Officers or non-commissioned members wishing to enrol as special students at RRMCM must apply in writing to the Registrar, giving details of previous education and indicating the course or courses desired. All such candidates will be interviewed personally at the college regarding their course selection, at a time to be set by the Registrar, normally about three weeks before the start of classes each semester.

## **SELECTION OF CANDIDATES**

Eligible applicants for the ROTP or RETP will be required to appear, by appointment, at a Canadian Forces Recruiting Centre (CFRC) for a medical examination, testing, and interview, at a convenient time after the date of their application. Within Canada, applicants not resident of the city within which the CFRC is located, will normally be provided with return transportation and normal travelling expenses from their place of residence to the CFRC and with living expenses while at the CFRC. The selection of officer cadets is made by the final board of selection appointed by the Minister of National Defence. Candidates will be advised of the decision of the final board of selection which is based on academic standing and on the recommendations of the Interview and Medical Boards as to the personal and physical suitability of the candidate.

Selection of applicants to the UTPNCM and UTPO is made by military and academic boards convened by NDHQ each year.

Special students will be selected by the RRMCA Admissions Committee. Candidates will be selected not only on their academic potential, but also on the basis of the courses they have selected and the feasibility of these courses being offered in any given semester.

Special students select courses with the approval of the Registrar, the head of the department concerned, and the Royal Roads Military College Faculty Council.

## **JOINING INSTRUCTIONS**

Each successful ROTP/RETP candidate will attend Basic Officer Training at a designated Canadian Forces Base before arrival at RRMCA. A joining instruction for this training will be issued by the Canadian Forces Training System or one of its schools. The reporting date, travel arrangements, clothing and equipment required and other details will be specified.

When a selection of an applicant is made, a letter of welcome will be sent with information for new cadets, stating the date of joining, clothing and equipment to bring and miscellaneous details of what to expect at RRMCA. Candidates who successfully complete Basic Officer Training will commence their first year at RRMCA in late August.

## **ADMISSION RESTRICTION**

The College reserves the right to reject applicants for admission on the basis of their overall academic records even if they technically meet entrance requirements. A student with an unsatisfactory record at another university or college may not be accepted for admission even if eligible for admission on the basis of high school graduation, having failed the last university or college year or having an overall weak academic record. Normally a student who has been required to withdraw for academic reasons from another university or college will not be considered for admission until a full academic year has elapsed.

## *ADMISSION INFORMATION*

Further information on ROTP or RETP may be obtained from any of the following:

- a. Commanding Officer of any Canadian Forces Recruiting Centre;
- b. Director of Recruiting and Selection, National Defence Headquarters, Ottawa, Ontario, K1A 0K2;
- c. Registrar, Royal Roads Military College, FMO, Victoria, British Columbia, V0S 1B0;
- d. Registrar, Royal Military College of Canada, Kingston, Ontario, K7K 5L0; or
- e. Registrar, le Collège militaire royal de Saint-Jean, Quebec, J0J 1R0.



## **FEES AND ALLOWANCES**

### **Regular Officer Training Plan**

An officer cadet who is a member of the ROTP shall have his fees paid by the Department of National Defence and shall be entitled to receive pay, allowances, and transportation and travelling expenses as prescribed by the ROTP.

An officer cadet who is a member of the ROTP but who has failed a semester or year and is permitted to repeat that semester or year at his own expense shall be required to pay the amount prescribed in Queen's Regulations and Orders (QR&O). The current annual rates, which are subject to change, are the same as those listed for Reserve Entry Training Plan cadets.

### **Reserve Entry Training Plan**

An officer cadet who is enrolled at the college under the RETP shall pay the following fees on the first day of arrival at RRMC, based on the current prevailing annual rates established by the QR&Os:

- a. annual college fee of \$1,080 to defray the costs of tuition, clothing, books, instruments, drawing materials, dry cleaning, laundry, and incidental expenses;
- b. a fee of approximately \$1,958 each year to defray the costs of meals and accommodation;
- c. an annual Recreation Club fee of \$80;
- d. a book deposit of \$100 (refunded at end of academic year); and
- e. a messing assessment of \$166.50.

Notes: a. Payment may be made in full on or before the first day of classes, or may be made in two stages as follows: each year \$1,734 on or before the first day a cadet reports to the College, and the balance payable on or before 15 January of the same academic year; and  
b. these are based upon the current rates, and are subject to change.

### **University Training Plans UTPNCM and UTPO**

An officer cadet who is a member of the UTPNCM or an officer who is a member of the UTPO shall have his fees paid by the Department of National Defence and shall be entitled to receive pay, allowances, and transportation and travelling expenses as prescribed by the applicable plan.

### **Special Students**

Special students taking a course or courses at RRMC will pay no fees but may be responsible for the purchase of their own textbooks and supplies.

### **Mess Subscriptions**

All officer cadets are required to pay an annual mess subscription, (approximately \$165) and charges levied for special functions at a rate prescribed by the Mess Constitution. Payment is made on a monthly basis during the academic year through deductions from the officer cadet's pay. Those who do not receive pay (RETP or repeating officer cadets) must make payment in full by 30 September of each year.

## *FEES AND ALLOWANCES*

### **Transportation**

An officer cadet of the Regular Forces proceeding to his home on annual leave, once in each year, for the portion of the journey to his home and return actually made in Canada or between Canadian points, is entitled to transportation allowances at public expense, in accordance with QR&Os.



## **SCHOLARSHIPS & LOANS**

### **Canada Scholarships**

The Canada Scholarships program recognizes excellence and outstanding achievement and encourages young scholars, particularly women, to pursue degrees in science and engineering. A number of Canada Scholarships are awarded annually to entering RRMC students. The scholarships are valued at \$2,000 in the first year, and are renewable provided the high academic standard upon which the award is premised is maintained.

Applications for Canada Scholarships are available from guidance counsellors in secondary schools and CEGEPs, and must be received by the RRMC Registrar in the year of admission, by the closing date specified in the application.

Applicants under the Reserve Entry Training Plan (RETP) may be eligible for a number of scholarships and bursaries available to students at Canadian universities, including the Canada Student Loans Plan, the Foundation Scholarships of the Royal Military College Club of Canada, Dominion Cadetships and the Terry Fox Humanitarian Award.

### **Foundation Scholarships – Royal Military College Club of Canada**

The RMC Club of Canada sponsors a number of foundation scholarships annually. These scholarships are awarded to qualified Reserve Entry Training Plan (RETP) candidates at any of the three military colleges.

The purpose of the scholarship is to attract outstanding candidates to the military colleges who at the time of entry are not prepared to decide upon a Service career but who, nevertheless, are anxious to profit from the disciplined life and excellent educational facilities available at the military colleges. In the awarding of the scholarships, the principle of scholastic excellence will be observed, in keeping with the purpose of the scholarships. Each scholarship has a value of \$1,000 per year until graduation providing the holder successfully completes each previous college year. It is the intention of the Club that a scholarship coupled with the service pay received during the summer, would enable a cadet to defray the major portion of the basic financial obligations associated with the Reserve Entry Training Plan (RETP).

Application forms and further information may be obtained from:  
The Secretary-Treasurer  
RMC Club of Canada  
Royal Military College of Canada  
Kingston, Ontario  
K7K 5L0

or from the representative of the Branch of the RMC Club of Canada in your area. Applications must be submitted by May 1st of the year of entry.

### **Dominion Cadetships**

A Dominion Cadetship may be granted by the Minister of National Defence to a cadet who, being a member of the Reserve Force, enters the initial year at a Canadian Military College.



## *SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES*

- a. The value of a Dominion Cadetship shall encompass:
  - (1) the annual college fee for the first year;
  - (2) the cost of single quarters and rations, for the first and subsequent years; and
  - (3) the annual Recreation Club fee for the first and subsequent years.
- b. Not more than fifteen Dominion Cadetships may be granted in a college year.
- c. A candidate, to be eligible for a Dominion Cadetship, must meet the enrolment and academic standards for admission and be the child of a person who was killed, has died or is severely incapacitated as a result of service in:
  - (1) the Canadian Forces; or
  - (2) the Canadian Merchant Marine, during hostilities.
- d. Application for a Dominion Cadetship shall be made in writing, giving full particulars of the candidate's eligibility under para (c) of this article, and shall normally be forwarded by the first day of March to a Canadian Forces Recruiting Centre or Canadian Forces Recruiting Centre Detachment.
- e. The final board of selection shall submit to the Minister of National Defence for approval a list of candidates recommended for Dominion Cadetships, in order of merit.
- f. A Dominion Cadetship is forfeited on failure of an academic year.

### **Royal United Services Institute of Vancouver Island Bursary**

The Royal United Services Institute of Vancouver Island (RUSI of VI) has established an annual bursary, the purpose of which is to assist in defraying a portion of the tuition costs of a cadet studying at Royal Roads Military College under the Reserve Entry Training Plan (RETP).

The value of the bursary will be determined annually by the RUSI of VI.

The bursary will be awarded to a deserving officer cadet requiring financial assistance who is in good academic standing on entering either the Second, Third or Fourth Year of study in a degree program at Royal Roads Military College under the Reserve Entry Training Plan (RETP).

Selection of the winner will be by the Commandant of the College on the recommendation of a sub-committee of Faculty Council chaired by the Registrar. Application forms may be obtained from the Registrar and must be submitted to the Registrar by September 1st in the year of application.

For 1990-91, the amount of the bursary will be \$500.00. The presentation of the bursary to the winner will normally be made at the Honours Day or the Fall Convocation ceremonies.

### **Terry Fox Humanitarian Award Program**

When Terry Fox took his Marathon of Hope halfway across Canada in the summer of 1980, his courageous run, combining both outstanding athletic achievement and high humanitarian ideals, stirred the pride and compassion of Canadians everywhere. Although he was unable to complete his cross-country

## *SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES*

journey, Terry Fox was successful in raising more than \$20 million for the cause of cancer research.

Through the Marathon of Hope and the inspiring example of his courage and determination, Terry Fox made a considerable contribution to the Canadian nation. The Terry Fox Humanitarian Award Program has been initiated by the Government of Canada, on behalf of the Canadian people, to provide permanent and honoured recognition of this single contribution by offering scholarship assistance to those who best exemplify the distinguished qualities and ideals of Terry Fox. The Government of Canada has provided an initial \$5 million endowment fund for this purpose.

The Terry Fox Scholarship is a renewable award, subject to satisfactory progress, and is tenable at any Canadian university or college. The value of each award is \$3000 annually, for a maximum of four years or until a first degree is obtained. For candidates attending an educational institution in provinces where no tuition fee is applicable, the award value is \$2000.

Scholarship candidates must be Canadian citizens or have applied for citizenship at the time of award consideration.

As many scholarships will be granted each year as the number of creditable candidates who apply, with the total number awarded each year limited by the interest from the investment of the \$5 million endowment. Candidates must qualify in the province or territory in which they are ordinarily resident. The field of study is open and at the discretion of the successful candidate.

Applications may be obtained by writing to:  
Terry Fox Humanitarian Award Program  
711 - 151 Sparks Street  
Ottawa, Ontario  
K1P 5E3

Deadline for the submission of applications, complete with supporting documents is February 1.

### **Canada Student Loan Plan**

This plan, instituted by the Federal Government in 1964, was introduced to provide loans to supplement the resources of a student and/or the parents where in the absence of such aid a student would be unable to pursue a post-secondary education. A student should apply for a loan under this plan for only the funds needed, over and above those from his own resources and/or those of his family, to enable him to continue his studies. The institution to which application is made will determine the amount of loan required in each case.

Borrowers under this plan are required to repay principal and to pay interest, but no payments are required so long as the student is in full-time attendance at an eligible institution and for six months thereafter. Interest charges during this period are paid by the Federal Government, which also guarantees the loan principal. After the interest-free period, repayment of principal and simple interest charges on the outstanding balance are required in regular monthly payments to the bank from the

## ***SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES***

borrower. The maximum amount which may be advanced under this plan to one student is \$3,200 in one year.

Application should be made in the first instance to the Registrar. When a loan is approved, the institution will issue a Certificate of Eligibility that authorizes the student to make arrangements for the loan with any branch of any chartered bank of Canada.

Officer cadets receiving the full benefits of the Regular Officer Training Plan normally will not be considered eligible for Canada Student Loans.

### **Canadian Forces Personnel Assistance Fund Educational Assistance Loan**

The Board of Directors of the Canadian Forces Personnel Assistance Fund (CFPAF) approved the creation of an Educational Assistance Loan Program which commenced in 1987. This program provides low interest loans to defer the cost of education for dependent children attending accredited post secondary institutions. Loans of up to \$1,200.00 per dependent, to a maximum of \$2,400.00 for two dependents per family, are available to qualified applicants each year. Repayment is over a 12-month period, commencing September annually.

Applicants may be serving or ex-members of the CF. As funds are limited, the selection of recipients will be adjudicated by the CFPAF Executive Committee, based upon deciding factors of years of service, number of children, family income, and individual compassionate circumstances.

Application forms will be available from Base Financial Counsellors, offices of Veterans Affairs Canada, Royal Canadian Legion Branches, and university/college loan offices. Deadline for applications is 30 June. No late submissions or appeals will be considered.

## **MEDALS, AWARDS, PRIZES AND CERTIFICATES**

### **Presentation Ceremonies**

There are three major presentation ceremonies during the year. They are as follows:

- a) Spring Convocation, conducted in May to confer degrees and present academic medals, awards, prizes and honours certificates to those students graduating or transferring to RMC or CMR.
- b) Graduation Ceremonial Parade, conducted in May to present military awards to deserving officer cadets of all years.
- c) Honours Day, conducted in September to present academic awards, prizes or honours certificates to the First and Third Year students from the previous year, or Fall Convocation (instead of Honours Day), conducted in October to confer degrees and present academic awards, prizes or honours certificates to the First and Third Year students from the previous year.

## SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES

The following award may be won by full time graduate students:

*The Governor General's Gold Medal*, awarded to the student who obtains the highest academic standing in his final year of the graduate degree program.

The following annual awards may be won by students who meet the requirements as specified:

### Medals

*The Governor General's Silver Medal*, awarded to the student who obtains the highest academic standing in his Fourth Year.

*The Lieutenant-Governor of British Columbia's Silver Medal*, awarded to the student who obtains the highest academic standing in his Third Year.

Note: By highest academic standing is meant the highest weighted grade average obtained for the complete academic year.

### Academic Awards

*The D.W. Hone Award in Physics and Oceanography*, presented by Professor Emeritus D.W. Hone for the student who achieves the highest standing in physics and oceanography courses in the Third Year Combined Major or Honours Physics and Oceanography degree programs.

*The Bull HN Award for Excellence in Computer Science*, purchased from the annual gift of Bull HN Information Systems Limited for the development of Royal Roads computer science programs and presented for the students of the Third and the Fourth Year Physics and Computer Science programs who achieve the highest standing in computer science courses in their respective years.

*The Armed Forces Communications and Electronics Association (Western Canada Chapter) Award*, presented for the best all-round ROTP/RETP officer cadet of the Fourth Year Physics and Computer Science program.

*The Armed Forces Communications and Electronics Association Education Fund of Canada Award*, awarded to the Third Year officer cadet entering the Physics and Computer Science degree program with the highest academic standing.

*The G.L. Pickard Award in Oceanography*, presented by Dr. G.L. Pickard for the student who achieves the highest standing in oceanography courses in the Fourth Year Physics and Oceanography program.

*The Clarence C. Cook Award in Physics*, presented in memory of Professor Emeritus C.C. Cook for the student who achieves the highest standing in physics courses in any Fourth Year Combined Major or Honours program in science.

*The Wallis Award in Military and Strategic Studies*, presented by Professor Emeritus and Mrs. A.D. Wallis for the student who achieves the highest standing in the Military and Strategic Studies Honours program.

## *SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES*

*The J.M. Grant & W.M. Ogle Award in Military and Strategic Studies*, presented by Emeritus Dean of Science A.G. Bricknell for the student who achieves the highest standing in the Third and Fourth Year of the Military and Strategic Studies program including any chemistry and physics courses taken in undergraduate studies at a CMC. In the event the student with the highest standing is also the winner of the Wallis Award, by reversion the Grant-Ogle Award will be awarded to the student with the second highest standing.

*The Captain J.M. Grant Memorial Collection and Award*, made available through funding by his daughter, Nancy Braithwaite, for the annual acquisition of maritime and naval reference material for the Coronel Library. An individual award is also made available annually to the undergraduate or graduate student who, in the course of his/her studies presents a thesis or essay judged to be the most thorough research on a maritime subject or related field.

*The Colonel W.R.N. Blair Award*, presented by the Personnel Selection Officers' Association for the best student in the Fourth Year of the Applied Military Psychology program.

*The RCNC Class of '46 Oceanography Reference Collection* made available by the Graduating Class of 1946 permits the annual acquisition of oceanographic reference material for the Coronel Library and recognizes the achievements of the graduating student with the highest academic standing in the Physics and Oceanography degree program.

*The Canadian Institute of International Affairs Award*, presented for the student who achieves the highest standing in history, political science and economics courses in the Fourth Year Military and Strategic Studies program.

### **Military Awards**

*The Royal Military College Club of Canada (Toronto Branch) Award*, presented by the Toronto Branch of the Royal Military College Club of Canada to the officer cadet who displayed the best performance in drill and physical fitness over the four years of the program.

*The Royal United Services Institute of Vancouver Island Award*, presented to the officer cadet of the First Year who is judged to be the best all-round officer cadet.

*The RMC Club Award*, presented to the officer cadet of the Second Year who has displayed the most improvement in all phases of his military training.

*The Military Engineering Association Award*, presented to the best Second Year officer cadet in an engineering classification.

*The Royal Canadian Armoured Corp Award*, presented to the best Fourth Year officer cadet in a land operations classification.

*The Navy League of Canada Award*, presented to the best Second Year naval cadet in a sea operations classification.

## SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES

*The RCAF Association Award*, presented to the Second Year officer cadet in an air operations classification with the highest academic and military proficiency.

*The H.E. Sellers Award*, presented to the officer cadet chosen as the best all-round Second Year ROTP/RETP cadet.

*The RMC Club (Vancouver Island Branch) Award*, presented to the best all-round Second Year UTPNCM officer cadet.

*The LCol F.J. Picking Award*, presented to the officer cadet judged to be the best all-round Third Year cadet.

*The Naval Officers Association of Canada (Vancouver Island Branch) Award*, presented for the best Fourth Year naval cadet in a sea operations classification.

*The United States Naval Institute Award of Membership*, awarded to the outstanding graduate in a Maritime classification who best combines academic performance, communicative skills and military training.

*Commandant's List*, appointments to the Commandant's List are for those officer cadets of any year or entry plan who exhibit superior performance in all aspects of the college program, including military assessment, academic grades, athletic performance, second language training, drill, and summer training.

*The Claus Gorgichuk Memorial Award*, presented by the Graduating Class of 1979, for the cadet of the graduating class judged by his peers to best exemplify the college motto: Truth, Duty, Valour.

*The Sword of Merit*, presented by the Department of National Defence for the graduating UTPNCM cadet who achieves the highest military and academic standing in Fourth Year.

*The Sword of Honour*, presented by the Department of National Defence for the best all-round ROTP/RETP cadet of the graduating class.

**Additional prizes may also be awarded.**

### **Departmental Prizes**

Academic book prizes are awarded annually to students who achieve the highest standing in the disciplines of science/engineering, French, and humanities/social sciences.

In addition, special book prizes may be awarded for work of unusual merit, when such prizes are recommended by an academic department and approved by Faculty Council.

### **Certificates**

First Class Honours certificates are awarded to students of the First, Second, or Third Year who obtain an overall A average in their final examinations, with no

### *SCHOLARSHIPS, PRIZES, AWARDS & CERTIFICATES*

failures. In addition, second class and pass certificates are awarded to Second Year officer cadets obtaining an overall B standing (with no failures), or C or D standing, respectively, in their final examinations. A degree script will be awarded to those meeting the degree requirements of the Science or Arts programs.

A student who completes his final year with first class honours standing will have his degree script inscribed "With Distinction."



**OCEANOGRAPHIC RESEARCH**



**OCEANOGRAPHY RESEARCH VESSEL**



**COMPUTER SCIENCE LAB**



## *ACADEMIC PROGRAMS*

### **CANADIAN MILITARY COLLEGE BACCALAUREATE DEGREE PROGRAMS**

The Canadian Military Colleges offer Baccalaureate degree programs in Science, Engineering, Arts, and Administration. Students may begin their degree studies at any one of the three Canadian Military Colleges and complete the degree requirement at the one offering the specialization in the degree program desired in the third and fourth years of study.

Each of the Canadian Military Colleges is an ordinary member of the Association of Universities and Colleges of Canada. The Engineering degree programs meet the standards for accreditation by the Canadian Council of Professional Engineers.

Students at the Canadian Military Colleges must select a program of study that is compatible with their own interests and ambitions, the requirements of the Canadian Forces, and the relevant academic regulations. The Canadian Forces reserves the right to limit enrolment in any given program of studies, or to select the location at which a program of studies will be taken.

### **THE ROYAL ROADS MILITARY COLLEGE ACADEMIC PROGRAM**

Degrees are granted by the Royal Roads Military College under the authority of "The Royal Roads Military College Act," passed by the thirtieth Parliament of the British Columbia Legislative Assembly and given Royal Assent on 26 March 1976.

The academic year at Royal Roads Military College consists of two semesters, each of which consists of 13 weeks of instruction and approximately two weeks of final examinations in course.

### **DEGREE TRANSFER PROGRAMS**

The Royal Roads Military College offers academic programs in the first two years of study leading to Baccalaureate degrees in Arts, Administration, Engineering and Science. These programs permit students to transfer to the Royal Military College of Canada and le Collège militaire royal de Saint-Jean to complete degree programs offered by those Colleges. Refer to the Conditions of Transfer to RMC and CMR section of the Calendar for further details.

### **BACCALAUREATE DEGREES**

The Royal Roads Military College offers academic programs leading to the following baccalaureate degrees:

- a. Bachelor of Science (Honours, Combined Major, or General) in Physics, Applied Psychology, Oceanography, Computer Science and Space Science programs and Bachelor of Science (Honours or Major) in Applied Military Psychology.
- b. Bachelor of Arts (Honours or General) with interdisciplinary concentrations in History, Literature and Philosophy, Political Science, and Economics and Bachelor of Arts (Honours or Major) in Applied Military Psychology.

## *ACADEMIC PROGRAMS*

The duration of the programs of study is four years regardless of which degree is sought. However, permission may be granted for a student to repeat not more than one failed year provided performance in all other areas is highly satisfactory. No credit will normally be granted for courses which constitute part of a failed year.

### **MASTER DEGREE**

The Royal Roads Military College offers academic programs leading to the following master degree:

Master of Science (Course or Thesis patterns) in Oceanography and Acoustics. The duration of the program of study is normally two years.

The Graduate Division also offers a one year program leading to a diploma in Oceanography.

Refer to the Graduate Studies section of the Calendar for further details concerning the general requirements of graduate programs.

### **HONORARY DEGREES**

Royal Roads Military College also offers the following degrees to those considered worthy of the honour:

- a. Doctor of Laws (L.L.D.), *honoris causa*;
- b. Doctor of Science (D.Sc.), *honoris causa*; and
- c. Doctor of Military Science (D.Mil.Sc.), *honoris causa*.

### **GENERAL REQUIREMENTS – BACCALAUREATE PROGRAMS**

The academic subjects in the curriculum are selected for their value to potential officers of the Canadian Forces. Science and Engineering programs have a proportion of time devoted to the humanities and social sciences, and on the other hand, the Arts programs have a proportion of time devoted to mathematics and science.

Non-credit Second Language Training is required for all officer cadets in all four years. The object of this training is to develop the maximum proficiency in the second official language, particularly in oral comprehension and expression. Five periods per week are scheduled in the academic timetable. (See Second Language Training Department section of the Calendar for details.)

Military Leadership and Applied Psychology courses for credit are required in all programs in all four years. These courses are:

- ML111 – Psychology of the Individual - Part 1
- ML212 – Social Psychology
- ML311 – Organizational Leadership and Management
- ML402 – Professional and Ethical Issues

Physical Education courses are required in all programs in all years. The Physical Education program is divided into three areas: representational or approved sports, intramural sports and physical training. All cadets must take part in both the

## **ACADEMIC PROGRAMS**

physical training and one of the sports programs. The physical training portion has two periods per week scheduled in the academic timetable.

Drill is required in all courses in all four years with one period per week scheduled in the academic timetable.

### **ACADEMIC COURSE CREDITS**

Although the academic year is divided into two semesters both full-year and one semester courses are offered. Course credits are based on a three lecture hour full-year course system, the normal course being assigned 3 units of credit in 26 weeks and a three hour semester course assigned 1½ units of credit in the 13 week semester. Other courses may be assigned more or fewer credits based on the following:

- 1 unit = 1 lecture/seminar hour per week for 26 weeks  
2-3 laboratory/tutorial hours per week for 26 weeks  
2 semester lecture/seminar hours per week for 13 weeks  
4-6 laboratory/tutorial hours per week for 13 weeks
- ½ unit = 1 semester lecture/seminar hour per week for 13 weeks  
2-3 laboratory/tutorial hours per week for 13 weeks  
1 laboratory/tutorial hour per week for 26 weeks
- 0 unit = 1 laboratory/tutorial hour per week for 13 weeks

### **ACADEMIC COUNSELLING**

Members of the faculty at Royal Roads serve as academic advisors to the students. These professors are available to the cadets at regular times to counsel them in their academic progress, to guide them in their choice of programs of study, or to advise them on any non-military matters that they may wish to discuss.

Individual and group counselling is provided by professional counsellors for students who encounter personal and interpersonal problems that interfere with their performance while at RRMCC. Students can be helped to deal with a broad range of concerns including the following: self-confidence and self-esteem; depression; stress and anxiety; relationships; sexuality; sexual and physical abuse; eating disorders; loss and grief; drug and alcohol abuse; loneliness; and procrastination.

### **ARTS DIVISION**

A student may proceed to the BA degree in one of the following programs: General, Major or Honours. Consult Program Tables and Departmental Sections of the Calendar for details of specific program requirements.

#### **Graduation Academic Requirements:**

- a) successful completion of the First and Second Years of the Arts or Science/Engineering programs at any CMC including a course in Mathematics 203 or Mathematics 241 or an equivalent course in Probability and Statistics.
- b) in the Third and Fourth Years in a General or Major program, 30 units must be completed of which 18 units must be in Arts courses at the 300 and 400 level.
- c) in the Third and Fourth Years in an Honours program an additional 6 units of Arts courses at the 300 and 400 level must be completed, including either a research project or a thesis.

- d) in all programs a minimum of 3 units must be completed in Military Leadership courses at the 300 and 400 level.

**General Requirements:**

- a) students normally must complete a minimum of 7½ units in each semester. Students wishing to register in more than 10 units in a semester must have the permission of the Academic Advisor and approval of Faculty Council.
- b) students must select courses in consultation with departmental advisors at the beginning of the Second Year and each subsequent year. Any exceptions to the listed courses in the Program descriptions may be made only with the prior written approval of the Head of Department and the Dean of Arts which must be on file in the Office of the Registrar.

**General Program:**

Of the 18 units required in Arts courses, 9 units at the 300 and 400 level in each of two of the following fields are required for the concentrations of the Military and Strategic Studies interdisciplinary program: Economics, History, Literature and Philosophy, and Political Science. An additional 3 units in Arts courses at the 300 and 400 level outside the fields of the two concentrations are required in addition to 3 units in Military Leadership 311 and 402.

**Major Program:**

Of the 18 units required in Arts courses, 15 units in one field at the 300 and 400 level are normally required. An additional 12 units of elective courses are required, of which not more than 3 units may be at the 200 level. In 1990-91, a program in Applied Military Psychology is the only Major program available and in this program not more than 3 units of the 12 units of elective courses may be in the field of psychology.

**Honours Programs:**

Permission to enter or remain in an Honours Program must be obtained from the Faculty Council before registration at the beginning of the Third Year. In addition to meeting specific course requirements as described in the Calendar, Honours candidates must maintain an overall second class standing in each semester of the Third and Fourth Years.

**SCIENCE DIVISION**

A student may proceed to the BSc degree in one of the following programs: General, Major, Combined Major or Honours. Consult Program Tables and Departmental Sections of the Calendar for details of specific program requirements.

**Graduation Academic Requirements:**

- a) successful completion of the First and Second Years of the Science/Engineering programs at any CMC including a course in Mathematics 241 or its equivalent plus, for the combined major programs, a weighted average of at least 55 percent in mathematics, science, and engineering courses. In addition, for programs with Computer Science, a course in Mathematics 252 or its equivalent is required, and for programs with Oceanography, courses in Mathematics 252 and Engineering 232 or their equivalents are recommended..

## **ACADEMIC PROGRAMS (RMC)**

- b) in the Third and Fourth Years, in a General or Major program a minimum of 30 units must be completed of which a minimum of 22 units must be in science courses at the 300 and 400 level.
- c) in the Third and Fourth Years, in a Combined Major program a minimum of 36 units must be completed of which 30 units must be in science courses at the 300 and 400 level.
- d) in the Third and Fourth Years, in an Honours program, an additional 4 units of science courses at the 300 and 400 level must be completed, including either a research project or a thesis.
- e) in all programs a minimum of 3 units must be completed in Military Leadership courses and a minimum of 3 units must be completed in other Arts courses at the 300 and 400 level.
- f) a few psychology courses designated 60 or higher in the last two digits offered in the Military Leadership and Applied Psychology Department are acceptable towards the BSc degree only in the Applied Military Psychology program to fulfill the requirement for 22 units in science courses.

### **General Requirements:**

- a) students normally must complete a minimum of 7½ units in each semester. Students wishing to register in more than 10 units in a semester must have the permission of the Academic Advisor and approval of Faculty Council.
- b) students must select courses in consultation with the departmental advisors at the beginning of Second Year and each subsequent year. Any exceptions to the listed courses in the Program descriptions may be made only with the prior written approval of the Head of Department and the Dean of Science and Engineering which must be on file in the Office of the Registrar.

### **General Program:**

Of the 22 units required in science courses, 9 units in each of two fields of concentration are normally required and 4 units in other science fields.

### **Major Program:**

Of the 22 units required in science courses, 15 units in one field are normally required and 7 units in other fields. In 1990-91, a program in Applied Military Psychology is the only Major program available.

### **Combined Major Programs:**

Of the 30 units required in science courses, 12 units in each of the major fields are normally required. The additional 6 units required are normally in other than these two fields.

### **Honours Program:**

Permission to enter or remain in an Honours program must be obtained from the Faculty Council before registration at the beginning of the Fourth Year. In addition to meeting the specific course requirements as described in the Calendar, Honours candidates must maintain an overall second class standing in each semester.

## **THE ROYAL MILITARY COLLEGE ACADEMIC PROGRAM**

The Royal Military College of Canada offers degree programs in Engineering, in Science and in the Humanities.

### **CONDITIONS OF TRANSFER FROM RRMC INTO THIRD YEAR AT RMC**

#### **a. General**

General conditions for admission to Third Year courses of study leading to a degree at RMC are as prescribed in the RMC Calendar and the RMC Academic Regulations. However, admission to all degree course programs is granted only with the approval of the head of department concerned. Heads of departments at RMC are always available to give advice concerning preparation for, and admission to, their degree programs. General enquiries should be directed to the Registrar, Royal Military College of Canada, Kingston, Ontario, K7K 5L0.

#### **b. General Requirement for Admission to Third Year at RMC**

The general requirement for admission to a Third Year degree course at RMC is that candidates will have the same basic preparation for their course no matter which Canadian Military College they have attended.

Entry into Honours is normally limited to students who pass at the end of the Second Year with at least 66 percent in the subjects of the Honours program of study. An overall average of at least 60 percent will also normally be required.

#### **c. Entry Requirements for RMC Degrees in Arts (BA)**

The general requirement for admission to all Third Year Arts (BA) programs at RMC is met by successful completion of one of the Second Year programs of study available at a CMC.

However, specific requirements for honours standing in particular courses will apply for admission to Honours Arts degree courses. Also, depending on the Arts degree program entered, specified courses may have to be taken in place of electives in either the Honours or the General programs of study.

#### **d. Entry Requirements for RMC Degree in Science (BSc)**

##### **Mathematics and Physics**

The following Second Year programs of study will meet the requirements for admission to Third Year Mathematics and Physics (General and Honours) at RMC:

Science

Engineering

Entry into the Honours course of study is limited to those who obtain at least 66 percent combined average in mathematics and physics courses in the Second Year. An overall average of at least 60 percent will normally be required. For entry into the General course of study, the combined average must be at least 55 percent and the overall average at least 50 percent.

## **ACADEMIC PROGRAMS (CMR)**

### **Science (Applied)**

The following Second Year programs of study will meet the requirements for admission to Third Year Science (Applied) at RMC:

Science

Engineering.

#### **e. Entry Requirements for RMC Degrees in Engineering (BEng)**

To enter a Third Year Engineering program a student must have the approval of the head of department or professor in charge of the program concerned. This normally requires the successful completion of the Second Year Engineering program at RMC, RRMC or CMR with at least the following minimum considerations:

Engineering Physics: 66 percent combined average in mathematics and physics.

Fuels & Materials Engineering: 55 percent combined average in chemistry, mathematics and physics

Civil Engineering: 55 percent combined average in mathematics and physics.

Computer Engineering: 55 percent combined average in mathematics and physics.

Electrical Engineering: 55 percent combined average in mathematics and physics.

Engineering Management: 55 percent combined average in mathematics and physics.

Mechanical Engineering: 55 percent combined average in mathematics and physics.

## **LE COLLÈGE MILITAIRE ROYAL DE SAINT-JEAN ACADEMIC PROGRAM**

Le Collège militaire royal de Saint-Jean offers degree programs in Administration, in Computing Science, in Physical Sciences, in Canadian Studies, and in Military and Strategic Studies.

### **PROGRAMS OF STUDY AT CMR AND CONDITIONS OF TRANSFER FROM RRCM INTO THIRD YEAR AT CMR**

The following programs of study are available at CMR to students on transfer from Second Year at RRCM:

#### **a. Bachelor of Administration – CMR**

The Administrative Sciences department offers a general undergraduate program in management and leadership oriented towards the skills and knowledge that will be needed by future armed forces officers. The program is intense, pragmatic and action-oriented with a particular emphasis on developing sound decision-making ability. It is comparable to similar programs offered at first- class civilian institutions.

The main purpose of the program is to provide for the development of effective leaders and managers capable of adapting to different types of situations. The program is designed for people who want to be leaders and managers not just learn about it. The secondary objectives are: (1) to provide the student with a broad background in Business Administration; (2) to improve the understanding of human behaviour in organizations; (3) to provide the future officer with a fair knowledge of Public Administration; and (4) to provide the future manager with a knowledge of quantitative methods for decision-making.

The program is structured in three phases. The preparation phase is satisfied by any CMC program of studies up until the end of Second Year. The core phase includes those courses that are essential for the study of management. For the most part core courses are taken in the Third Year. The concentration phase, in the Fourth Year, enables the student to concentrate in one of four areas: defence policy, human resources, accounting and logistics of management and computing science.

Many approaches to learning are used: case method, role-playing, films, lectures, reading, report writing, business games, classroom discussions, tours of industry, and simulation exercises. Students are also called upon to do a major consulting report on an organization outside of the College.

Entry into the BAdm program can be made from any CMC academic option at the end of the First or Second Year, contingent upon a review of the applicant's record. It is recommended that students wishing to transfer at the end of Second Year take a course in accounting. If this is not done, the student may still transfer but will be required to take accounting in the Third Year. Since the number of courses in Third Year is kept the same for all students, this may imply that Third Year core courses are postponed until Fourth Year and taken in lieu of optional courses in the concentration.



## **ACADEMIC PROGRAMS (CMR)**

The BAdm program offers many advantages. It integrates the theory of the classroom with the practical experience that students have had in the cadet wing and summer training. It extends this experience by examining and preparing them for situations which will arise later in their careers. It provides a solid preparation for post graduate studies in management or business, for the various accounting qualifications and for success within the armed forces or later in civilian organizations.

### **b. Bachelor of Computing Science – CMR**

The general objective of this program is to prepare officers in the different fields of computing science which are of interest to the Canadian Forces. Because of the diversity of classification requirements, the program should necessarily be of a broad nature.

The following concentrations are available: Systems, Management, Physics and Mathematics.

- 1) The objective of the Systems Concentration is to impart to the students the hardware and software knowledge required to operate efficiently in an environment strongly oriented towards computerized and automated systems.

As a general rule, officer cadets from the three Canadian Military Colleges, who have successfully completed the Second Year of a Science or Engineering program are admissible provided that they have taken MAT 212, MAT 251 or the equivalent, and have obtained a 60 percent general average. Admission to the course is always subject to approval by the chairmen of the departments involved and must be sanctioned by the Deans of the divisions concerned.

- 2) The goal in the Management Concentration is to form computer specialists with a good knowledge of modern management techniques and the capability of making their science serve these techniques.
- 3) The objective of the Physics Concentration is to provide the student with a fundamental background in computing science (particularly in software) completed by a good knowledge of physics in general, and specifically of the physics related to computers.
- 4) The goal of the Mathematics Concentration is to provide the student with the fundamental background in mathematics and computing science which will enable him to use the most modern techniques in tackling the numerous logistics and tactics problems which are encountered in the different classifications of the Canadian Forces. To familiarize the student with the components of a modern computerized system of defence.

As a general rule, officer cadets from the three Canadian Military Colleges, who have successfully completed the Second Year of a Science or Engineering program are admissible in the Management,

Physics or Mathematics Concentrations provided that they have taken MAT 212, MAT 251 or the equivalent, and have obtained a 55 percent general average. Admission to these courses is always subject to approval by the chairmen of the departments involved and must be sanctioned by the Deans of the divisions concerned.

**c. Bachelor of Science – CMR**

The science options at CMR are designed to impart a full appreciation of quantitative and analytical methods. They encourage and stimulate a critical analysis of cause and effect, a quest for precision and a scientific curiosity. With the increasing influence of scientific progress in the Canadian Forces, this kind of education is relevant to any responsible role that students may assume upon graduation.

The following programs are available:

**1) Bachelor of Science with Honours in Physics**

This most demanding program emphasizes fundamental physical principles. Graduates are prepared to undertake post-graduate studies in physics.

Entry will normally be open to candidates from the three Canadian Military Colleges who have successfully completed the Second Year of a Science or Engineering program, provided that they have taken MAT 212, MAT 251 or the equivalent, and have obtained a minimum combined average of 66 percent in mathematics and physics and an overall average of 60 percent. Entry to the Honours program is subject to the approval of the Mathematics and Physics Department at CMR and must be sanctioned by the Dean of the division concerned.

**2) Bachelor of Science with Major in Physics and Minor in Mathematics**

Principles and applications of physics and mathematics are stressed in this program. It is intended for students with strong scientific interests who have demonstrated at least an average achievement in previous science courses.

Entry will normally be open to those candidates who have successfully completed the Second Year in a Science or Engineering program of study at RMC, RRMC, or CMR, provided that they have taken MAT 212, MAT 251, or the equivalent, and have obtained a minimum combined average of 55 percent in mathematics and physics. Admission to this program is subject to the approval of the Physics and Mathematics Departments and must be sanctioned by the Dean of the Division.

**3) Bachelor of Science (General)**

The particular objective of this program is to procure a modern scientific university formation in offering the possibility to stress personal interests by a choice of courses. It is intended for students who have succeeded in a Second Year program in Science or Engineering.

## **ACDAEMIC PROGRAMS (CMR)**

Entry will normally be open to those candidates who have completed the Second Year in any of the Science or Engineering programs of study at RMC, RRMC, or CMR.

### **d. Bachelor of Arts in Canadian Studies (Minor in Administration) – CMR**

The primary objective of the Canadian Studies program is to give students an opportunity to gain a comprehensive understanding of Canadian civilization as a living culture. A number of departments cooperate in offering this course of study.

Secondary objectives are: (1) The Canadian Studies Program is designed to provide the future officer with a better understanding of his fellow-countrymen for whom and with whom he will be required to work. (2) To provide the student with a university education which will enable him to be an effective young officer in the Canadian Forces. (3) To offer the officer cadet the possibility of earning a BA degree in relation to his aptitudes and interests.

Methods of study include: (1) The field method: students have the opportunity to experience CMR and the Montreal area as a microcosm of the Canadian reality and the interface of the three major components of our society. (2) Content analysis method: a qualitative and quantitative study of the values, beliefs and norms of Canadian society done through a systematic analysis of the country's history, literature, arts and institutions. (3) Cross-cultural method: the study of the English and French Canadian cultures, their similarities and differences.

Entry will normally be open to those candidates from RMC and RRMC who have completed their Second Year in Arts and preferably to those who have taken Principles of Accounting. Other candidates from other options may be accepted subject to a special review of their academic records.

### **e. Bachelor of Arts in Military and Strategic Studies – CMR**

The primary objective of this program is to prepare future officers to analyse and understand the military and strategic problems in the field of contemporary international relations. This program is of interest to the Canadian Forces because of its specialization.

The Military and Strategic Studies at CMR offers a General program and an Honours program. Following a progressive evolution from First through the Second Year, the program terminates by an indepth study during the Third and Fourth Years.

The unique interdisciplinary character of this program is evident. Courses include Military History, Science of War, International Relations, Defence Policy, International Public Law and War and Law, Decision Making, Economy, Psychology, Technology of Weapons and some quantitative approaches to the study of conflicts.

In addition to allowing the student to move from one military college to another, this program supplies him with a solid foundation for post-graduate studies and for a professional career with unlimited possibilities.

This program is given in French only.

## *PROGRAM OUTLINES*

Entry will normally be open to those candidates from RMC and RRMC who have completed their Second Year in Arts. Other candidates from other options may be accepted subject to a special review of their academic records.



## *PROGRAM OUTLINES*

### **RRMC PROGRAM TABLES**

Tables 1 to 5 outline the programs available for First and Second Year students at Royal Roads Military College.

Occasionally numbers appear in brackets, indicating an optional course that may be taken either term. Bracketted numbers are not included in totals.



**TABLE 1**

**First Year – Degrees in Arts or Administration**

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training I	Conversational French	0	0	3	2	0	3	2	1
English 133	English Literature 1100 to 1850, Composition, Logic	5	5	0	0	5	0	0	
History 122	The Founding of New Societies, 1500-1763	(1 1/2)	–	–	–	(3)	(0)	(0)	2
History 123	European History to 1763	3	3	0	0	3	0	0	
Political Science 102	Introduction to Political Science	1 1/2	–	–	–	3	0	0	3
Military Leadership 111	Psychology of the Individual – Part I	1 1/2	3	0	0	–	–	–	
Mathematics 103	Calculus and Analytical Geometry	1 1/2	3	2	0	3	2	0	
Computer Science 112	Computer Science - Concepts and Applications	1/2	–	–	–	1	0	1	
Chemistry 123	Introductory Chemistry	3	3	0	0	3	0	3	
PE 103		0	0	0	2	0	0	2	
Drill 103		0	0	0	1	0	0	1	
Total		17 1/2	17	5	5	18	5	9	

- NOTES – 1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.
2. Required by those cadets who transfer from Science/Engineering to Arts and the end of the first semester.
3. Mathematics 113 may be required by those cadets who transfer from Science/Engineering at the end of the first semester.

TABLE 2

## First Year – Degrees in Science or Engineering

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training I	Conversational French	0	0	3	2	0	3	2	1
English 113	Literature of Science and Society	3	3	0	0	3	0	0	
Military Leadership 111	Psychology of the Individual – Part I	1½	3	0	0	—	—	—	
Mathematics 113	Calculus and Linear Algebra	5	5	3	0	5	2	0	
Computer Science 122	Introduction to Computing	1	—	—	—	2	0	2	
Physics 103	Mechanics	2	2	0	1	2	0	1	
Physics 113	Optics and Electricity	3	3	0	2	3	0	2	
Chemistry 103	General Chemistry	3	3	0	3	3	0	3	
PE 103		0	0	0	2	0	0	2	
Drill 103		0	0	0	1	0	0	1	
Total		18½	19	6	11	18	5	13	

NOTES – 1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.

TABLE 3

## Second Year – Degrees in Arts or Administration

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training II	Conversational French	0	0	3	2	0	3	2	1
English 231	British and European Literature	1½	3	0	0	—	—	—	2,3
English 242	Canadian and American Literature	1½	—	—	—	3	0	0	
History 211	Europe and the Wider World, 1763-1870	1½	3	0	0	—	—	—	
History 212	World History, 1870-1970	1½	—	—	—	3	0	0	
Economics 213	Principles of Economics	3	3	0	0	3	0	0	
Military Leadership 212	Social Psychology	1½	—	—	—	3	0	0	
Mathematics 203	Finite Mathematics, Probability & Statistics	3	3	2	0	3	2	0	
Physics 123	Introductory Physics	3	3	0	1½	3	0	1½	
PE 203		0	0	0	2	0	0	2	
Drill 203		0	0	0	1	0	0	1	
Total		16½	15	5	6½	18	5	6½	7
Optional Courses:									
Political Science 213	Introduction to International Politics	3	3	0	0	3	0	0	4,5
Applied Psychology 221	Psychology of the Individual – Part 2	1½	3	0	0	—	—	—	6



### TABLE 3 CONTINUED

- NOTES –
1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.
  2. History 121 is also required by students who transfer from Science/Engineering at the end of their first semester in First Year.
  3. History 123 is also required if not completed in First Year.
  4. Political Science 102, if not completed in First Year, is required if Political Science 213 is not selected as an elective.
  5. Optional, but recommended for cadets intending to remain at RRM in the Military and Strategic Studies program. Prerequisite for cadets intending to transfer to CMR for the Military and Strategic Studies program, and for the RRM Joint Concentration in Politics and Economics (M&SS program).
  6. Optional, but prerequisite for Applied Military Psychology degree program.
  7. Semester course loadings of less than 7-1/2 or more than 10 units of credit require the prior approval of Faculty Council.

TABLE 4

## Second Year – Degrees in Science

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training II	Conversational French	0	0	3	2	0	3	2	1
History 221	Canadian History for Engineers	1½	3	0	0	–	–	–	
Military Leadership 212	Social Psychology	1½	–	–	–	3	0	0	
Mathematics 223	Calculus, Vector Calculus, Differential Equations	3	3	1	0	3	1	0	
Mathematics 241	Probability and Statistics	1½	3	0	0	–	–	–	2
Physics 203	AC Circuits and Electromagnetism	3	2½	0	3	2½	0	3	
Physics 211	Vibrations and Waves	1	2½	0	0	–	–	–	
Physics 252	Modern Physics	1	–	–	–	2½	0	0	
Chemistry 243	Thermodynamics	3	2	0	0	3	0	3	
Computer Science 211	Computer Applications I	1	2	0	2	–	–	–	
Engineering 261	Engineering Graphics	1	2	0	1	–	–	–	
PE 203		0	0	0	2	0	0	2	
Drill 203		0	0	0	1	0	0	1	
Total		17½	20	4	11	14	4	11	
Optional Courses:									
Mathematics 252	Linear Algebra	1½	–	–	–	3	0	0	3,4,5
Engineering 232	Mechanics of Materials	2	–	–	–	3	0	2	5
Mathematics 233	Advanced Calculus, Vector Calculus, Differential Equations	4	4	1	0	4	1	0	6
Computer Science 202	Computer Applications II	1	–	–	–	2	0	1	7

**TABLE 4 CONTINUED**

- NOTES –
1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.
  2. Required for students wishing to continue in all Science programs or the Applied Military Psychology program in Third Year at RRMCMC.
  3. Required for students wishing to continue in programs with Computer Science in Third Year at RRMCMC.
  4. Not required, but recommended, for Science (Applied) degree at RMC and the General Science degree at CMR. Required for other Science degree programs at RMC or CMR.
  5. Recommended for students wishing to continue in programs with Oceanography at RRMCMC, or for Naval Architecture at MIT.
  6. Recommended for students planning to continue in Electrical Engineering, Engineering Physics, or Honours Science, in lieu of Mathematics 223.
  7. Students electing Computer Science 202 must take Chemistry 203 (see Table 5) in lieu of Chemistry 243. Recommended for students planning to continue in programs with Computer Science in Third Year at RRMCMC.
- \* The Honours Science program is normally the entry level to the Honours combined major programs.

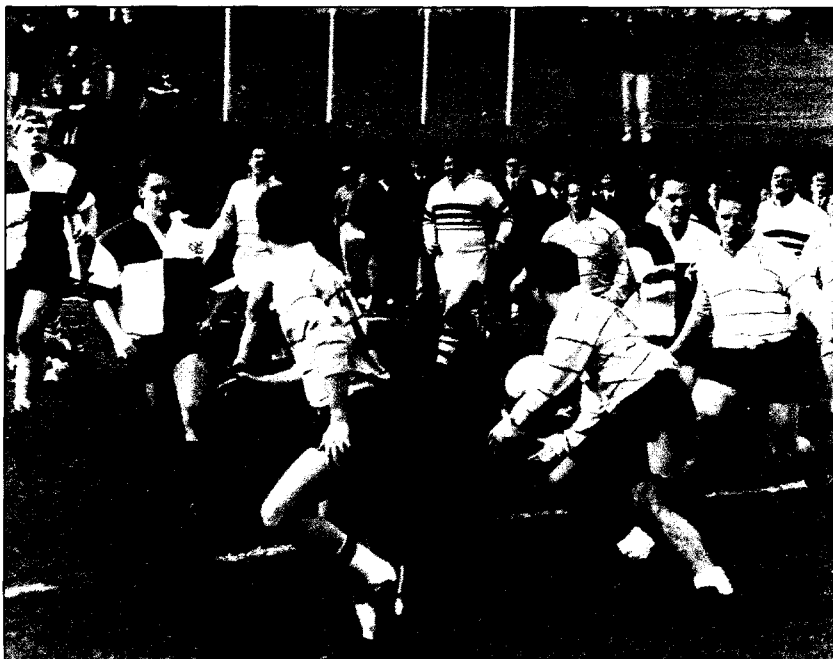
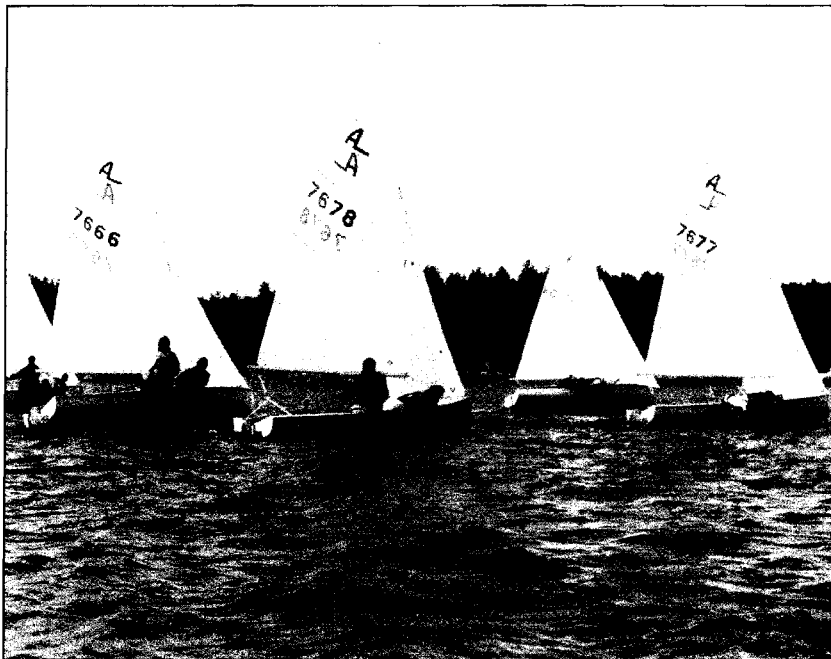
TABLE 5

## Second Year – Degrees in Engineering

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training II	Conversational French	0	0	3	2	0	3	2	1
History 221	Canadian History for Engineers	1½	3	0	0	–	–	–	
Military Leadership 212	Social Psychology	1½	–	–	–	3	0	0	
Mathematics 223	Calculus, Vector Calculus, Differential Equations	3	3	1	0	3	1	0	
Mathematics 241	Probability and Statistics	1½	3	0	0	–	–	–	3
Mathematics 252	Linear Algebra	1½	–	–	–	3	0	0	
Physics 203	AC Circuits and Electromagnetism	3	2½	0	3	2½	0	3	4,5
Physics 211	Vibrations and Waves	1	2½	0	0	–	–	–	
Physics 252	Modern Physics	1	–	–	–	2½	0	0	
Chemistry 203	Thermodynamics	3	2	0	0	3	0	0	
Computer Science 211	Computer Applications I	1	2	0	2	–	–	–	5
Engineering 232	Mechanics of Materials	2	–	–	–	3	0	2	
Engineering 263	Engineering Graphics and Descriptive Geometry	3	2	0	1	3	0	1	
PE 203	Physical Education	0	0	0	2	0	0	2	
Drill 203	Basic and Sword Drill	0	0	0	1	0	0	1	
Total		23	20	4	11	23	4	11	
Optional Courses: Mathematics 233	Advanced Calculus, Vector Calculus, Differential Equations	4	4	1	0	4	1	0	2

## TABLE 5 CONTINUED

- NOTES –
1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.
  2. Recommended in lieu of Mathematics 223 for those who plan to continue in Electrical Engineering, Engineering Physics or Honours Science.
  3. Required for students wishing to continue in all Science programs or the Applied Military Psychology Program in Third Year at RRMCC.
  4. Required for students wishing to continue in programs with Computer Science in Third Year at RRMCC.
  5. Recommended for students wishing to continue in programs with Oceanography at RRMCC, or for Naval Architecture at MIT.



## *COURSE DESCRIPTIONS*

### **COURSE DESCRIPTIONS**

The different courses offered at RRM C are described in detail in the sections that follow (listed alphabetically by departments). For each course at RRM C the name of the subject (e.g. History) is given, followed by a three digit number. The first number indicates the level or year in which the course is normally taken, the second number is used to distinguish between the various courses offered by the department in that year, and the third number indicates the semester in which the course is offered. Some courses at RRM C extend over a full academic year of two semesters; these courses will be indicated by a 3 as the third number (e.g. Mathematics 203). A few courses have 4 as the third number, indicating it may be offered either semester. The course number is followed by a brief descriptive title of the course; this in turn is followed by numbers in two sets of parentheses that indicate firstly the units of credit, and secondly the number of lectures, tutorials, and laboratory periods respectively each week in whichever semester it is offered (6 numbers if course covers both semesters). A detailed course description would read as follows:

**PHYSICS 123: Introductory Physics(3) (3,0,0/3,0,0)**

This is a full year course offered by the Department of Physics for second year Arts or Administration students. It is listed as a 100 level course since introductory courses at other universities are so numbered regardless of the year that students take them. The course has 3 units of credit and meets three times each week over both semesters for lectures.

**PHYSICS 411: Solid State Physics(1½) (3,0,0)**

This is a one semester course offered by the Department of Physics in the first semester of the fourth year. The course meets three times each week for lectures, has no tutorial or laboratory periods, and carries 1-1/2 units of credit.

**MATHEMATICS 203: Finite Mathematics,  
Probability & Statistics (3) (3,2,0/3,2,0)**

This is a full year course offered by the Department of Mathematics in Second Year. The course extends over both the first and second semesters of the year, meets three times each week for lectures, twice for tutorials, has no laboratory periods, and carries three units of credit for the year.

- Notes: 1. In a few cases, a student may take only one semester of a two semester course. In this case his transcript will indicate a course numbering ending in a 1 or 2, instead of the usual 3 (e.g. History 121 is the first semester of the History 123 course).
2. A course ending in a 4 indicates, for calendar purposes only, an arts elective which may be offered in either semester depending on the instructional resources.

DEPARTMENT OF CHEMISTRY

Associate Professor and Head of Department - M.R. Barr, BSc, MSc, PhD

Professor - G.M. Barrow, BSc, MSc, PhD

Professor - M.G. Robinson, BSc, PhD

Associate Professor - K.J. Reimer, BSc, MSc, PhD

**CHEMISTRY 103: General Chemistry (3)**

**(3,0,3/3,0,3)**

Review of fundamental laws. The properties of gases; elementary kinetic theory, Atomic structure, the Periodic Law. Types of valence bond; molecular structure. Redox processes and electrolytic and voltaic cells. The properties of solutions. Rates of chemical reactions. First and Second Laws of Thermodynamics. Chemical equilibrium; ionic equilibria; pH, hydrolysis, and buffers. A brief introduction to organic chemistry.

The laboratory course supplements the lecture material. Types of substances and their physical and chemical properties are investigated. Included are studies of elements and compounds, covalent and ionic substances, anions and cations, acids and bases and transition metal coordination compounds. The principles of spectroscopy and thermodynamics are introduced. Principles of redox reactions, equilibria and kinetics are illustrated with organic chemistry reactions.

Computer supplements provide additional studies of chemical bonding, quantum mechanics, kinetics and chemical equilibria.

**CHEMISTRY 123: Introductory Chemistry (3)**

**(3,0,0/3,0,3)**

This course surveys the development of modern chemical science with an emphasis on the application of the scientific method. The concept of atoms and atomic structure will be considered as will the nature of chemical bonds and the relation of chemical properties to the periodic table. Topics such as redox reactions, solubility, physical state, equilibrium, polymers, biochemistry and radio-activity will be covered; the emphasis being on the application of these principles to an understanding of the world in terms of molecular behaviour. Examples will include polymers, explosives, war gases, corrosion, chemotherapy, toxicology, energy options. Laboratory experiments will illustrate and supplement the lecture material.

**CHEMISTRY 203: Thermodynamics (3)**

**(2,0,0/3,0,0)**

The course is offered for second year Engineering students and is divided into two parts:

- (a) Review of the Gas Laws; Elementary thermodynamics; discussion of the first, second and third laws; reversible and irreversible processes; spontaneity of reactions involving gases and different types of heterogeneous systems. Electrode potentials, cells, free energy, chemical potential, one and two phase systems, the phase rule; and, as time allows;
- (b) Applications of chemistry of interest specifically to engineers, drawn from such topics as gaseous, liquid and solid fuels; lubricants; corrosion; cells; batteries; plastics; protective coatings; explosives, etc.



## **CHEMISTRY**

### **CHEMISTRY 243: Thermodynamics (3)**

**(2,0,0/3,0,3)**

Taken by Science students in both semesters. In the second semester, a weekly laboratory session will accompany the lectures. Experiments include enthalpies of combustion, neutralization and vaporization; electrode potential and temperature dependence; phase rule; distillation; calculation of thermodynamic values and computer simulations. (See Chemistry 203 in which lectures are the same.)

### **CHEMISTRY 312: Applications of Chemistry (1½)**

**(3,0,0)**

Review of bonding and structural chemistry; fuels, combustion processes and energy sources; explosives; lubricants and protective coatings; organic and inorganic polymers including mechanisms for synthesis and breakdown. Structures and properties of solids; properties of metals including ferrous and non-ferrous alloys; electrochemistry of cells, batteries, and fuel cells; principles of corrosion and corrosion control.

Offered on demand. Prerequisite: Consent of the Department.

### **CHEMISTRY 401: Applied Thermodynamics (1½)**

**(3,0,0)**

Review of the laws of thermodynamics and applications of fundamental relationships. Heat engines; study of types and thermodynamics of operation, gas liquefaction and refrigeration systems; non-ideal substances and the use of steam tables; thermodynamics of flow processes for compressible and incompressible fluids. Methods of presenting thermodynamic data. Psychrometry and the application of thermodynamics to meteorology.

<sup>1</sup>Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## COMPUTER SCIENCE

The undergraduate degrees in Physics and Computer Science and Space Science and Computer Science are interdisciplinary. As there is no department of Computer Science, the curriculum is under the guidance of the Computer Science Curriculum Committee chaired by the Professor in Charge (PIC).

## INSTRUCTORS

## DEPARTMENT

Professor and PIC - A.G. Buckley, BSc, MSc, PhD	Mathematics
Associate Professor - J.S. Collins, BSc, BEng, MEng, PhD, MCSEE, MEIC, MIEEE, PEng	Engineering
Associate Professor - J.L. LaCombe, BSc, MSc, PhD	Physics
Associate Professor - F. Milinazzo, BSc, PhD	Mathematics
Associate Professor - M.J. Press, BSc, MSc, PhD	Physics
Associate Professor - R.C. Snell, BSc, MSc, PhD	Mathematics
Associate Professor - W.W. Wolfe, BSc, MSc, PhD	Mathematics
Assistant Professor - J.R. Buckley, BSc, PhD	Physics
Assistant Professor - D.J. Shpak, BSc, MEng, PhD, PEng	Engineering
Lecturer - Captain D.P. Mulders, BSc, MMath	Mathematics

The descriptions of named Computer Science courses follow, but there are a number of associated courses which are to be found under the department offering them, e.g. signal processing, electronics and microcomputers.

Specialization in Computer Science leads to an understanding of developments in computer science technology. An entry is made into the volatile and rapidly developing discipline of computer science with sufficient theoretical background to enable the student to keep up with developments in this growing field. The computer science curriculum is based upon the core curricula recommended by committees of the Association of Computing Machinery (ACM) and of the Institute of Electrical and Electronic Engineers (IEEE). The IEEE part of the curriculum places a greater emphasis upon hardware relevant to military equipment than does that of the ACM.

## BSc COMBINED MAJOR WITH COMPUTER SCIENCE

Refer to Academic Regulations 10 and 12d.

*Third Year***Major**

Computer Science 302  
Computer Science 321  
Computer Science 332  
Computer Science 341

*Fourth Year***Major**

Computer Science 402  
Computer Science 411  
Computer Science 412  
Computer Science 421

See the appropriate Departmental listing for information concerning the other selected Combined Major.

**Other Courses**

Military Leadership 311  
Math 301  
Math 302

**Other Courses**

Military Leadership 402

## COMPUTER SCIENCE

### Elective Courses

1½ units of credit of  
300 or 400 level Arts or  
Science elective courses.  
(Note 1)

### Elective Courses

3 units of credit of 300 or  
or 400 level Arts or Science  
elective courses (Note 1)  
1½ units of Arts elective  
(Note 2)

Note 1: When combined with Physics

Note 2: When combined with Space Science

Honours degree additional requirements are MA 432, CS 443 and an additional  
1½ units of Science elective. Refer to Academic Regulations 13a to 13e.

## BSc GENERAL WITH COMPUTER SCIENCE CONCENTRATION

Refer to Academic Regulations 10 and 12c.

Concentration Courses		Credits		Prerequisites
CS302	Intro to Computer Systems	2.0	(4,0,2)	CS211
CS341	Data Structures	1.5	(3,0,0)	CS211
And 6 units of credit selected from:				
CS321	Theory of Computing	1.5	(3,0,0)	CS211
CS332	Programming Languages	1.5	(3,0,1)	CS341
CS421	Microcomputer Architecture	1.5	(3,0,0)	CS302
CS412	Digital Design	1.5	(2,0,0)	CS421
CS411	Operating Systems	1.5	(3,0,1)	CS302, CS332
CS402	Data Base Management Systems	1.5	(3,0,0)	CS321

With the written permission of the Dean of Science and Engineering one or more of  
the following courses may be substituted for credit in the Computer Science  
concentration if not applied to a second concentration:

MA312	Numerical Analysis	1.5	(3,0,0)	CS211, MA252
SS442	Robotics	1.5	(3,0,0)	PH322

### Second Concentration

See appropriate Departmental listing for information concerning the selected second  
concentration.

### Other Courses

ML311	Organizational Leadership	1.5	(3,0,0)
ML402	Professional & Ethical Issues	1.5	(3,0,0)

### Elective Courses

Arts elective 300 or 400 level courses: 3 units of credit  
Science elective 300 or 400 level courses : 6 units of credit

## COMPUTER SCIENCE 112: Computer Science Concepts and Applications (½)

(1,0,1)

For first year Arts or Administration students.

An introduction to computer hardware and software. The basic components of a computer are discussed, including the CPU, RAM and ROM memories, files and disk storage, and basic I/O concepts. Application software is then examined, particularly that available on personal computers. This includes concepts of text processing, comparing editing, word processing, and high quality typesetting using TEX. Data bases are introduced looking briefly at their design and methods of query. Finally, the utility of spreadsheets for financial, statistical and graphical analysis is introduced.

**COMPUTER SCIENCE 122: An Introduction to Computing (1) (2,0,2)**

For all first year Science and Engineering students.

An introduction to the methods of algorithm and program development for problem-solving on a computer. The emphasis will be on problem analysis, algorithm design, and development of structured, modular programs. The Pascal language is introduced and used as the language of instruction.

**COMPUTER SCIENCE 202: Computer Applications II (1) (2,0,1)**

An elective course for Second Year Science students.

This course may be elected with Chemistry 203 in lieu of Chemistry 243. The contents will introduce students to a diversity of topics related to the programs with Computer Science, chosen from hardware, software, and operating systems.

**COMPUTER SCIENCE 211: Computer Applications I (1) (2,0,2)**

For second year Science or Engineering students.

Advanced programming language techniques, and application of these techniques to typical scientific problems. The basic programming techniques of Pascal learned in CS122 are extended to include records, user-defined types, pointers and recursion. An introduction to data structures is given, including linked lists, stacks and trees. Algorithm efficiency is considered. Application of these ideas to problems of searching, sorting, and expression evaluation is discussed. FORTRAN is introduced in the later part of the course; syntactic differences with Pascal are presented, with emphasis on semantic similarities. Programming applications to solve basic problems in numerical analysis using the above ideas are done in FORTRAN.

Prerequisite: Computer Science 122

**COMPUTER SCIENCE 302: Introduction to Computer Systems (2) (4,0,2)**

Systems components and machine language including instruction types, addressing modes, opcode design and microprogramming. Assembly language programming techniques including arithmetic and logical operations, data representation, list processing, loop control and I/O buffering. Comparison of several machine architectures.

Prerequisite: Computer Science 211 or consent of the Department.

## *COMPUTER SCIENCE*

### **COMPUTER SCIENCE 311: Interactive Computer Graphics (1½) (3,0,0)**

The content will include point and line drawing displays, two dimensional transformations, graphics packages, interactive graphics, and raster graphics. Instruction and exercises will be oriented toward use of the Engineering Department's APOLLO workstation facilities using GKS software.

This course is intended primarily for Physics and Computer Science students who have PASCAL programming experience.

### **COMPUTER SCIENCE 321: Theory of Computing (1½) (3,0,0)**

Introduction to theoretical aspects of Computer Science. Discussion will include topics widely used in Computer Science, including the big-O notation and algorithm analysis, along with basic graph theory. Essential topics from discrete mathematics including sets, functions, relation and proof techniques will be covered. An introduction to formal topics of Computer Science will be given, including formal languages and computation, finite automata, formal grammars and normal forms, and Turing machines.

Prerequisite: Computer Science 211.

### **COMPUTER SCIENCE 332: Organization of Programming Languages (1½) (3,0,1)**

Language definition; data types and structures; control structures; run-time considerations. Comparison of the structure of several high-level languages both compiled and interpreted.

Prerequisite: Computer Science 302 and 341 or consent of the Department.

### **COMPUTER SCIENCE 341: Data Structures (1½) (3,1,0)**

Topics covered include analysis of algorithms; representations and applications of data structures (stacks, lists, trees, queues); file processing technique including sequential and random access organizations, sorting, merging and searching. Students will gain experience with a number of programming languages in a variety of operating system environments.

### **COMPUTER SCIENCE 402: Data Base Management Systems (1½) (3,0,0)**

An introduction to DBMS: data base management systems. Topics will include a discussion of relational, hierarchical and network models. Methods of designing data base systems, and the relative advantages of the different models will be considered. Accessing data using query languages will be discussed. Some implementation issues will be presented, including file organization, indexing and hashing, and concurrency control. Safety issues will be looked at, including precautions against failures, and locking to control concurrent access.

Prerequisites: Computer Science 321, 341.

**COMPUTER SCIENCE 411: Operating Systems (1½) (3,0,1)**

Resource management including memory, processor, processes and devices. Operation of loaders, segmentation and paging. Process dispatching, queue management. Concurrency, mutual exclusion, synchronization and communication. I/O buffering and request processing.

Prerequisite: Computer Science 302 or consent of the Department.

**COMPUTER SCIENCE 412: Digital Design (1½) (2,0,4)**

This course develops the ideas of the top-down design of digital circuits.

Topics discussed include Boolean Algebra, Karnaugh maps, building blocks for digital design and memory, the Algorithmic State Machine and how to implement it, as well as design pitfalls. Practical examples are used to illustrate these concepts including the design of a small mini computer. In the laboratory, various hardware interfaces are built and tested and small individual projects are undertaken.

Prerequisite: Computer Science 421.

**COMPUTER SCIENCE 421: Microcomputer Architecture (1½) (2,0,4)**

A discussion of the hardware requirements needed to make a microcomputer function. Includes CPU, RAM, ROM, system bus. I/O (programmed, interrupt, DMA and serial) with handshaking, A/D and D/A converters, timing diagrams and microprogramming. The laboratory gives hands-on experience with these concepts as well as practical experience building several I/O interfaces.

Prerequisites: Physics 371, Computer Science 302 or consent of the Department.

**COMPUTER SCIENCE 443: Computer Science Project (1) (0,0,2/0,0,2)**

Fourth Year students in the Honours (course) program, working singly or in syndicates, work on an experimental or theoretical project in the general area of computer science with members of the staff of the Department of Chemistry, Engineering, Mathematics or Physics. A student must submit and defend a project report according to thesis regulations but of much narrower scope.

The topic must be approved by Faculty Council.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## ENGINEERING

### DEPARTMENT OF ENGINEERING

Associate Professor and Head of Department - J.S. Collins, BSc, BEng(EE),  
MEng(EE), PhD(EE), MCSEE, MEIC, MIEEE, PEng

Associate Professor - M.D. Thom, CD, rmc, pfsc, pcsc, aws, BAsC, AdeC

Assistant Professor - D.J. Shpak, BSc, MEng, PhD, PEng

Assistant Professor - C.J. Damaren, BAsC, MASc, PhD

### BSc GENERAL WITH ENGINEERING SCIENCE CONCENTRATION

Refer to Academic Regulations 10 and 12c.

This concentration normally requires completion of the second year Engineering program (see Table 5).

Concentration Courses	Credits	Prerequisites
EG322 Applied Fluid Mechanics	1.5 (3,0,1)	
And 7½ units of credit selected from:		
EG321 Space Systems & Environ.	1.5 (3,0,0)	
EG411 Spacecraft Dynamics	1.5 (3,0,0)	PH322
EG442 Robotics	1.5 (3,0,0)	PH322
CS412 Digital Design	1.5 (2,0,4)	CS421
CS421 Microcomputer Architecture	1.5 (2,0,4)	CS302
CH401 Applied Thermodynamics	1.5 (3,0,0)	
MA411 Signal Processing I	1.5 (3,0,0)	MA301
PH322 Intermediate Mechanics	1.5 (3,0,3)	MA301
PH371 Electronics & Microcomputers	2.0 (3,0,3)	

### Second Concentration

See appropriate Departmental listing for information concerning the selected second concentration.

### Other Courses

ML311 Organizational Leadership	1.5 (3,0,0)
ML402 Professional & Ethical Issues	1.5 (3,0,0)

### Elective Courses

Arts elective 300 or 400 level courses: 3 units of credit

Science elective 300 or 400 level courses : 6 units of credit

### ENGINEERING 232: Mechanics of Materials (2) (3,0,2)

For second year Engineering and Honours Science students; recommended for those intending to enter the Physics and Oceanography program; optional for General Science. This course is essential for those students contemplating eventual post graduate work in naval architecture.

Review of statics; stresses due to axial loads, strain and axial deformation; stress due to temperature change; physical properties of materials, torsion of circular

shafts and thin walled tubes; analysis of plane stress, stresses in beams due to bending, combined stresses. The elastic properties are emphasized throughout.

The Mechanics of Materials laboratory gives the student an opportunity to carry out: tensile tests on a number of different metal samples, Rockwell Hardness tests; and torsion tests to failure. There will be demonstrations of strain distribution in a beam due to bending to help illustrate the subject matter.

**ENGINEERING 261: Engineering Graphics (1) (2,0,1)**

For second year General and Honours Science students.

Use of drawing instruments and drawing materials; geometric constructions; lettering; sketching and shape description; multiview projection; reading drawings; sectional views; dimensioning; and isometric pictorial sketching. An introduction will be given to computer aided drafting (CAD).

**ENGINEERING 263: Engineering Graphics and Descriptive Geometry (3) (2,0,1/3,0,1)**

For second year Engineering students.

Includes all topics covered in Engineering 261 and the following additional topics: oblique and perspective drawings; auxiliary views; intersections; screw threads and fasteners; limit dimensioning; assemble drawings; revolutions; developments; empirical equations; graphical solution of vectors; computer aided drafting; simple determinate truss analysis and an introduction to the design process with student teams providing design solutions to stated problems.

The Engineering Department has twenty-five networked APOLLO workstations running Auto-Trol computer aided drafting software.

Practical problems are solved using either manual drafting or computer aided drafting (CAD).

**ENGINEERING 321: Space Systems and Environment (1½) (3,0,0)**

Description of state-of-the-art spacecraft. Application of design techniques and synthesis of systems. Comparative propulsion systems. Re-entry considerations. Mission constraints. Contingency planning. Sub-system interaction. Design project. The near-earth environment and its effect of space vehicle design. System analysis of sensors, structure, controls, communication, electrical power, environment and ground support.

**ENGINEERING 322: Applied Fluid Mechanics (1½) (3,0,1)**

An introduction to basic theory and kinematics of flow, Navier-Stokes equations, model studies, boundary layer concepts, turbulent flow, lift and drag and an introduction to compressible flow. The laboratory period will involve student conducted laboratory demonstrations and short written experiments.



## *ENGINEERING*

### **ENGINEERING 402: Robotics (1½)**

**(3,0,0)**

This course teaches the interdisciplinary field of robotic control, sensing and intelligence.

The course brings together, in a logical progression, all of the basic design, analysis and synthesis principles and techniques of the field.

Topics covered include robot arm kinematics and dynamics, planning and control of manipulator movement, sensing and machine vision, robot programming languages and robot intelligence and task planning.

Prerequisite: Physics 322.

### **ENGINEERING 411: Spacecraft Dynamics (1½)**

**(3,0,0)**

Controlling the attitude of a satellite. Quaternion attitude parameters, torque-free rigid body motion, flexible body effects and energy dissipation, gravity gradient stabilization, spin stabilization, momentum and reaction wheels, cross-moment gyros, reaction jets, arctan steering, cross-product steering. E and W, explicit, implicit and Q guidance. Manoeuvres, perturbations, docking and rendezvous. Design of computer programs to solve guidance problems.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## **DEPARTMENT OF HISTORY AND POLITICAL ECONOMY**

Professor and Dean of Arts - J.A. Boutilier, BA, MA, PhD (Sabbatical 1990-91)

Professor and Acting Dean of Arts - A.G. Martel, BA, MA, PhD, FRHistS

Associate Professor and Head of Department - J.A. Bayer, BA, MA, PhD

Professor-P.J.S. Dunnett, BSc, MA, PhD

Assistant Professor - P.G. Nixon, BA, BEd, MA, PhD

Assistant Professor - P. Gardner, BA, MA, PhD

Assistant Professor - C.J. Fedorak, BA, MA, PhD (Sabbatical replacement)

Lecturer - A. Battista, CD, BAdm, MA

Special Lecturer - T.B. Killip, BA, MA

### **ENTRY AND QUALIFICATIONS**

Honours and General programs of study, as outlined below, leading to a BA degree are offered in the Department of History and Political Economy. Candidates for a BA may enter the program from either the Arts, Science or Engineering Second Year programs at any of the CMCs. Three concentrations in the interdisciplinary program of Military and Strategic Studies are offered.

Candidates for the BA Honours degree enter the program in the Third Year and must normally have obtained an overall weighted average of 66 percent at the end of the Second Year. Honours students are required to maintain an overall average of 66 percent throughout the Third and Fourth Years of study. For further information regarding course requirements and admission to the programs of study in the Honours programs, see Academic Regulation 13.

The selection of courses to make up a program of study in the Department must be guided by the outlines listed below, the general degree requirements and academic regulations, and in consultation with departmental academic advisors. Any exceptions to the listed courses may be made only with the prior written approval of the Head of the Department and the Dean of Arts which must be on file in the Office of the Registrar.

### **PROGRAMS OF STUDY**

The Military and Strategic Studies program is an interdisciplinary program designed to introduce students to 20th century diplomatic and military history, contemporary international relations and modern strategic thought. It builds upon and develops from the First and Second Year programs of study at the CMCs. The program is intended as a solid foundation for subsequent officer development through individual study of disciplines relating to war and the military.

## *HISTORY AND POLITICAL ECONOMY*

### **BA GENERAL, MILITARY AND STRATEGIC STUDIES**

(Joint Concentration in History and International Politics)

Refer to Academic Regulations 10, 12a and 12b

#### *Third Year*

##### **Major**

History 311  
History 343  
Political Science 321  
Political Science 342 or  
Political Science 302  
Political Science 312

##### **Other Courses**

Military Leadership 311

##### **Elective Courses**

*One of the following:*

Economics 311\*  
Economics 321  
Economics 331  
Economics 341\*  
Economics 361\*  
History 331  
Political Science 361\*

*One of the following:*

Economics 332  
Economics 352\*  
Economics 422  
Economics 432\*  
Economics 442\*  
History 302  
Political Science 322\*, and  
*one* 300 or 400 level course in  
Literature or Philosophy  
or Applied Psychology or  
Science in the *second semester*.

#### *Fourth Year*

##### **Major**

History 411  
History 421  
History 432  
History 452  
Political Science 441  
Political Science 432

##### **Other Courses**

Military Leadership 402

##### **Elective Courses**

*One of the following:*

Economics 311  
Economics 341\*  
Economics 361\*  
Economics 421\*  
History 471  
Political Science 361\*  
Political Science 401\*

*One of the following:*

Economics 332  
Economics 352\*  
Economics 412\*  
Economics 422\*  
Economics 432\*  
Economics 442\*  
History 302  
History 312\*  
Political Science 302\*  
Political Science 322\*  
Political Science 412\*  
Political Science 402\*, and  
*one* 300 or 400 level course in  
Literature or Philosophy  
or Applied Psychology or  
Science in the *first semester*.

Note: If Political Science 213 or its equivalent was not completed in Second Year, it must be taken in the Third Year in lieu of three units of credit in elective courses outside the student's area of joint concentration.

\* Offered in 1990-91

**BA GENERAL, MILITARY AND STRATEGIC STUDIES**

(Joint Concentration in Economics and Politics)

Refer to Academic Regulations 10, 12a and 12b.

*Third Year*

**Major**

Political Science 361

Political Science 322

Economics 341

Economics 352

**Other Courses**

Military Leadership 311

**Elective Courses**

*One of the following:*

Economics 311\*

Economics 321

Economics 331

Economics 361\*

*One of the following:*

Political Science 321\*

Political Science 441\*

*One of the following:*

Economics 332

Economics 422

Economics 432\*

Economics 442\*

*One of the following:*

Political Science 302\*

Political Science 312\*

Political Science 342, and

*one* 300 or 400 level

course in Literature or

Philosophy or Applied

Psychology or Science

in the *first semester*.

*Fourth Year*

**Major**

Political Science 401

Political Science 402

Economics 412

Economics 421

**Other Courses**

Military Leadership 402

**Elective Courses**

*One of the following:*

Economics 311\*

Economics 321

Economics 331

Economics 361\*

*One of the following:*

Political Science 321\*

Political Science 441\*

*One of the following:*

Economics 332

Economics 422

Economics 432\*

Economics 442\*

*One of the following:*

Political Science 302\*

Political Science 342

Political Science 412\*

Political Science 432\*, and

*one* 300 or 400 level course

in Literature or Philosophy or

History or Applied Psychology or

Science in the *second*

*semester*.

Note: If Political Science 213 or its equivalent was not completed in Second Year, it must be taken in the Third Year in lieu of three units of credit in elective courses outside the student's area of joint concentration.

\* Offered in 1990-91

## *HISTORY AND POLITICAL ECONOMY*

### **BA GENERAL, MILITARY AND STRATEGIC STUDIES**

(Joint Concentration in History and Literature)

Refer to Academic Regulations 10, 12a and 12b.

#### *Third Year*

##### **Major**

History 311

History 343

Literature 322

English 341

English 342

#### *Fourth Year*

##### **Major**

History 411

History 421

History 432

Literature 432

##### **Other Courses**

Military Leadership 311

##### **Other Courses**

Military Leadership 402

Philosophy 311

Philosophy 422

##### **Elective Courses**

3 units of credit in any

300 or 400 level Arts

courses and

1½ units of credit in

any 300 or 400 level

elective course.

##### **Elective Courses**

3 units of credit in any

300 or 400 level Arts

courses and

1½ units of credit in

any 300 or 400 level

elective course.

### **BA HONOURS, MILITARY AND STRATEGIC STUDIES**

(All areas of joint concentration)

Refer to Academic Regulations 13a to 13e.

In addition to the courses listed above for the general programs, candidates for the honours degree in a joint concentration must present six additional units of credit in elective courses from *inside* the student's areas of concentration. Three of these units of credit must be earned in the Third Year of study and three units of credit must be earned in the Fourth Year. In the Fourth Year, honours candidates may elect to complete the course Military Studies 483 in lieu of three additional units of credit.

**ECONOMICS 213: Principles of Economics (3) (3,0,0/3,0,0)**

For second year Arts students.

This course amplifies the material covered in Economics 301 and includes research projects calculated to enrich a principles course.

**ECONOMICS 301: Economics for Scientists (1½) (3,0,0)**

For Third and Fourth Year Science students.

An introduction to the methods of economics: the central problems of every economic society; the elements of supply and demand; theory of production and the firm; the concept and determination of national income; the monetary system; international trade and finance; and Canadian economic problems and policy.

**ECONOMICS 304: Directed Reading and Research (1½) (0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program. Students wishing to pursue a specialized interest may undertake a program of directed reading and/or research in that area under the supervision of a member of staff. Such programs may be undertaken by students either individually or in small groups.

Offered on demand. Prerequisite: consent of the instructor, approval of program by head of department and Faculty Council.

**ECONOMICS 311: The Canadian Economy (1½) (3,0,0)**

An examination of contemporary economic issues in Canada; inflation, unemployment, immigration, the economic basis of nationalism, separatism, trade unionism, and the role of multi-national corporations.

Offered on demand. Prerequisite: consent of the instructor.

**ECONOMICS 314: Selected Topics in Economics (1½) (0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program.

A selected topic of interest to students in M&SS will be chosen to facilitate understanding of a specialized subject such as: Economics of Developing Countries; Comparative Economic Systems; Economics of the USSR and East European Countries.

Offered on demand. Prerequisite: consent of the instructor.

**ECONOMICS 321: Mathematical Economics (1½) (3,0,0)**

Application of linear and matrix algebra, calculus and dynamic analysis to economics.

Offered on demand. Prerequisite: consent of the instructor.

## *HISTORY AND POLITICAL ECONOMY*

### **ECONOMICS 331: Quantitative Methods (1½) (3,0,0)**

An introduction to econometrics to cover topics such as: simple regression; multiple regression; autoregressive errors; heteroskedasticity; simultaneous equation models and instrumental variables estimation.

### **ECONOMICS 332: Canadian Economic History (1½) (3,0,0)**

This course examines the development of the Canadian economy to the present day. The roles of labour, capital and technology are analyzed in the light of modern growth theories.

Offered on demand. Prerequisite: consent of the instructor.

### **ECONOMICS 341: Intermediate Microeconomic Theory (1½) (3,0,0)**

Resource allocation under competitive and non-competitive market conditions. The analytics of prices, wages and rents in a market exchange economy. Private and public choice in both decentralized and centrally planned economies. The implications of economic management at the micro-level.

Offered on demand. Prerequisite: consent of the instructor.

### **ECONOMICS 352: Intermediate Macroeconomic Theory (1½) (3,0,0)**

Theories of aggregate economic conduct. The determination of national income, employment, consumption, investment, inflation and economic growth. The study of economic policy at the macro-level.

Offered on demand. Prerequisite: consent of the instructor.

### **ECONOMICS 361: Applied Business Finance (1½) (3,0,0)**

This course is designed to provide students with a basic understanding of business finance. Topics included are: annuities, sinking funds, amortization of debt, bonds and bond discounting, residential and commercial mortgages, capitalized cost, and finally, an overview of financial instruments most commonly used in business. Beyond the basic business applications, students will be exposed to government uses of annuities and sinking funds.

Offered on demand. Prerequisite: consent of the instructor.

### **ECONOMICS 412: Industrial Organization (1½) (3,0,0)**

Industrial Organization examines the structure, conduct and performance of industry. Topics to be covered will include: industry concentration, economics of scale, patents, vertical integration and barriers to entry, the goals of the firm, the growth of the firm, multi-nationals, advertising, price formation and government influences on industrial organization.

Offered on demand. Prerequisite: consent of the instructor.

**ECONOMICS 421: The Economics of Defence (1½) (3,0,0)**

An examination of the implications of Canadian defence policy upon the Canadian economy, and the constraints placed by economic considerations.

Prerequisite: consent of the instructor.

**ECONOMICS 422: Money and Banking (1½) (3,0,0)**

The principles of money, credit creation and banking; organization, operation and control of the banking system; and the relationship between the quantity of money and the level of economic activity; and the theory of exchange rates and international financial markets.

Offered on demand. Prerequisite: consent of the instructor.

**ECONOMICS 432: International Trade and Finance (1½) (3,0,0)**

An analysis of the pure theory of international trade and topics of international policy. The course examines such issues as: free trade; tariffs; regional integration; the balance of payments; and the theory of adjustments to balance of payments disequilibria. Theory and policy are applied in the context of Asia-Pacific trade.

Prerequisite: consent of the instructor.

**ECONOMICS 442: Natural Resource Economics (1½) (3,0,0)**

This course analyzes the theories and policies which are used to develop and manage natural resources in industrial countries. Topics examined include project evaluation, management of renewable and non-renewable resources, resource taxation, conservation and optimal utilization. Theories and policies will be applied using Canadian case studies.

Prerequisite: Economics 341 or consent of the instructor.

**HISTORY 121: European History to 1500 (1½) (3,0,0)**

For second year Arts students who transferred from Science at the end of the first semester in the first year.

A survey of European civilization from the Ancient World to the Renaissance with particular emphasis upon the growth of Christianity, the nature of feudal society, the impact of the Renaissance and the beginnings of the European expansion.

**HISTORY 122: The Founding of New Societies, 1500-1763 (1½) (3,0,0)**

For first year Arts students who transfer from Science at the end of the first semester.

A survey of the expansion of Europe beyond the European frontier: the founding of the Spanish, Portuguese, British, French and Dutch colonies, with particular emphasis upon New France and British North America. The impact of the expansion on European society is also considered, along with the Reformation, absolutism and the Enlightenment.



## *HISTORY AND POLITICAL ECONOMY*

### **HISTORY 123: European History to 1763 (3)**

**(3,0,0/3,0,0)**

For first year Arts students and for second year Arts students who did not take it in first year.

The first semester consists of a survey of European civilization from the Ancient World to the Renaissance with particular emphasis upon the growth of Christianity, the nature of feudal society, the impact of the Renaissance and the beginnings of the European expansion.

The second semester consists of a survey of the expansion of Europe beyond the European frontier: the founding of the Spanish, Portuguese, British, French and Dutch colonies, with particular emphasis upon New France and British North America. The impact of the expansion on European society is also considered, along with the Reformation, absolutism and the Enlightenment.

### **HISTORY 211: Europe and the Wider World, 1763-1870 (1½)**

**(3,0,0)**

This is a lecture/seminar course for second year Arts students.

This course continues the examination undertaken in HI 123 of the inter-relationship between European and North American history in the period between the Seven Years and Franco-Prussian Wars. Attention is paid to the revolutionary process, the development of ideologies in Nineteenth Century Europe, and the emergence of the "nation state".

### **HISTORY 212: World History, 1870-1970 (1½)**

**(3,0,0)**

While this course continues to emphasize European, American and Canadian history, coverage expands to the world stage. Topics dealt with include the development of independent Canada; the era of New Imperialism in Africa, Asia, and Oceania; the rise of the United States as a world power; the World Wars; the decline of European empires; and the new world order.

### **HISTORY 221: Canadian History for Engineers (1½)**

**(3,0,0)**

This is a lecture survey course for second year Science and Engineering students.

This course is a survey of the history of Canada from 1867 to 1980, with emphasis on Canadian military history.

### **HISTORY 302: Technology and War, 1914 to Present (1½)**

**(3,0,0)**

The focus is on the political history of technology in this century. Seminars examine the themes of technology and morality, the difficulties of adopting new technology during a war, the relationship of politics and military technology, and finally, what predictions can be made for the future based on historical "lessons". Required readings, selected for the specific questions discussed, are used rather than a text.

### **HISTORY 304: Directed Reading and Research (1½)**

**(0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program.

## *HISTORY AND POLITICAL ECONOMY*

Students wishing to pursue a specialized interest may undertake a program of directed reading and/or research in that area under the supervision of a member of staff. Such programs may be undertaken by students either individually or in small groups.

Offered on demand. Prerequisite: consent of the instructor, approval of program by head of department and Faculty Council.

### **HISTORY 311: The Evolution of Modern Strategy (1½) (3,0,0)**

This seminar course examines the evolution of strategic thought in relation to the experience of war in the post-Napoleonic pre-atomic period.

### **HISTORY 312: Armies and Society (1½) (3,0,0)**

An examination of the military as a social and political phenomenon in various cultures: to what extent is the military 'a mirror of society'? to that extent have military organizations attempted to impose their values on the rest of society? Each term a particular culture or ideology is selected for investigation: communist, fascist, liberal-democratic or third world.

Offered on demand. Prerequisite: consent of the instructor.

### **HISTORY 314: Selected Topics in History (1½) (0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program.

A selected topic of interest to students in M&SS will be chosen to facilitate understanding of a specialized subject such as: Decolonization in Africa; Canada and the Cold War; Traditions of Revolution in Latin America.

Offered on demand. Prerequisite: consent of the instructor.

### **HISTORY 331: Historiography and Methodology (1½) (3,0,0)**

This course is designed to introduce students to research and writing techniques as well as the problems of historiography.

Offered on demand. Prerequisite: consent of the instructor.

### **HISTORY 343: War and Diplomacy in Europe: 1848-1960 (3) (3,0,0/3,0,0)**

History in the grand manner: the rise and fall of Great Powers, the making and unmaking of states, the eclipse of Europe by America and Asia. The origins of the First World War, the peace of Versailles, the twenty years' crisis and the beginnings of the Cold War form the broad divisions of the course, while imperialism and nationalism, communism and fascism predominate as factors underlying the flow of events. The interplay of diplomacy with strategy, trade, finance and technology is examined throughout.

### **HISTORY 411: America as a World Power (1½) (3,0,0)**

A survey of American foreign relations from the Spanish-American War to the withdrawal from Vietnam. It analyzes the transformation of the United States

## ***HISTORY AND POLITICAL ECONOMY***

from colonial to great power status, with attention upon the internal dynamics of that evolution as well as external causes. America's foreign policies are considered in relation to the nation's economic growth and cultural development, its involvement in wars, and the advent of the Truman Doctrine, the Marshal Plan, NATO, SEATO and NORAD.

Particular emphasis is given to the impact of industrial development and technological change, coupled with the role of ideology in the political decision-making process, including changes in strategic thinking and diplomatic method.

### **HISTORY 421: Naval History in the Twentieth Century (1½) (3,0,0)**

This course examines the emergence and eclipse of Japan as a major naval power, the decline of the Royal Navy, the character of critical naval engagements in the First and Second World Wars, the growth of the American and Soviet navies, the role of the Royal Canadian Navy in war and peace, and changes in naval technology and doctrine.

### **HISTORY 432: China and Japan in the Twentieth Century (1½) (3,0,0)**

This course examines: the rise of Japan as an imperial power; the 1911 revolution in China and ensuing warlord era; the struggle between the Kuomintang and communist forces in China prior to the Pacific War; the Pacific War; the Chinese Revolution of 1949; the American occupation of Japan; the Korean War; the dramatic growth of the Japanese economy; the cultural revolution in China; the rapprochement between China and the Western powers; and the new economic, political and military balance in East Asia.

### **HISTORY 452: Russia in the Twentieth Century (1½) (3,0,0)**

Pre-revolutionary Russia; the 1917 revolution; establishment and consolidation of Soviet power, NEP and its repercussions; Stalinization; Comintern; the evolution of Soviet foreign policy and the development of Soviet military power.

### **HISTORY 471: The Pacific Rim and East Asia to 1905 (1½) (3,0,0)**

This course examines the European exploration of the Pacific Basin, the establishment of European colonial empires throughout the region, the response of indigenous cultures to European contact, the growth of great power interests in the area, and the emergence of the modern state of Japan.

### **MILITARY STUDIES 483: Honours Arts Research Seminar (3) (0,3,0/0,3,0)**

A student who receives permission to take this course will meet with his/her instructor on a regular basis throughout the first semester to discuss readings related to the student's proposed topic.

In the second semester the student must write a research paper on the proposed topic. The student must continue to meet regularly with his/her instructor during the preparation of the research paper.

See rules governing Honours Arts Research Seminar.

Prerequisites: Second class honours in Second Year and consent of the Department.

**POLITICAL SCIENCE 102: Introduction to Political Science (1½) (3,0,0)**

This course traces the evolution of liberal democratic thought from Aristotle to Fabian socialism. It also examines the "isms" such as nationalism and totalitarianism. Concepts of political science such as legitimacy, effectiveness and change as characteristics of political systems are introduced.

**POLITICAL SCIENCE 213: Introduction to International Politics (3) (3,0,0/3,0,0)**

A study of factors governing the international political system with emphasis on the development of Russo-American relations since 1945.

**POLITICAL SCIENCE 302: Peacekeeping, Crisis and Warfare (1½) (3,0,0)**

A study of factors determining the nature, extent and control of international conflict with particular emphasis on peacekeeping as a technique of conflict resolution.

Prerequisite: Political Science 213 or permission of the instructor.

**POLITICAL SCIENCE 304: Directed Reading and Research (1½) (0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program.

Students wishing to pursue a specialized interest may undertake a program of directed reading and/or research in that area under the supervision of a member of staff. Such programs may be undertaken by students either individually or in small groups.

Offered on demand. Prerequisite: consent of the instructor, approval of program by head of department and Faculty Council.

**POLITICAL SCIENCE 312: Contemporary Strategic Thought (1½) (3,0,0)**

This seminar course examines the post-1945 evolution of strategic doctrine in relation to political pressures and problems.

**POLITICAL SCIENCE 314: Selected Topics in Political Science (1½) (0,3,0)**

Open to third and fourth year students enrolled in the Military and Strategic Studies program.

A selected topic of interest to students in M&SS will be chosen to facilitate understanding of a specialized subject such as: International Politics in the Arab World; Politics and Government in Southeast Asia; East European Communist Systems.

Offered on demand. Prerequisite: consent of the instructor.

## ***HISTORY AND POLITICAL SCIENCE***

### **POLITICAL SCIENCE 321: Irregular Warfare (1½) (3,0,0)**

An examination of the uses of revolution, guerrilla warfare, subversion and terrorism as techniques for the disruption of national security.

Prerequisite: Political Science 213 or consent of the Department.

### **POLITICAL SCIENCE 322: Issues in Canadian Politics (1½) (3,0,0)**

This course will examine contemporary issues in Canadian politics. Topics discussed will include issues such as Quebec nationalism, northern sovereignty, western separatism, free trade, national energy policy, and senate reform.

Offered on demand. Prerequisite: consent of the instructor.

### **POLITICAL SCIENCE 342: Asia-Pacific Defence and Security Issues (1½) (3,0,0)**

This course examines a wide range of issues related to defence and security in the Asia-Pacific region. While the primary focus is military, close attention will also be paid to the social, economic and political dimensions of state security. Following an overview of major events during the last decade, the course examines, week by week, such topics as the Japanese Self-Defence Force, Sino-Soviet Relations and the New Peoples Liberation Army, N.E. Pacific Sea Lanes of Communication and their importance to Canada, ANZUS and its restructuring, the Korean balance of power and its implications as a future flash-point. The Soviet Naval Forces buildup in the Pacific, the US bases there and the New Peoples Army insurgency, CINCPAC Forward Basing and US Pacific strategic interests, the Vietnam/Kampuchea conflict and its repercussions, ASEAN, Indonesia and South Pacific tensions, including current events in Fiji and New Caledonia.

### **POLITICAL SCIENCE 361: Modern Political Thought (1½) (3,0,0)**

Any examination of basic issues in western political thought including democracy, authority, legitimacy and dissent.

Offered on demand. Prerequisite: consent of the instructor.

### **POLITICAL SCIENCE 401: Canadian Public Administration (1½) (3,0,0)**

Examines the basic principles of public administration in Canada including organization, procedures and the relationship of administration to policy.

Prerequisite: Political Science 102.

### **POLITICAL SCIENCE 402: American Government and Politics (1½) (3,0,0)**

A study of the American constitution, institutions of government and political process.

Prerequisite: Political Science 102.

**POLITICAL SCIENCE 412: The Political Economy  
of the Canadian Arctic (1½) (3,0,0)**

This course is open to Arts and Science students in the third and fourth years.

This course offers an interdisciplinary overview of major political, economic, defence and environmental issues related to the Canadian Arctic. Particular attention will be paid to those issues likely to be encountered by Canadian Forces personnel serving in the Arctic.

**POLITICAL SCIENCE 432: Arms Control (1½) (3,0,0)**

An examination of the theory and practice of arms control in contemporary international politics. Topics discussed will include strategic arms limitation agreements, nuclear test ban treaties, and the control of chemical and bacteriological warfare.

Prerequisite: Political Science 213 or consent of the Department.

**POLITICAL SCIENCE 441: Canadian Foreign Policy (1½) (3,0,0)**

An examination of important issues and developments in Canada's relations with the international community from 1914 to the present day.

Prerequisite: Political Science 213 or consent of the Department.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## *LITERATURE AND PHILOSOPHY*

### **DEPARTMENT OF LITERATURE AND PHILOSOPHY**

Associate Professor and Head of Department - M.S. Madoff, AB, PhD

Associate Professor - C.N. Ramkeesoon, BA, MA, PhD

Associate Professor - P.S. Sri, BSc, MA, PhD

Special Lecturer - G.W.S. Brodsky, CD, BA, MA, PhD

### **PROGRAM OF STUDY**

The Department, in conjunction with the Department of History and Political Economy offers a joint concentration of Literature and History leading to a BA. For details of the course requirements, see the Department of History and Political Economy section of the Calendar.

#### **ENGLISH 113: Literature of Science and Society (3) (3,0,0)**

Through readings about utopian or dystopian societies, future worlds and the ethics and procedures of scientific investigation and technological change as these affect social organization, this course introduces students to the literature that has arisen in response to science and engineering. At the same time the course investigates the applications of logic and linguistics to writings about science and technology and offers instruction in the techniques of clear expression.

For first year Science and Engineering students.

#### **ENGLISH 133: English Literature 1100-1850, Composition and Logic (5) (5,0,0/5,0,0)**

Study of important literary works by major authors from the age of Chaucer to the Baroque occupies the first semester.

In the second semester important works of neo classicism, Romanticism and early Victorianism are studied. Students are required to write two main essays per semester, and shorter compositions.

Integrated with the study of English literature during both semesters, is the study of the evolution of the English language and the study of the formal relationship between language and thought.

#### **ENGLISH 231: British and European Literature (1½) (3,0,0)**

A survey of nineteenth and twentieth century British and European literature, its origins and connections. Comparative studies of short fiction, poetry and drama.

Two essays will be required.

Students are encouraged to take original approaches and to practice self-expression with formal precision of statement. Wide background reading is stimulated and required.

**ENGLISH 242: Canadian and American Literature (1½) (3,0,0)**

A study of themes, forms, and methods adopted by English-speaking authors in Canada and the United States, from the early nineteenth century to the present, with particular attention to poetry, short fiction and drama.

Two essays will be required.

**ENGLISH 304: Directed Reading Studies in Literature (1½) (0,3,0)**

This course provides the opportunity for students in third and fourth year to undertake independent yet supervised studies in literature. Upon application to the instructor, the student will receive a list of required primary and secondary readings and a schedule of tutorial topics arising from the readings. Each week the student and the instructor will meet in a tutorial, where the student will present a paper on the assigned topic and will discuss the other results of his reading. There will be a major term essay and a final examination.

Variations of the course include the following:

- Studies in the Novel
- Studies in the Classics
- Studies in Drama
- Studies in Poetry

Offered only on demand in exceptional circumstances and according to availability of instructor. Approval of Head of the Department must be obtained.

Note: A student may take this course not more than twice and provided that the course content is different each time.

**ENGLISH 311: Studies in Detective Fiction (1½) (3,0,0)**

This course examines the themes, methods, and cultural setting of one of the most diverse and widespread literary forms of the nineteenth and twentieth centuries: the detective story. After introduction to several models of the forms's evolution, students discuss excellent examples of the detective story, written by Poe, Doyle, Sayers, Hammett, Chandler, Simenon, and others.

The course gives opportunities for attention to such related forms as the mystery and the espionage story and for the viewing of films made from detective novels. There are also opportunities to apply philosophical investigations of the ethics and epistemology to detective fiction.

In addition to regular seminar participation, a critical essay and a final examination will be required.

Offered on demand, not available in every academic year. Prerequisite: consent of instructor.

**ENGLISH 321: Literary Criticism (1½) (3,0,0)**

This course examines the major theories of literary critics from Plato to Northrop Frye and their impact on Western society and culture. It explores the



## *LITERATURE AND PHILOSOPHY*

strengths and weaknesses of the most important schools of literary criticism including the historical, biographical, existentialist, archetypal, Marxist, and psycho-analytical approaches. It also raises and attempts to answer some significant and provocative questions: what is literature?, how does a work of literature function and produce meaning?, what is "beauty" in literature?, what is the use of literature? The course encourages students to sharpen their analytical and synthetic powers as well as to discover an important way of seeking truth.

A term paper (of about 1500 words) and a seminar are required from each student, in addition to the mid-term and final examination.

Offered on demand, not available in every academic year. Prerequisite: consent of the instructor.

### **ENGLISH 341: Literature of War in the Modern Age (1½) (3,0,0)**

This seminar course is a study of prose and poetry reflecting the impact of modern mass warfare on the warrior and his society from the mid-nineteenth century to the present. Changing conceptions of military honour and morality in war are examined in their historical context.

One section of seminar leadership and one term essay are required.

Offered on demand. Prerequisite: consent of the instructor.

### **ENGLISH 342: Special Topics in the Literature of War (1½) (3,0,0)**

After the overview of modern war literature in English 341, this course encourages intensive study of a particular conflict and the literary and artistic works which have arisen from it. The variable content of the course may include the literature of the Greek civil and foreign wars, the American rebellion/Napoleonic Wars, the U.S. Civil War, World War One, the Spanish Civil War, World War Two, and the Vietnam War.

Students must complete a major research/critical project.

Prerequisite: English 341, or permission of instructor.

### **LITERATURE 322: Studies in the Literature of the Third World (1½) (3,0,0)**

This course is open to Arts and Science students in the third and fourth years.

This course examines modern literary works selected from Mexico, Central and South America, the Caribbean, Africa, the Middle East, China, and the Indian subcontinent, in the context of the conditions that impinge upon the artist's imagination: the stresses of economic underdevelopment, the throes of revolution, the waning of colonialism and the problems of racial and cultural differences, the replacement of tribal or village cultures, and the struggle for human rights.

**LITERATURE 422: Introduction to French Canadian Literature (1½) (3,0,0)**

The first section of this course aims at introducing the student to those singular elements which combine to fashion the unique temperament and character of the French Canadian and therefore of his written art, French Canadian literature.

The second part of this course involves the reading and critical evaluation of literary works by excellent French Canadian writers.

The course is conducted in English or French, depending upon the linguistic competence of students electing it. In the former case fluency in French will still be helpful for fuller appreciation of the readings. The readings are from the French Canadian originals but help with translation will be available.

Offered on demand. Prerequisite: consent of the instructor.

**PHILOSOPHY 311: Introduction to Philosophy (1½) (3,0,0)**

This course is a thematic approach to philosophy, ancient and modern. It will attempt to bridge the apparent divisions between the sciences and the humanities, the east and the west. Scientific and literary works will often be used to illuminate abstract philosophical problems.

A term paper and a seminar are required from each student, in addition to the mid-term and the final examination.

Offered on demand. Prerequisite: consent of the instructor.

**PHILOSOPHY 422: Philosophical Perspectives (1½) (3,0,0)**

This course focuses on philosophical questions that are rooted in concrete and often profoundly perplexing experiences. It highlights the crucial role of imagination as well as of reason in human affairs and explores topics ranging from existentialism to zen, evolutionism to relativity.

A term paper and one or two seminars will be required from each student.

Offered on demand. Prerequisite: Philosophy 311 or consent of the instructor.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## MATHEMATICS

### DEPARTMENT OF MATHEMATICS

Professor and Dean of Science and Engineering - G.M. Lancaster, BSc, PhD

Professor and Head of Department - M.J. Wilmut, ndc, BSc, MA, PhD

Professor - A.G. Buckley, BSc, MSc, PhD

Associate Professor - F. Milinazzo, BSc, PhD

Associate Professor - R.C. Snell, BSc, MSc, PhD

Associate Professor - W.W. Wolfe, BSc, MSc, PhD

Assistant Professor - K.J. Keen, BSc, MSc, PhD

Lecturer - D.P. Mulders, BSc, MMath

Special Lecturer - P. Smart, BEd, BSc, MEd, MPA, PhD

### BSc GENERAL WITH MATHEMATICS CONCENTRATION

Refer to Academic Regulations 10 and 12c.

Concentration Courses	Credits		Prerequisites
MA301 Diff. Equations	1.5	(3,0,0)	
MA401 Complex Analysis	1.5	(3,0,0)	MA301
And 6 units of credit selected from:			
MA302 Numerical Analysis	1.5	(3,0,0)	MA301, MA252
MA411 Signal Processing I	1.5	(3,0,0)	MA301
MA432 Adv. Applied Mathematics	1.5	(3,0,0)	MA301
MA422 Signal Processing II	1.5	(3,0,0)	
PH322 Intermediate Mechanics	1.5	(3,0,0)	MA301
SS421 Astrodynamics	1.5	(3,0,0)	PH322
SS432 Digital Image Processing	1.5	(3,0,1)	MA411

### Second Concentration

See appropriate Departmental listing for information concerning the selected second concentration.

### Other Courses

ML311 Organizational Leadership	1.5	(3,0,0)
ML402 Professional & Ethical Issues	1.5	(3,0,0)

### Elective Courses

Arts elective 300 or 400 level courses : 3 units of credit

Science elective 300 or 400 level courses : 6 units of credit

### MATHEMATICS 103: Calculus and Analytic Geometry (3) (3,2,0/3,2,0)

For first year Arts students.

An introduction to the calculus of one and two variables, including geometric vectors; the mathematics of finance. The emphasis is on non-science applications.

**MATHEMATICS 113: Calculus and Linear Algebra (5)**

**(5,3,0/5,2,0)**

For first year Science and Engineering students.

This course includes the normal topics of a first year calculus course and selected topics from elementary linear algebra. Topics from both areas will be selected in each semester.

Algebra: sets, relations, and functions; vector algebra with applications to geometry in two and three dimensions; determinants; and complex numbers.

Calculus: an introductory course in differential and integral calculus, including differentiation of algebraic, trigonometric, and other elementary functions; related rates; slopes, maxima and minima, and inflection points; curve sketching, the differential; the definite integral and applications to areas, volumes, arc length, surfaces, and other physical problems; simple separable differential equations; polar co-ordinates and parametric equations; techniques of integration; indeterminate forms; improper integrals; hyperbolic functions and partial fractions are introduced as the need arises in the calculus.

**MATHEMATICS 203: Finite Mathematics,  
Probability and Statistics (3)**

**(3,2,0/3,2,0)**

For second year Arts students.

Selected topics from linear algebra, probability, game theory, linear programming, network and graph theory. Statistical measures and description of data; discrete and continuous probability distributions; sampling theory; t-distribution.

Introductory statistics for data analysis, including estimation theory with confidence intervals; hypothesis testing on mean, difference of means and variance; Type I and Type II errors; goodness-of-fit test and test for independence; regression and correlation; non-parametric tests.

**MATHEMATICS 223: Calculus, Vector Calculus,  
and Differential Equations (3)**

**(3,1,0/3,1,0)**

For General Science students and most Engineering students.

Partial differentiation with applications to maxima and minima in several variables, indeterminate forms, multiple integration, vector analysis including Green's divergence and Stokes's Theorems, and infinite series.

Differential equations of first order, linear equations of higher order with constant coefficients, applications, Frobenius method.

**MATHEMATICS 233: Advanced Calculus, Vector Calculus,  
and Differential Equations (4)**

**(4,1,0/4,1,0)**

Recommended for those students who plan on choosing Honours Science, Engineering Physics, or Electrical Engineering programs of study.

## **MATHEMATICS**

This course will include all of the topics of Mathematics 223 but with more rigorous treatment.

This course may be taken only with the approval of the Department of Mathematics.

### **MATHEMATICS 241: Probability and Statistics (1½) (3,0,0)**

For second year Engineering students and General Science students.

Basic concepts of probability, including discrete and continuous probability distributions, joint distributions, expectation.

Introductory statistics for data analysis, including estimation theory with confidence intervals, hypothesis tests on mean and variance, goodness-of-fit tests, and contingency tables.

### **MATHEMATICS 252: Linear Algebra (1½) (3,0,0)**

For second year Engineering students.

Matrices; systems of linear equations; determinants; abstract vector spaces; linear transformations; co-ordinatization of vectors; eigenvectors; diagonalization; Cayley-Hamilton theorem.

### **MATHEMATICS 301: Differential Equations (1½) (3,0,0)**

Laplace Transform methods for solving ordinary differential equations; series solutions; solution of partial differential equations using separation of variables; the principle of super-position and Fourier series; applications to problems such as wave motion, heat transfer, gravitational potential, control theory, and Sturm-Liouville systems.

Prerequisite: Mathematics 223, 252 or consent of the Department.

### **MATHEMATICS 302: Numerical Analysis (1½) (3,0,0)**

Numerical solutions of problems encountered in applied mathematics using the computer, numerical integration, solutions of ordinary differential equations; roots of equations; polynomial interpolation; linear systems.

Prerequisites: Mathematics 223, 252, 301. Computer Science 211.

### **MATHEMATICS 401: Complex Analysis (1½) (3,0,0)**

Differentiability of functions of a complex variable; analytic functions; Cauchy-Riemann equations; contour integration; Cauchy's Theorem and formulae; maximum modulus theorem; Liouville's theorem; Taylor and Laurent series; singularities; residue theorem and applications; elementary conformal mappings.

Prerequisite: Mathematics 301 or consent of the Department.

**MATHEMATICS 411: Signal Processing I (1½) (3,0,0)**

Frequency domain signal analysis; linear systems: Discrete systems including digital filter design and the Fast Fourier Transform.

Prerequisite: Mathematics 301 or consent of the Department.

**MATHEMATICS 422: Signal Processing II (1½) (3,0,0)**

Fourier Transforms, linear systems, review of probability theory, functions of random variables; classifications and analysis of stochastic process; signal detection; beam forming.

Offered on demand. Prerequisite: consent of the Department.

**MATHEMATICS 432: Advanced Applied Mathematics (1½) (3,0,0)**

This course is a continuation of Math 301. The emphasis is on analytic techniques used in the analysis of solutions of ordinary and partial differential equations. Among the topics discussed will be Fourier analysis, transform methods, asymptotic analysis and perturbation methods for ordinary differential equations. Special attention will be given to physically relevant applications. It is strongly recommended that students enrolled in this course have taken Mathematics 401.

Prerequisite: Mathematics 301 and consent of the Department.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## **MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY**

### **DEPARTMENT OF MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY**

Assistant Professor and Head of Department - Major L.P.K. LeGras, CD, pcsc, BA, MASc

Associate Professor - R.C. St. John, BA, MA, PhD

Assistant Professor - Squadron Leader (ret'd) A.T. Malcolm, CD, pcsc, asc, BA, MA, PhD

Lecturer - Major L.C. Hillier, CD, BA, MSc

Lecturer - Captain A.T. MacIntyre, CD, BA, MA

### **ENTRY AND QUALIFICATIONS**

Honours and Major Programs of Study, as outlined below, leading to either a BA or BSc degree are offered in the Department of Military Leadership and Applied Psychology. Candidates for a BA may enter the program from either the Arts, Science or Engineering Second Year programs. Candidates for a BSc must enter the program from the Second Year Science and Engineering programs.

Candidates for the BA Honours degree enter the program in the Third Year. Candidates for the BSc Honours degree enter the program in the Fourth Year. For information regarding admission to the Programs of Study in the Honours programs, see Academic Regulation 13.

The selection of courses to make up a program of study in the Department must be guided by the outlines listed below, the general degree requirements and academic regulations and in consultation with departmental academic advisors. Any exceptions to the listed courses may be made only with the prior written approval of the Head of the Department and the appropriate Dean which must be on file in the Office of the Registrar.

### **PROGRAMS OF STUDY**

#### **BA Major, Applied Military Psychology**

Refer to Academic Regulations 10, 12a and 12b.

##### *Third Year*

##### **Major**

Applied Psychology 322  
Applied Psychology 361  
Applied Psychology 362  
Applied Psychology 372  
Applied Psychology 381

##### **Other Courses**

Military Leadership 311

##### *Fourth Year*

##### **Major**

Applied Psychology 422  
Applied Psychology 431  
Applied Psychology 441  
Applied Psychology 461  
Applied Psychology 462

##### **Other Courses**

Military Leadership 402

## *MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY*

### **Elective Courses**

Six units of credit in Arts  
or Science courses at the 300 or  
400 level. Applied Psychology  
221 must be taken in lieu of an  
elective if not completed in Second Year.

### **Elective Courses**

Six units of credit in Arts  
or Science courses at the 300  
or 400 level.

**Note:** In the Third and Fourth Years, not more than three units of elective courses may be taken in Applied Psychology courses with the exception of Applied Psychology 221 which must be taken in lieu of an Arts elective if not completed in the Second Year.

### **BA Honours, Applied Military Psychology**

Refer to Academic Regulations 13a to 13e.

In addition to the courses listed above for the Major program, candidates for the honours degree must present three additional units of credit in Applied Psychology elective courses in the Third Year. In the Fourth Year the courses Applied Psychology 481 and 452 are taken in lieu of two Arts and Science elective courses and Applied Psychology 483, Psychology Honours Thesis, must be completed.

### **BSc Major, Applied Military Psychology**

Refer to Academic Regulations 10, 12a and 12b.

#### *Third Year*

##### **Major**

Applied Psychology 322  
Applied Psychology 361  
Applied Psychology 362  
Applied Psychology 372  
Applied Psychology 381

##### **Other Courses**

Military Leadership 311  
Mathematics 301

##### **Elective Courses**

Six units of credit in Arts  
or Science courses at the 300  
or 400 level (Notes 1 and 2)

#### *Fourth Year*

##### **Major**

Applied Psychology 422  
Applied Psychology 431  
Applied Psychology 441  
Applied Psychology 461  
Applied Psychology 462  
Applied Psychology 471

##### **Other Courses**

Military Leadership 402

##### **Elective Courses**

Six units of credit in Arts  
or Science courses at the  
300 or 400 level (Notes 1 and 2)

**Note 1:** A minimum of 9 units of credit in Science elective courses must be presented at the completion of the Fourth Year. Science elective courses must be selected in consultation with the Academic Advisor and with the approval of the Department Head and the Dean of Science and Engineering. Students should expect to select the majority of these courses in support of the study of human factors in engineering. The selection of electives can be adapted to individual student interest and a typical grouping to meet the requirements would be:



## **MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY**

Computer Science 302  
Computer Science 332  
Computer Science 341

Physics 371  
Computer Science 412  
Computer Science 421

Note 2: A maximum of 3 units of credit in Arts elective courses may be taken in the Third and Fourth Years with the exception that Applied Psychology 221 must be taken in the Third Year as an Arts elective if not completed in Second Year.

### **BSc Honours, Applied Military Psychology**

Refer to Academic Regulations 10, 12a and 12b.

Candidates for the honours degree must complete all the courses listed above for the Major program with the exception of Applied Psychology 471 and complete the following courses in the Fourth Year: Applied Psychology 481, Applied Psychology 452 and Applied Psychology 483, Psychology Honours Thesis.

### **BSc Combined Major, Applied Psychology with Space Science**

Refer to Academic Regulations 10 and 12d.

#### **Third Year**

##### **Major**

Applied Psychology 322  
Applied Psychology 361  
Applied Psychology 362  
Applied Psychology 381

Major courses for Space  
Science as shown under  
Space Science section  
of the Calendar

##### **Other Courses**

Military Leadership 311

##### **Elective Courses**

Applied Psychology 221  
must be taken if not completed  
in Second Year.

#### **Fourth Year**

##### **Major**

Applied Psychology 372  
Applied Psychology 441  
Applied Psychology 461  
Applied Psychology 462

Major courses for Space  
Science as shown under  
Space Science section  
of the Calendar

##### **Other Courses**

Military Leadership 402

##### **Elective Courses**

1½ units of credit  
of 300 or 400 level Arts  
elective courses

### **BSc Honours Combined Major Requirements**

Refer to Academic Regulations 13a to 13e.

The additional course requirements for the Honours degree in Combined Major, Applied Psychology with Space Science are shown in the BSc Combined Major Honours with Space Science entry in the Space Science section of the Calendar.

**MILITARY LEADERSHIP 111: Psychology of the Individual**

**– Part 1 (1½)**

**(3,0,0)**

An introduction of those areas of human development and behaviour that are relevant to future leaders' needs and interests. The course commences with an exposure to the fundamental topics and elementary psychological vocabulary necessary for the understanding of the rationale of individual differences. These topics are then related to certain developmental and social psychological concepts with a view to understanding human behaviour in situations where there is a requirement to influence the behaviour of others. To this end, elementary topics of perception, learning, motivation, intelligence, personality, adjustment, and maturation will be related to concepts of social structure, individual socialization, attitude formation, and interpersonal processes.

**MILITARY LEADERSHIP 191: Psychology of the Individual (1½)**

**(3,0,0)**

Available, upon permission of the Head of Department, to First Year students repeating their year without previous failure in ML 111.

The content of this course will be more advanced than that of ML 111, and it will be related to the studies already completed by the student.

**MILITARY LEADERSHIP 212: Social Psychology (1½)**

**(3,0,0)**

The basic objective is to introduce and acquaint the student with the broad field of social psychology. The course is designed to provide a fundamental understanding of human social behaviour. Emphasis is placed on the types and degrees of social influences on individuals by groups. An awareness of the dynamic components of social behaviour will contribute to the development of effective leadership and management principles and help the student to prepare for a career as a military officer. Topics will be selected from social perception, norms, attitudes and persuasion, conformity, obedience, groups and group behaviour, aggression, violence and conflict, and social power. In addition, professional officer development and leadership theories and approaches will be presented.

Prerequisite: Military Leadership 111 or consent of the Department.

**MILITARY LEADERSHIP 292: Social Psychology (1½)**

**(3,0,0)**

Available, upon permission of the Head of the Department, to Second Year students repeating their year without previous failure in ML 212.

The content of this course will be more advanced than that of ML 212, and it will be related to the studies already completed by the student.

**MILITARY LEADERSHIP 311: Organizational Leadership and Management (1½)**

**(3,0,0)**

The purpose of this course is to study human behaviour in organizations at the individual and group level, including the effect of organization structure on behaviour. Specific attention will be given to concepts for developing and improving interpersonal skills.

Prerequisites: Military Leadership 111 and 212.

## **MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY**

### **MILITARY LEADERSHIP 402: Professional and Ethical Issues (1½) (3,0,0)**

This course is designed to provide students with an opportunity to develop an awareness and understanding of some of the issues, concerns, challenges they will have to face and deal with as military officers. Proceeding from a comprehensive review of military professionalism and ethics, the course examines some of the ethical dilemma which must be confronted by the military officer. Ethical decision making, assessing the ethical climate, institutional pressures, ethical codes and the role of the military personnel system in supporting the military ethos are topics studied in detail. Leadership challenges posed by the nature of continuous operations as well as contemporary issues in military leadership are examined. Organizational leadership, development and change and the attainment of institutional excellence are studied. Finally, an understanding of advanced communication skills is provided through the medium of a media workshop.

Prerequisite: Military Leadership 111 or consent of the Department.

### **APPLIED PSYCHOLOGY 221: Psychology of the Individual – Part 2 (1½) (3,0,0)**

A continuation of the study of basic concepts and principles of individual behaviour, particularly in the areas of biological bases of behaviour, motivation, learning, sensory processes, perception, memory, development, and psychopathology.

Microcomputer interactive psychological experiments will give students hands-on experience in the research experiment process while facilitating learning about research methodology, as well as providing direct exposure to classical psychological experiments.

A required course for the Applied Military Psychology degree program.

Prerequisite: ML 111 or equivalent.

### **APPLIED PSYCHOLOGY 322: Military Psychology – Part 1 (1½) (3,0,0)**

This course is intended to provide leaders with a better understanding of the human factor in combat and pre-combat by examining the application of psychology to military problems. Conducted in a seminar format, the course will examine individual, group, and leadership factors affecting combat performance including selections, training, man-weapon interface, cohesion, morale, hostile environments, combat behaviour, and psychological warfare.

Prerequisites: ML 111 and 212.

### **APPLIED PSYCHOLOGY 332: Psychological Foundations of Sport (1½) (3,0,0)**

The course examines individual, social, clinical and applied research in the field of sport psychology from historical and contemporary perspectives. Analysis and discussion of the origins, ethics, and future of sport psychology will introduce the course focus on individual factors such as personality, performance and anxiety, social-psychological issues of aggression, group dynamics, leadership, and

socialization. Examination will be made of how sport and exercise benefit participants in the development and maintenance of psychological well-being.

**APPLIED PSYCHOLOGY 341: Personality (1½) (3,0,0)**

The study of theory and research on the principles affecting personality development and structure.

Prerequisite: ML 111 or equivalent.

**APPLIED PSYCHOLOGY 331: Abnormal Psychology (1½) (3,0,0)**

Students will study the nature and history of abnormal behaviour from the perspectives of the biomedical, psychodynamic, behavioural, cognitive, and humanistic approaches. They will, in part, apply their knowledge of physiology (AP 361) to an examination of anxiety disorders, major depressive disorders, social and interpersonal problems including drug abuse, the psychoses, and disorders of the nervous system. Emphasis will be placed on the biomedical and behavioural/cognitive approaches.

Prerequisite: ML 111 or equivalent.

**APPLIED PSYCHOLOGY 352: Selected Topics in Military Psychology (1½) (3,0,0)**

Prerequisite: ML 111 or equivalent and AP 372.

**APPLIED PSYCHOLOGY 361: Elements of Physiological Psychology (1½) (3,0,0)**

This course involves a presentation of the fundamentals of human neurobiology and the relationships between brain and behaviour. Emphasis is placed on the structures and functions of the human nervous system. Topics include human neuroanatomy, neurophysiology, perceptual and motor control systems, and neurochemistry. The course provides a framework for discussing subjects such as sleep, motivation, sexuality, psychopathology and learning. Students are familiarized with the techniques used to study human neurobiology and neuropsychology.

Prerequisite: ML 111.

**APPLIED PSYCHOLOGY 362: Introduction to Research Methods (1½) (3,0,0)**

This course involves a survey of experimental methodology and experimentation in science. The course will deal with the procedural aspects involved in the design and conduct of scientific experiments. It deals with the various aspects of control, reliability, validity and ethics in experimental design, and considers the threats to each of these found in experiments in the literature. The course provides an overview of how to design and carry out research in the behavioural sciences.

Prerequisites: ML 111, MA 203 or 241.

## *MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY*

### **APPLIED PSYCHOLOGY 372: Sensation/Perception (1½) (3,0,0)**

This course provides an overview of the techniques involved in psychophysics and the measurement of various aspects of sensation/perception in man and animals. The topics include the fundamentals of signal detection theory, psychophysical scaling and psychophysics. It also covers the neurobiology of the five major senses: touch, taste, smell, audition, and vision.

Students are encouraged to perform in-class experiments and demonstrations relevant to the topics being discussed.

Prerequisites: ML 111.

### **APPLIED PSYCHOLOGY 381: Statistics for the Behavioural Sciences (1½) (3,0,0)**

This course applies statistical concepts to the behavioural sciences. Students will describe and understand such concepts as measures of central tendency, measures of dispersion, and the normal distribution. They will determine relationships between data and apply models related to prediction. Hypothesis testing involving dependent and independent data will be introduced and will lead to simple two-way analysis of variance. The course will conclude with an introduction to non-parametric statistics.

### **APPLIED PSYCHOLOGY 422: Military Psychology – Part 2 (1½) (3,0,0)**

Continuation of AP 322 an examination of military relevant topics.

Prerequisites: ML111 and 212 and AP 322.

### **APPLIED PSYCHOLOGY 431: Counselling Psychology (1½) (3,0,0)**

This course provides the student with an overview of the psychodynamic, behavioural, cognitive, humanistic and existential theories which form the basis for contemporary interviewing and counselling practice. Perspectives on emotional and lifestyle health will be presented, along with their relevance to leadership and organizational productivity. Specific application is made to military settings, including: the problem solving, disciplinary or performance assessment interview; intervention strategies for lifestyle problems; and, the appropriate use of referral specialists. This is primarily a theory course, however, students will be expected to participate in some experiential learning in the form of role play.

Prerequisite: ML 111, AP 221 and ML 311.

### **APPLIED PSYCHOLOGY 441: Personnel Psychology (1½) (3,0,0)**

A comprehensive review of essential personnel psychology concepts and techniques; recruitment and placement; training and development; compensation and motivation; appraisal and career management; and the legal environment.

Prerequisite: Military Leadership 111 and 212.

### **APPLIED PSYCHOLOGY 442: Forensic Psychology (1½) (3,0,0)**

The objectives of this course are to examine criminal and deviant behaviour covering both the biological and social psychological issues influencing/producing

behaviour that is by statute criminal. The course starts with basic biological issues such as a simple review of genetic XYY research and possible physiological influences in the development of psychopathy. This is followed by social learning theory and other non-biological explanations of deviant and criminal behaviour. Once this groundwork is completed the course turns to specific behaviours such as violence/aggression (e.g. sexual assault, terrorism and hostage taking). These specific behaviours are then dissected for their possible biological and non-biological influences which of course range from alcohol to cultural factors. Considerable time is spent on social psychological variables influencing behaviour such as riot and general crowd control situations which have potential for disaster (e.g. panic in fire). The course finishes with a review of intervention and treatment strategies aimed at specific and general criminal/deviant behaviours.

**APPLIED PSYCHOLOGY 452: Psychological Tests  
and Measurement (1½)**

**(3,0,0)**

A study of the basic concepts of measurement in psychology and the application of these concepts in selected areas of psychology. The principal topics of the course will be historical foundations, basic concepts such as reliability, validity, and invariance, the use of different tests and instruments, scaling, and the unique aspects of measurement encountered in different areas of psychology.

**APPLIED PSYCHOLOGY 461: Cognitive Processes (1½)**

**(3,0,0)**

This course provides the student with an introduction into the mental processes and information processing. The topics include human memory, attention, and thought processes. Both visual and auditory cognition will be discussed, as well as the cognitive approach to higher mental processes. The methods used in measuring mental processes will be examined with examples provided by various in-class experiments and demonstrations. In addition, the topic of artificial intelligence and the problems facing the design of “thinking machines” will be discussed in the course.

**APPLIED PSYCHOLOGY 462: Human Factors in Engineering (1½)**

**(3,0,0)**

This course will introduce the students to the broad problems in human-machine interactions and interfacing. This will involve studying human capabilities as applied to engineering and design. Topics will also include the measurement of human and machine capabilities, the effects of noise on performance, and the effects of sustained operations on performance. The various techniques used to enhance human performance will also be discussed and evaluated. Aids to memory, perception, discrimination and detection will be examined and demonstrated in class. Students will also be introduced to the use of computers in psychological research settings.

**APPLIED PSYCHOLOGY 471: Research Project (1)**

**(1,0,1)**

Students in the Bachelor of Science Program will undertake a behavioural science experiment under the direction of a faculty member. They will design and gather data utilizing the principles of AP 362 Research Methods, perform the experiment, analyze the data using the techniques of AP 381, Statistics for the Behavioural Sciences, and complete a comprehensive report written to the standards of the Canadian Psychological Association.

## ***MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY***

### **APPLIED PSYCHOLOGY 472: Human Physiology (1½) (3,0,0)**

This course will be a survey course outlining the principles of mammalian physiology. Topics to be covered include the general properties of the living cell, nerve and muscle, cardiovascular, respiratory, gastro-intestinal systems, metabolism and nutrition, renal system, and reproductive control systems. The knowledge of physiology gained from the course will be applied to topics such as chemical warfare, sustained operations, and survival techniques.

### **APPLIED PSYCHOLOGY 481: Statistics for the Behavioural Sciences – Advanced (1½) (3,0,0)**

This course will commence with an introduction to the Statistical Package for the Social Sciences (SPSS-X). It will review the material of AP 381 utilizing the mainframe computer and SPSS-X to analyze and portray data. Students will continue with a comprehensive examination of non-parametric statistics, again using the computer package. Finally, students will be conceptually introduced to multi-variate statistics and will examine data by means of principal components analysis, factor analysis, multiple regression techniques, multiple analysis of variance, and multiple and canonical correlation methodology.

### **APPLIED PSYCHOLOGY 482: Advanced Topics in Sensory Neurobiology (1½) (3,0,0)**

This course provides students with the opportunity for the detailed examination of the development of adult sensory processes. Topics include examining the various models of human visual processing, machine vision, human auditory detection and discrimination, and the methods used in assessing perceptual abilities and performance. These will be related to topics relevant to the military such as the use of vision enhancement devices, vigilance tasks, zero gravity effects, and sustained operations.

Prerequisites: ML 111 and AP 361.

### **APPLIED PSYCHOLOGY 483: Psychology Honours Thesis (3) (0,3,0/0,3,0)**

Fourth Year students in the Honours program will complete research in an area related to Applied Military Psychology. The thesis must be defended in accordance with thesis regulations. Students should familiarize themselves with the regulations of this Calendar which pertain to RRMH Honours programs.

## OCEANOGRAPHY

The undergraduate degrees in Physics and Oceanography, and the postgraduate diploma and MSc in Oceanography and Acoustics are all interdisciplinary. As there is no department of Oceanography, the curricula are under the guidance of the Oceanography Curriculum Committee, chaired by the Dean of Science and Engineering.

## INSTRUCTORS

## DEPARTMENT

Professor - M.G. Robinson, BSc, PhD	Chemistry
Professor - A.G. Buckley, BSc, MSc, PhD	Mathematics
Associate Professor - D.P. Krauel, ndc, BSc, MSc, PhD	Physics
Associate Professor - W.T. MacFarlane, BA, MSc, PhD	Physics
Associate Professor - R.F. Marsden, BSc, PhD	Physics
Associate Professor - K.J. Reimer, BSc, MSc, PhD	Chemistry
Assistant Professor - J.R. Buckley, BSc, PhD	Physics
Assistant Professor - G.H. Fleming, CD, BSc, MA, PhD	Physics
Assistant Professor - M.W. Stacey, BSc, PhD	Physics
Assistant Professor - S.R. Waddell, BSc, MSc, PhD	Physics

## BSc COMBINED MAJOR WITH OCEANOGRAPHY

Refer to Academic Regulations 10 and 12d.

*Third Year**Fourth Year***Major****Major**

Oceanography 301  
 Oceanography 321  
 Oceanography 331  
 Oceanography 352  
 Oceanography 362

Oceanography 401  
 Oceanography 442  
 Oceanography 451  
 Oceanography 462

See the appropriate Departmental listing for information concerning the other selected Combined Major.

**Other Courses****Other Courses**

Military Leadership 311  
 Math 301  
 Math 302 (Note 2)

Military Leadership 402  
 Math 401 (Note 1)  
 Math 411 (Note 2)  
 Science 492

**Elective Courses****Elective Courses**

1½ units of 300 or 400  
 level Arts or Science elective  
 courses (Note 1).

4½ units of 300 or  
 400 level Arts or  
 Science elective courses (Note 1)  
 1½ units of 300 or 400 level  
 Arts elective courses (Note 2).

Note 1: When combined with Physics.

Note 2: When combined with Space Science.



## OCEANOGRAPHY

Honours degree additional requirements are MA 432, OC 473 and an additional 1½ units of Science Elective for Course option or just OC 483 for Thesis option when Physics is other major. The requirement when Space Science is the other major is shown in the Space Science section of the Calendar. Refer to Academic Regulations 13a to 13e.

### BSc GENERAL WITH OCEANOGRAPHY CONCENTRATION

Refer to Academic Regulations 10 and 12c.

Concentration Courses		Credits		Prerequisites
OC301	Descriptive Oceanography	1.5	(3,0,0)	
OC321	Biological Oceanography	1.5	(2,0,2)	
OC331	Chemical Oceanography	1.5	(3,0,1)	
And 4½ units of credit selected from:				
OC352	Oceanographic Methods	1.5	(2,0,4)	OC301, OC321, OC331
OC362	Acoustics	1.5	(3,0,0)	MA301
OC401	Geophys. & Geol. Oceanography	1.5	(3,0,0)	PH332, MA301
OC451	Intro to Dynamic. Oceanography	1.5	(3,0,0)	OC301
OC412	Aeronomy	1.5	(3,0,0)	
OC432	Geochem. of Marine Sediments	1.5	(3,0,0)	OC331
OC442	Practical Marine Oceanography	0.5	(0,0,3)	OC301
OC462	Adv. Dynamic. Oceanography	1.5	(3,0,0)	CS301, MA301, OC451

With the written permission of the Dean of Science and Engineering the following course may be substituted for credit in the Oceanography concentration if not applied to a second concentration:

PH342	Remote Sensing	1.5	(3,0,0)	MA301
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### Second Concentration

See appropriate Departmental listing for information concerning the selected second concentration.

### Other Courses

ML311	Organizational Leadership	1.5	(3,0,0)
ML402	Professional & Ethical Issues	1.5	(3,0,0)

### Elective Courses

Arts elective 300 or 400 level courses : 3 units of credit

Science elective 300 or 400 level courses : 6 units of credit

The descriptions of named Oceanography courses follow, but there are a number of associated courses which are to be found under the department offering them, e.g. Applied Optics and Remote Sensing, Signal Processing, Applied Fluid Mechanics, etc.

**OCEANOGRAPHY 301: DESCRIPTIVE OCEANOGRAPHY (1½) (2,0,1)**

This course gives a general introduction to the oceans. The principal topics covered are: a survey of the physical properties of sea water; the distribution of salinity, temperature, etc., and their seasonal variations; the circulation of the oceans; energy budgets; oceanographic instrumentation and measurement techniques; and underwater sound velocity distributions as a result of temperature and salinity variations.

**OCEANOGRAPHY 321: Biological Oceanography (1½) (2,0,1)**

This course is an introductory course which deals with the marine ecosystem. Topics include: the chemical and physical characteristics of sea water; the ecosystem and the basis of life and its development; principles of taxonomy and the marine biota and finally, marine productivity. This final topic introduces the factors affecting primary productivity, global plant production, fish production and fisheries biology.

**OCEANOGRAPHY 331: Chemical Oceanography (1½) (3,0,2)**

Chemical composition and properties of sea water. Geochemical cycles, carbonate, silicon, etc. Dissolved and suspended organic material. Dissolved gases, pH and alkalinity. Nutrients. Trace metals and sediments. Corrosion and fouling. Commercial extraction of chemicals from the ocean. In the laboratory program, an attempt is made to duplicate the collection of samples in an actual oceanography study. Students collect samples from stations in nearby marine areas on a routine basis and analyze them using current analytical methods. The analysis covers both Oceanography 321 and Oceanography 331. The data are interpreted in terms of the seasonal changes in the chemistry and biology of a marine ecosystem.

**OCEANOGRAPHY 352: Oceanographic Methods (1½) (2,0,4)**

The principles covered in Oceanography 301, 321, and 331 are applied in practical field and laboratory studies of the physics, biology and chemistry of local waters. Sea time will be available aboard both the College launch, the Tayut and the MSSV Strickland (in cooperation with the University of Victoria). Modern instrumentation will be employed in the measurement of current; temperature; salinity; oxygen, nutrient, trace metal concentrations; marine pollutants, etc. Data reduction and interpretation will be required. The student must submit a project report following the format outlined in the honours thesis regulations.

Prerequisite: Oceanography 301, 321, 331

**OCEANOGRAPHY 362: Acoustics (1½) (3,0,0)**

See course description under Physics 362.

**OCEANOGRAPHY 401: Geophysical and Geological Oceanography (1½) (3,0,0)**

This course gives a general introduction to the physics of the earth within the framework of global plate tectonics. Following a discussion of the plate tectonic hypothesis and the differences between ocean floors and continental surfaces, the main topics are seismology; gravimetry and the interpretation of gravity anomalies;

## **OCEANOGRAPHY**

geodasy; geomagnetism and paleomagnetism; geothermal studies; marine geophysics and geophysical prospecting.

Prerequisite: Physics 332, Mathematics 301\*

(\*May be taken concurrently.)

### **OCEANOGRAPHY 412: Aeronomy (1½)    SS 3 3 2                    (3,0,0)**

This course deals principally with the atmosphere and its interactions with the oceans. Major topics covered are: the composition and properties of the atmosphere; comparison of dynamics of the atmosphere to the dynamics of the ocean; thermodynamics of the atmosphere; water vapour and cloud formation; solar and terrestrial radiation; transfer processes, including air-sea-ice interaction; magnetic fields and ionospheric physics; instruments, observations and their presentation; synoptic patterns; and military application.

Offered on demand. Prerequisite: consent of the Department.

### **OCEANOGRAPHY 432: Geochemistry of Marine Sediments (1½)                    (3,0,0)**

This course considers the sources, distribution and fate of material accumulating on the ocean floor. Lithogenous, cosmogenous, and biogenous components are considered, as is the influence of pollution. Fluxes between the water column and sediments are discussed in terms of their effect on the overall biochemistry of selected elements. The establishment of sedimentary redox zones as a consequence of organic matter degradation and the influence of these on cycling processes will receive considerable attention. Pelagic and coastal regions will be compared and contrasted. Mineral resources (ocean mining, petroleum and gas reserves, manganese nodules, hydrothermal vents) will be considered in terms of their economic value, technological challenges and ownership implications. The impact of man's activities on the marine environment will be discussed using examples of current interest.

Offered on demand. Prerequisite: Oceanography 331 or consent of the Department.

### **OCEANOGRAPHY 442: Practical Marine Oceanography (½)                    (0,0,3)**

Field experience is obtained in a local coastal environment. Measurement of current, temperature, salinity, etc. are taken. Data reduction, interpretation, and a final report are required.

Prerequisite: Oceanography 301 or consent of the Department.

### **OCEANOGRAPHY 451: Introduction to Dynamic Oceanography (1½)    (3,0,0)**

The equations of motion and continuity are developed and applied to hydrostatics, geostrophic and wind-driven currents, thermohaline circulation, waves, tides, and estuarine circulation.

Prerequisite: Oceanography 301 or consent of the Department.

**OCEANOGRAPHY 462: Advanced Dynamic Oceanography (1½) (3,0,0)**

Selected topics in turbulence, turbulent diffusion, waves, design of experiments, and analysis of data.

Prerequisites: Oceanography 451, Mathematics 301.

The topic must be approved by Faculty Council.

**OCEANOGRAPHY 473: Oceanography Project (1) (0,0,2/0,0,2)**

Fourth Year students in the Honours (course) program, working singly or in syndicates, work on an experimental or theoretical project in the general area of oceanography with members of the staff of the Department of Chemistry, Engineering, Mathematics or Physics. The student must submit and defend a project report according to thesis regulations but of much narrower scope.

The topic must be approved by Faculty Council.

**OCEANOGRAPHY 483: Oceanography Thesis Project (4) (0,1,4/0,1,4)**

Fourth Year students in the Honours (Thesis) program, working singly or in syndicates, work on an experimental or theoretical project in the general area of oceanography with members of the staff of the Department of Chemistry, Engineering, Mathematics or Physics. The student must submit and defend a thesis according to thesis regulations.

The topic must be approved by Faculty Council.

## PHYSICS

### DEPARTMENT OF PHYSICS

Associate Professor and Dean of Graduate Studies - D.P. Krauel, ndc, BSc, MSc, PhD

Associate Professor and Head of Department - M.J. Press, BSc, MSc, PhD

Professor - P.J.Schurer, BSc, MSc, PhD

Associate Professor - W.T. MacFarlane, BA, MSc, PhD

Associate Professor - R.F. Marsden, BSc, MA, PhD

Associate Professor - J.L. LaCombe, BSc, MSc, PhD

Assistant Professor - J.M. Gilliland, BSc, MA, PhD

Assistant Professor - M.W. Stacey, BSc, MSc, PhD

Assistant Professor - S.R. Waddell, BSc, MSc, PhD

Assistant Professor - J.R.Buckley, BSc, PhD

Assistant Professor - G.H. Fleming, CD, BSc, MA, PhD

The purpose of specialization in Physics, with a sound background in Mathematics, Chemistry and Engineering, is to provide the student with the ability to apply physical laws and to use the equipment and techniques of the exact sciences to solve problems. The interests of the Canadian Forces are reflected in the choice of topics studied.

### BSc COMBINED MAJOR WITH PHYSICS

Refer to Academic Regulations 10 and 12d.

#### *Third Year*

##### **Major**

Physics 322

Physics 332

Physics 371

Physics 342 (Note 1)

Physics 362 (Note 2)

##### **Other Courses**

Military Leadership 311

Math 301

Math 302 (Notes 2 and 3)

#### *Fourth Year*

##### **Major**

Physics 401

Physics 411

Physics 421

Physics 432

Physics 412 (Note 3)

##### **Other Course**

Military Leadership 402

Math 411 (Notes 2)

Math 401 (Note 1)

See the appropriate Departmental listing for information concerning the other selected Combined Major.

##### **Elective Courses**

1½ units of credit of 300

or 400 level elective course

##### **Elective Courses**

4½ units (Note 1),

or 1½ units (Note 2), or 3 units  
(Note 3) of credit of 300 or 400  
level elective courses

Note 1: When combined with Oceanography.  
 Note 2: When combined with Space Science.  
 Note 3: When combined with Computer Science.

Honours degree additional requirements are shown under the other possible major combination-Oceanography, Computer Science, Space Science. Refer to Academic Regulations 13a to 13e.

### **BSc GENERAL WITH PHYSICS CONCENTRATION**

Refer to Academic Regulations 10 and 12c.

<b>Concentration Courses</b>	<b>Credits</b>	<b>Prerequisites</b>
9 units of credit selected from:		
PH371 Electronics & Microcomputers	2.0 (3,0,3)	
PH411 Solid State Physics	1.5 (3,0,0)	MA301
PH332 EM Wave Propagation	2.0 (3,0,3)	MA301
PH342 App. Optics & Remote Sensing	1.5 (3,0,0)	
PH362 Acoustics	1.5 (3,0,0)	MA301
PH421 Quantum Mechanics	1.5 (3,0,0)	
PH322 Intermediate Mechanics	1.5 (3,0,0)	MA301
PH432 Applied Nuclear	1.5 (3,0,0)	MA301
PH412 Solid State Devices	1.5 (3,0,0)	PH411, PH371

With the written permission of the Dean of Science and Engineering one or more of the following courses may be submitted for credit in the Physics concentration if not applied to a second concentration:

CH401 Applied Thermodynamics	1.5 (3,0,0)	
OC401 Geophys. & Geol. Oceanography	1.5 (3,0,0)	
MA432 Adv. Applied Mathematics	1.5 (3,0,0)	MA301

#### **Second Concentration**

See appropriate Departmental listing for information concerning the selected second concentration.

#### **Other Courses**

ML311 Organizational Leadership	1.5 (3,0,0)
ML402 Professional & Ethical Issues	1.5 (3,0,0)

#### **Elective Courses**

Arts elective 300 or 400 level courses : 3 units of credit  
 Science elective 300 or 400 level courses : 6 units of credit

### **PHYSICS 103: Mechanics (2)**

**(2,0,1/2,0,1)**

For all first year students taking the Science and Engineering program of studies.

An introduction to the principles of physics through the study of mechanics. In the first semester the course includes the following topics: vectors; Newtonian kinematics; motion along a straight line, in a plane, and in three dimensions; friction; work; mechanical energy; conservation of energy; statics.

## ***PHYSICS***

In the second semester topics include: dynamics; collisions; conservation of momentum; simple harmonic motion; Hooke's Law; the simple pendulum; rotational dynamics; moment of inertia; rotational energy; introduction to special relativity; law of universal gravitation.

### **PHYSICS 113: Optics and Electricity (3) (3,0,2/3,0,2)**

For all First Year students taking the Science and Engineering program of studies.

An introduction to the principles of physics through the study of optics and electricity. In the first semester the course includes the following topics: nature and propagation of light; reflection; refraction; interference; diffraction; polarization; mirrors; lenses; optical instruments; electric charge and matter; Coulomb's Law; electric field; electrical potential; capacitance.

In the second semester the following topics are covered: electric current; Ohm's Law; DC circuits; Kirchhoff's Laws; concepts of magnetic field and Lorentz' force.

### **PHYSICS 123: Introductory Physics (3) (3,0,1½/3,0,1½)**

For Second Year students taking the Arts or Administration program of study.

This course introduces the concepts of elementary physics for students without a background in physics. In the first semester the concepts of force, velocity, acceleration, Newton's Laws of Motion, the gravitation field, work, power, energy, momentum, rotational motion and the conservation laws of energy and momentum are discussed. In the second semester the topics covered include the structure of matter, electric fields, electrical potential, potential differences, capacitance, resistance, current flow, simple AC and DC circuits, magnetic fields and the electromagnetic properties of materials. Topics of particular interest to the Armed Forces are used as illustrative examples. Topics covered in the classroom are supplemented by laboratory experiments on alternate weeks in both semesters.

### **PHYSICS 203: AC Circuits and Electromagnetism (3) (2½,0,3/2½,0,3)**

For all Second Year students taking the Science or Engineering program of studies.

In the first semester the course is an introduction to AC circuit analysis and includes the following topics: resistance; capacitance; inductance; sinusoidal steady state; complex numbers; Kirchhoff's Laws; power; series and parallel resonance; mesh current analysis; nodal analysis; Thevenin's Theorem; Norton's Theorem; transients.

Electromagnetism is covered in the second semester and includes the following topics: review of electrostatics; Gauss' Theorem; dielectrics; polarization; magnetic field interactions in free space and in matter; Ampere's Law; Biot-Savard Law; Faraday's Law; Maxwell's equations.

Prerequisites: Physics 103 and 113, Mathematics 113.

**PHYSICS 211: Vibrations and Waves (1)**

**(2½,0,0)**

For all Second Year students taking the Science or Engineering program of studies.

The course includes the following topics: undamped and damped harmonic motion; forced harmonic motion; resonance; coupled oscillators; normal modes; travelling waves; superposition; dispersion; phase and group velocities; potential and kinetic energy in an elastic wave; Doppler effect; shock waves; introduction to advanced problems in dynamics.

Prerequisites: Physics 103 and 113, Mathematics 113.

**PHYSICS 252: Modern Physics (1)**

**(2½,0,0)**

For all Second Year students taking the Science or Engineering program of studies.

The course is an introduction to the elementary concepts in quantum mechanics as developed by Einstein, Planck, Bohr, Heisenberg, Schrodinger, and others and includes the following topics: relativity; the particle concept of electromagnetic radiation and photon interactions; the Bohr model of the hydrogen atom, energy levels and bound states; introduction to Schrodinger's wave mechanics for particles; probabilistic views and applications in one dimension with step potentials.

Prerequisites: Physics 103 and 113, Mathematics 113.

**PHYSICS 322: Intermediate Mechanics (1½)**

**(3,0,0)**

Methods of handling systems and rigid body dynamics in three dimensions are studied, including the use of LaGrange's equations, the Hamiltonian, and accelerated coordinate frame equations. The principles of Gauss, D'Alembert and Fermat are studied. Application of computers and numerical techniques are emphasized, as well as the traditional methods of mathematical vector analysis.

Prerequisites: Physics 211 and 252, Mathematics 301.

**PHYSICS 332: Electromagnetic Wave Propagation (2)**

**(3,0,3)**

This course deals with the creation, propagation, reflection and absorption of electromagnetic waves in homogeneous isotropic or layered media, and by transmission lines, wave guides, antennae, and cavities. Topics covered in the classroom are supplemented by laboratory experiments.

Prerequisites: Physics 203 and 211, and Mathematics 301.

**PHYSICS 342: Applied Optics and Remote Sensing (1½)**

**(3,0,0)**

A discussion of the practical aspects of the production, transmission and detection of electromagnetic radiation. Topics include the fundamental concepts behind lasers, radar, synthetic aperture radar and holography. The principles of remote sensing, fibre optic communications, optical imaging, and image analysis are discussed in addition to practical considerations such as spatial and temporal resolution and transmission windows in the atmosphere and ocean.



## **PHYSICS**

Offered on demand. Prerequisite: Physics 113 or 123.

### **PHYSICS 362: Acoustics (1½) (3,0,0)**

The Acoustic Wave and Sonar equations are studied as they pertain to the creation, propagation, reflection, refraction and absorption of acoustic waves in homogeneous and horizontally layered media and in the real oceans. Sound signatures with applications to exploration geophysics, acoustic emission and silencing; and, in particular, underwater submarine detection and surveillance are discussed.

Prerequisites: Physics 211, Mathematics 301.

### **PHYSICS 371: Electronics and Microcomputers (2) (3,0,3)**

The course can be broken into three main sections. I. Analog electronics; theory of operation of diodes and transistors and typical solid state circuits, operational amplifiers, analog control theory. II. Digital electronics; gates, counters, registers, ROM, RAM, multiplexers, analog-digital and digital-analog conversion. III. Introduction to microcomputers; architecture; timing; input- output; interfacing; simple programming; digital control.

The laboratory work deals with experiments on analog (25%) and digital (25%) electronics and with experiments involving simple programming, input-output and timing on single-board microcomputers (50%).

Prerequisite: Physics 203 and 252.

### **PHYSICS 401: Experimental Physics (½) (0,0,3)**

For all Fourth Year students in the Combined Major Science program as well as for those General Science students who choose Physics 411 or Physics 421.

A course of experiments which illustrate and supplement the work discussed in the lecture courses.

### **PHYSICS 411: Solid State Physics (1½) (3,0,0)**

A discussion of basic properties of the solid state of matter and applications to electronics and computers. Symmetry in crystals, X-ray analysis, crystal defects, lattice dynamics (phonons), free electron theory, energy bands, p-n junction, magnetic and dielectric properties, super conductivity.

Physics 401 must be taken in conjunction with this course.

Prerequisites: Physics 203, 211 and 252, and Mathematics 301.

### **PHYSICS 412: Solid State Device Technology (1½) (3,0,0)**

Semiconductor materials and physics of semiconducting devices. Materials science of integrated circuit construction and packaging. Techniques of diffusion, ion implantation, lithography, etching, metalization, oxide and crystal growth. Comparison of various technologies and levels of integration from the viewpoint of complexity, signal-to-noise criteria, power requirements and operational speed. Discussion of specific CF-related hostile-environment requirements for circuit components.

Prerequisites: Physics 312, 371 and 421.

**PHYSICS 421: Quantum Mechanics (1½) (3,0,0)**

This course deals with the quantum theory of the electronic structure of the atom. Applications to optical and solid state devices are discussed, e.g. lasers, magnetometers, fibre optics, integrated circuits, spectroscopy, and remote sensing.

Physics 401 must be taken in conjunction with this course.

Prerequisites: Physics 411.

**PHYSICS 432: Applied Nuclear Physics (1½) (3,0,0)**

This course gives a broad overview of nuclear physics and its applications. Topics discussed include: the structure of matter, elementary forces, elementary particles, nuclear composition and binding energy, nuclear structure, radioactivity, Rutherford scattering, nuclear hazards, radiation monitoring, nuclear reactors, and radiation shielding.

Prerequisites: Physics 421 recommended, Mathematics 301.

Note: Details of individual courses offered at RMC or CMR should be obtained from their respective calendars.

## SPACE SCIENCE

### SPACE SCIENCE

The undergraduate degrees in Space Science and one of: Physics, Oceanography, Computer Science, or Applied Psychology are all interdisciplinary. As there is no department of Space Science, the curricula are under the guidance of the Space Science Curriculum Committee, chaired by the Dean of Science and Engineering.

#### INSTRUCTORS

Associate Professor - J.S. Collins, BSc, BEng, MEng, PhD  
Associate Professor - M.J. Press, BSc, MSc, PhD  
Assistant Professor - G.H. Fleming, CD, BSc, MA, PhD  
Assistant Professor - C.J. Damaren, BSc, MSc, PhD

#### DEPARTMENT

Engineering  
Physics  
Physics  
Engineering

### BSc COMBINED MAJOR WITH SPACE SCIENCE

Refer to Academic Regulations 10 and 12d.

#### *Third Year*

##### **Major**

Math 301  
Math 302  
Space Science 301  
Space Science 321 (Note 1)  
Space Science 332 (Note 1)  
Space Science 342 (Note 1)  
Physics 322

#### *Fourth Year*

##### **Major**

Math 411  
Space Science 411 (Note 1)  
Space Science 421  
Space Science 432  
Space Science 442 (Note 1)  
Space Science 491  
Science 492

See the appropriate Departmental listing for information concerning the other selected Combined Major.

#### **Other Courses**

Military Leadership 311

#### **Other Courses**

Military Leadership 402

#### **Elective Courses**

1½ units of credit of  
300 or 400 level Arts  
elective courses.

#### **Elective Courses**

1½ units of credit of  
300 or 400 level Arts  
elective courses.

1½ units of credit of  
300 or 400 level Science or  
Arts elective courses (Note 2).

1½ units of credit of  
300 or 400 level Science  
or Arts elective courses (Note 2).

Note 1: In the Space Science program there are certain courses that may be electives in other concentrations but are required courses for the Space Science degree program. These courses can only be used to fulfill the core course requirements. Other elective courses will have to be selected in order to meet the requirements for a Combined Major degree program.

Note 2: When combined with Physics.

### BSc COMBINED MAJOR HONOURS WITH SPACE SCIENCE

Refer to Academic Regulations 13a to 13e.

An Honours degree program is offered in Space Science with Combined Major with Physics, Oceanography or Applied Psychology. Honours students are required to take, in addition to the regular course load, Mathematics 432 and 1-1/2 units of credit of 300 or 400 level Science elective courses. Honours students are also required to complete an honours project (SS473), or research project (AP471) in the case of the Applied Psychology Major.

### **BSc GENERAL WITH SPACE SCIENCE CONCENTRATION**

Refer to Academic Regulations 10 and 12c.

Concentration Courses		Credits		Prerequisites
9 units of credit selected from:				
SS332	Aeronomy	1.5	(3,0,0)	MA411 PH322 PH322 PH322
SS342	Optics and Remote Sensing	1.5	(3,0,0)	
SS301	Astronomy	1.5	(3,0,0)	
SS432	Digital Image Processing	1.5	(3,0,1)	
SS421	Astrodynamics	1.5	(3,0,0)	
SS321	Space Systems and Environ	1.5	(3,0,0)	
SS411	Spacecraft Dynamics	1.5	(3,0,0)	
SS442	Robotics	1.5	(3,0,0)	
SC492	Seminar	0.0	(0,2,0)	

#### **Second Concentration**

See appropriate Departmental listing for information concerning the selected second concentration.

#### **Other Courses**

ML311	Organizational Leadership	1.5	(3,0,0)
ML402	Professional & Ethical Issues	1.5	(3,0,0)

#### **Elective Courses**

Arts elective 300 or 400 level courses: 3 units of credit (Note 1)

Science elective 300 or 400 level courses: 6 units of credit

Note 1: Students choosing the Space Science concentration must take SS491 as one of their Arts elective courses.

#### **SPACE SCIENCE 301: Astronomy (1½) (3,0,0)**

This course includes the basic elements of astronomy and astro-navigation. Topics include Kepler's law, Bode's law, the solar system, the earth-moon system, astronomical coordinate systems, stellar distances and magnitudes, spectral classification, stellar evolution, star clusters, interstellar medium, radio astronomy, as well as the techniques used to determine positions of orbiting satellites by star sightings.

#### **SPACE SCIENCE 321: Space Systems and Environment (1½) (3,0,0)**

See course description under Engineering 321.

#### **SPACE SCIENCE 332: Aeronomy (1½) (3,0,0)**

See course description under Oceanography 412.

## *SPACE SCIENCE*

### **SPACE SCIENCE 342: Applied Optics and Remote Sensing (1½) (3,0,0)**

See course description under Physics 342.

### **SPACE SCIENCE 411: Spacecraft Dynamics (1½) (3,0,0)**

See course description under Engineering 411.

### **SPACE SCIENCE 421: Astrodynamics (1½) (3,0,0)**

In this course the concepts to be discussed include time-dependent planetary orbits, trajectory mechanics, point of closest approach of two orbits, the multi-stage rocket problem, optimum planetocentric orbital manoeuvres, coplanar transfers between circular and elliptical orbits, non-coplanar orbital transfers, optimum intercept manoeuvres, optimum interplanetary transfers, minimum fuel, time, or initial weight-in-orbit interplanetary transfers, geocentric, lunar and interplanetary communications. The student should obtain an in-depth understanding of the problems and solutions associated with putting and keeping man in space.

### **SPACE SCIENCE 432: Digital Image Processing (1½) (3,0,0)**

This course will introduce the basic concepts and techniques of digital image processing. Topics to be covered include digital image fundamentals, such as the elements of visual perception, types of imagery, image transforms such as the discrete Fourier, histogram modification, filtering, pseudo-colour, image restoration, methods of image compression, pattern recognition, and tracking algorithms. Extensive use will be made of the College ultra-high resolution Gould Image Processing System. The course will focus on imagery of the Canadian Arctic, applications used to measure the extent and thickness of ice packs, evidence of human activities, as well as thermal structures evident in infrared imagery of coastal oceans to determine water parameters pertaining to the acoustic detection of submarines.

### **SPACE SCIENCE 442: Robotics (1½) (3,0,0)**

See course description under Engineering 402.

### **SPACE SCIENCE 491: Space Operations (1½) (3,0,0)**

This course looks at the political, legal, economic, scientific, military, technological and human factors that are an essential part of Canada's space efforts. To be discussed are the legal implications of spacecraft overflights, the implications of the military and non-military use of space, such as nuclear devices, the right to privacy and the use of space-generated information during wartime and in the preservation of peace. The short and long-term effects of weightlessness and confinement on the human body and mind will be considered. Legal problems of satellite orbits, for example, the use of the limited positions available in the geosynchronous orbits used by communications and broadcast satellites.

### **SCIENCE 492: Seminar (0) (0,2,0)**

A series of lectures in various topics of science, presented by guest speakers, members of the College staff, and students in the Honours Program.

## DEPARTMENT OF SECOND LANGUAGE TRAINING

Senior Teacher and Head of Department - A. Hadley, BA, DipEd, MEd

Senior Teacher - J.G. Donnelly, BA, BPEd, Teach Cert

Language Teacher - N. Arnold, BA, DipEd

Language Teacher - M. Connor, BA

Language Teacher - L. Éléonore, BA, BSc, MEd

Language Teacher - B. Leclerc, BA, BEd

Language Teacher - J. Robichaud, BA, BAEd, LcTh

Language Teacher - M. Savard, BA, MA

Language Teacher - A. Tétreault, BA

Language Teacher - D.R. Toyonaga, BA

One objective of the Canadian Military Colleges is to develop the ability to communicate in the second language. Consequently, second language training is mandatory for all students who do not already possess a high level of competence in their second language, i.e. francophones will receive training in English and anglophones will receive training in French.

Upon entry, students will be tested in four skills of their second language:

- a. listening
- b. speaking
- c. reading
- d. writing

Proficiency in each of these skills is measured on a six-point scale (0-5) to give a second language profile (e.g. "3321"). A student with a profile which totals 10 or more, including scores of at least level 3 in listening and speaking, will have attained the level of "functional" bilingualism. Scores of at least 4 in listening and speaking, with a minimum total of 14, signify the "integral" bilingualism level. Students reaching this level are exempt from second language training.

It is expected that many students will reach the "functional" level at the end of their fourth year. However, this level will probably be beyond the reach of those beginning the program with little or no competence in their second language, and relatively low aptitude for learning it. Consequently, a student who completes the language training program is expected to achieve at least the minimum acceptable standard of 2222 (or a total of 8) in order to graduate.

In addition to this minimum requirement for graduation, students enrolled in Second Language Training are required to show a satisfactory rate of progress at the end of each academic year.

Small, homogeneous classes, usually composed of eight students, will be established to give students the opportunity to progress according to their learning abilities. Five periods of instruction will be given every week during normal class

## *SECOND LANGUAGE TRAINING*

hours. First year students who do not achieve the “integral” level by the end of the academic year will take an intensive summer course which usually lasts ten weeks.

To increase exposure to the second language and to underline the bilingual nature of RRMCC, the College has established alternate English weeks and French weeks during which the students have the opportunity of working in their second language. In addition, students are strongly encouraged to take part in Immersion weekends organized by the SLT Department.

## **DRILL**

Officer in Charge of Drill - Captain M.F. Macintosh, BA

Drill Sergeant Major - Master Warrant Officer V.J. Wooley, CD

Drill Instructor - Sergeant J.G. Dufresne

Drill Instructor - Petty Officer 2nd Class J.J.G.R. Gagnard, CD

Bandmaster - Petty Officer 1st Class T.R. Vickery, CD

The objectives of the Drill program are to teach the officer cadets the fundamentals of drill as required in the Canadian Forces, to develop discipline and esprit de corps, to stimulate the power of command through mutual instruction, and to promote leadership through responsibility in handling groups of officer cadets.

Reference: A-PD-201-000/PT-000 Canadian Forces Manual of Drill and Ceremonial.

**DRILL 103 (0) (0,0,1/0,0,1)**

Includes rifle, foot, and ceremonial drill.

**DRILL 203 (0) (0,0,1/0,0,1)**

In addition to rifle, foot, and ceremonial drill, this course includes sword drill and mutual instruction.

**DRILL 303 (0) (0,0,1/0,0,1)**

Includes rifle, foot, and colours drill, as well as ceremonial and mutual instruction.

**DRILL 403 (0) (0,0,1/0,0,1)**

Reviews of all phases of drill previously taught.



## *PHYSICAL EDUCATION AND ATHLETICS*

### **PHYSICAL EDUCATION, ATHLETICS AND RECREATION**

Director of Athletics - Captain J.A. Kimick, CD, BA, BPE, MSc

Athletic Administration Officer - Lieutenant K. W.A. Fogalin, BA (PE)

Physical Education Officer/Chief Instructor - Master Warrant Officer A.G. Plant, CD

Physical Education and Recreation Instructors: -

Sergeant J.J. Dufresne, CD

Sergeant G.L. Riglin

Sergeant J.G.L. Turcotte

Sergeant R.J. Fuller

The aim of the Physical Education Program is to instill an understanding of the theory and philosophy of physical education, athletics and recreation; to develop leadership qualities; and to instill habits necessary for maintaining a healthy standard of personal fitness that will enhance the service person's career. The program is divided into an instructional phase, an intramural phase and a representative team sports phase. A progressive four-year program designed for the Canadian Military Colleges is followed.

#### **PHYSICAL EDUCATION 103 (0) (0,0,2/0,0,2)**

The instructional phase of this course covers personal conditioning activities, combatives (wrestling) and aquatics. Physiological fitness tests are conducted to further assess individual physical fitness capabilities and status.

#### **PHYSICAL EDUCATION 203 (0) (0,0,2/0,0,2)**

The instructional phase of this course branches into a core elective program. Electives offered include soccer, hockey, basketball, volleyball, aquatics, orienteering, softball, and flag football. The high level of instructor ability allows the cadet to develop his potential in each activity. An example is the aquatic program and, although all cadets must attain the Military Swim Standard, instruction to RLSS Bronze Cross level is available.

#### **PHYSICAL EDUCATION 303 (0) (0,0,2/0,0,2)**

The instructional phase continues the comprehensive elective program, offering instruction in unarmed combat, badminton, squash, tennis, and aquatics. Cadets choose sports in which they may pursue further personal development of skills, and are offered the opportunity to earn an RLSS Bronze Medallion or Cross in aquatics.

#### **PHYSICAL EDUCATION 403 (0) (0,0,2/0,0,2)**

The instructional phase electives offered are badminton, squash, curling, tennis, bowling, golf, volleyball, and aquatics. Cadets are introduced to the "life-time" sport skills that may be part of their life style for most of their career. As well, specific instruction is given related to post graduation career responsibilities and duties as a unit Sports Officer.

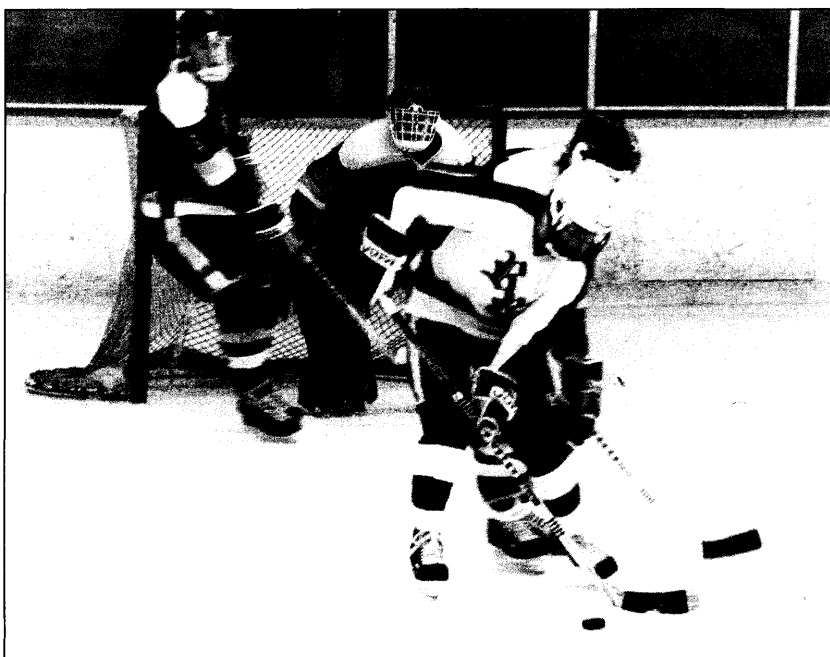
### **INTRAMURALS, INTERSQUADRON EVENTS AND REPRESENTATIVE TEAMS**

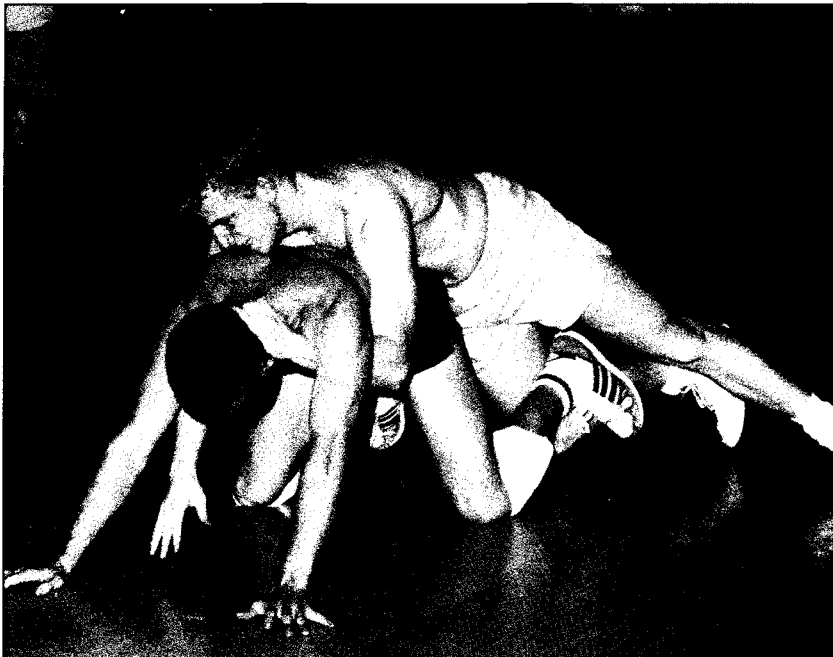
In addition to the two periods per week of instruction in physical education, all cadets participate in a minimum of two, after class sports periods. These are in the form of intramurals (IMs), or representative teams. The exact sport may vary slightly from year to year, but the IMs usually include soccer, volleyball, hockey, ball hockey, European team handball, broomball, flag football, curling and seven aside rugby. Under the general supervision of an athletic staff member, cadets organize and officiate the IM program and the intersquadron tournaments which are also held throughout the year. These events usually include orienteering, cross country running, wrestling, swimming and track and field.

The best coaching cadre is sought for the representative teams. It has included former Canadian National team members in rowing, rugby, and volleyball, and our curling team has represented the British Columbia Colleges Athletic Association at the National Colleges event. In addition to these sports, orienteering, sailing, running, soccer, wrestling, mountaineering, triathlon, squash, and shooting, are offered.

Note: All cadets are required to pass the CMC fitness test three times per year. The test consists of five items: 1.5 mile run, agility run, standing long jump, chin ups and sit ups. UTPM cadets are required to pass the 1.5 mile run only.







## ACADEMIC REGULATIONS

### UNDERGRADUATE STUDY ACADEMIC REGULATIONS

#### DEFINITIONS

**Student:** a member of the Canadian Forces attending Royal Roads Military College to study for a baccalaureate degree. Such students may be of the following types:

- a. **Officer Cadet:** a student attending RRMC under the Regular Officer Training Plan (ROTP), the Reserve Entry Training Plan (RETP), or the University Training Plan – Non-Commissioned Member (UTPNCM).
- b. **Officer:** a student attending RRMC under the University Training Plan – Officers (UTPO).
- c. **Special Student:** other members of the Canadian Forces or RRMC civilian staff, or dependents of RRMC staff or students, taking one or more courses at RRMC on a part-time basis. The academic regulations which follow do not apply to special students except where specifically noted.

**Program of Study:** a group of courses comprising a year's program of studies, e.g., Mechanical Engineering, Physics and Oceanography, etc.

**Subject:** a division of the program of studies, e.g., physics, history, etc.

**Course:** a series of lectures and/or laboratory sessions in a given subject, designated by a number and for which an annual or semester assessment must be provided, e.g., Chemistry 103, Oceanography 401, etc.

**Mandatory Course:** a course required to be taken by a student to fulfill the requirements of an approved program of study.

**Elective:** a course selected by the student from several designated offerings as opposed to a mandatory course to fulfill requirements of an approved program of study.

**Extra Course:** a course which is not a required part of a program of study but which, under certain circumstances, may be taken in addition to the regular requirements of the program of study.

**Failed-Credit Standing:** standing granted on the recommendation of the Faculty Board, and with the approval of the Faculty Council and the Commandant, in a failed course for the purpose of allowing a student who has failed one course to pass the year. The actual final grade earned will be recorded on the transcript with the annotation "failed-credit" (FC), and will remain a failure for the purpose of determining whether or not work prerequisite to other courses has been completed.

**Carry a Course:** when so recommended by the Faculty Board and approved by the Faculty Council and the Commandant, a student carries a course after failing this course in the previous semester or year by taking the failed course (or an authorized equivalent) again in the first subsequent academic semester or year in which the course is scheduled, together with the normal academic workload of that semester or year. The grade accorded on the first attempt will be recorded on the student's transcript with the notation "Failed but permitted to carry." The semester or year will

not be cleared until the carried course has been passed. A student may not carry a course from one CMC to another.

**Credit:** a course at RRMC is assigned 3 units of credit for a 3 lecture hour course over 26 weeks (2 semesters) and 1-1/2 units of credit for a 3 lecture hour course over 13 weeks (1 semester). Other courses may be assigned more or fewer credits based on scheduled laboratory or tutorial sessions.

**Supplemental Examination:** an examination set upon the recommendation of the Faculty Board, and with the approval of Faculty Council and the Commandant, in a course in which a student has failed. A pass in a supplemental examination may be accepted by Faculty Board to remove the deficiency of the failure. If the failed course is required to complete the work of a year, the year is failed until pass standing is obtained in that course.

### DURATION OF THE PROGRAM OF STUDIES

1. For students starting their studies at the Royal Military College of Canada, or at the Royal Roads Military College, the duration of the program of studies is four years of two terms or semesters each; for students starting their studies at le Collège militaire royal de Saint-Jean, it is four or five years of two terms or semesters each, depending upon whether the student enters at the First Year or at the Preparatory Year level.
2. The years in the program of studies for students are designated as follows: Preparatory Year (at le Collège militaire royal de Saint-Jean only); the First, Second, Third, and Fourth Years (all three colleges). Entrance to the Preparatory Year and to the First Year requires completion of the secondary school programs as outlined as admission requirements in the appropriate Calendar.
3. Students successfully completing the Second Year at Royal Roads Military College and not entering a Bachelor of Science, or Bachelor of Arts program at RRMC will normally complete their final two years at either RMC or CMR.

### DEGREES

- 4a. A degree of Bachelor of Arts or a degree of Bachelor of Science in general, major, combined major or honours patterns in the fields of history, political science, economics, applied military psychology, military and strategic studies, physics, oceanography, space science or computer science as appropriate shall be granted by Royal Roads Military College to a student who has successfully completed the requirements by the final year at the institution.
- 4b. A degree of Master of Science in course or thesis patterns in the fields of oceanography and acoustics shall be granted by Royal Roads Military College to a graduate student who has successfully completed the requirements at the institution.
- 4c. The degree of Doctor of Laws (LLD) *honoris causa*, Doctor of Science (DSc) *honoris causa*, and Doctor of Military Science (DMilSc) *honoris causa* shall be granted by Royal Roads Military College to those who are worthy of the honour.

## **ACADEMIC REGULATIONS**

5. Students who complete the final year with first class honours standing will have their degree scripts inscribed “With Distinction” (see Academic Regulations 23 and 27).

### **Certificate of Qualification**

- 6a. At the end of the Second Year a Certificate of Qualification may be granted by Royal Roads Military College to any student who has successfully completed the First and Second Year of their programs of studies at that institution.
- 6b. At the end of the First and Third Year a Certificate of Qualification may be granted by Royal Roads Military College to any student who has successfully completed with first class honours without supplementals that year of their programs of studies at that institution.
- 6c. A certificate of qualification may be granted by Royal Roads Military College to any student who has successfully completed a program approved by Faculty Council for a Special Graduate Student or a short course such as the METOC Short Course in Oceanography.

## **RRMC PROGRAMS OF STUDY**

### **General Limitations**

7. The Canadian Forces reserve the right to limit enrolment in any given program of studies at any Canadian Military College, or to select the location at which a program of studies will be offered.

### **The First Year**

8. All students registered in First Year are required to take all the courses prescribed in the calendar under “First Year - Degrees in Arts or Administration” or “First Year - Degrees in Science or Engineering.” Students may transfer into First Year Arts following completion of the first semester of the First Year Science or Engineering program.

### **The Second Year**

- 9a. All students registered in the Second Year Arts or Administration program of study are required to take the courses prescribed in the calendar under “Second Year - Degrees in Arts or Administration.”
- 9b. All students registered in a Second Year Science or Engineering program of study are required to take courses prescribed in the calendar under “Second Year - Degrees in Science” or “Second Year - Degrees in Engineering.” A student may not normally transfer into Second Year Arts on the completion of the first semester.
- 9c. Students who have completed the Science or Engineering program of study in the Second Year may transfer to the Third Year Arts program for the Military and Strategic Studies general or honours degree program, or Applied Military Psychology general or honours degree program, or to a Third Year Arts degree program at the other Canadian Military Colleges. The department(s) in which the student becomes registered may require that a specified course be taken instead of an elective in the Third or Fourth Year of the respective Arts degree program.

**Third and Fourth Years**

10. Programs of study are offered as follows: Arts with a Major in Applied Military Psychology or with interdisciplinary concentrations (Military and Strategic Studies) in History, Political Science, Economics and Literature; Science with Combined Majors in Computer Science, Oceanography, Physics, Applied Psychology and Space Science, with a Major in Applied Psychology, and with interdisciplinary concentrations in Computer Science, Engineering Science, Mathematics, Oceanography, Physics and Space Science. Details of required and elective courses are as specified in the current calendar.
11. Admission into these degree programs offered at RRMC requires normally the satisfactory completion of Second Year at any CMC. Specific programs may require certain prerequisite courses as directed by the departments concerned and specified in the current calendar.
- 12a. Candidates for an Arts degree (interdisciplinary concentrations or major) must normally take a semester course loading of 7½ units of credit and complete a minimum of six units in any semester. Of the minimum 30 units of credit in 300 and 400 level courses that must be obtained over four semesters, 9 units must be in each of two fields for the interdisciplinary concentration programs and 15 units must be in one field for the major programs. For all programs, three units must be in Military Leadership 311 and 402. Elective courses may be selected from the designated Third and Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits.
- 12b. For interdisciplinary concentration programs in minimum of 3 units of credit in elective courses must be completed from among offerings outside of the fields of the concentrations. In a major program, at least nine units of credit in elective courses must be taken from outside the major field.
- 12c. Candidates for a Science degree (interdisciplinary concentrations or major) must normally take a semester course loading of 7½ units of credit and complete a minimum of six units in any semester. Of the minimum 30 units of credit in 300 and 400 level courses that must be obtained over four semesters, 22 units are required in science courses; 9 units must be in each of two fields for the interdisciplinary concentration programs and 15 units must be in one field for the major programs. For all programs, three units must be in Military Leadership 311 and 402. Elective courses may be selected from the designated Third or Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits, but a minimum of 3 units must be in Arts electives.
- 12d. Candidates for a Science degree (combined major) must normally complete a minimum semester loading of 7½ units of credit. Of the minimum 36 units of credit in 300 and 400 level courses that must be obtained over four semesters, 30 units are required in science courses of which 12 units must be in each of two fields. For all programs, three units must be in Military Leadership 311 and 402. Elective courses may be selected from the designated Third and Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits, but a minimum of 3 units must be in Arts electives. A minimum weighted average of 55 percent in Science courses must normally be maintained in each semester by the candidate to remain in the combined major programs.



## **ACADEMIC REGULATIONS**

- 12e. Elective courses selected by students must be approved by the departments concerned and the Registrar.

### **Third and Fourth Years – Honours Programs**

- 13a. Honours programs of study are offered by the Arts Division in the Applied Military Psychology and the Military and Strategic Studies degree programs and by the Science Division in conjunction with the Combined Major degree programs. Details of the required courses are as specified in the current calendar.
- 13b. Candidates for any Honours program must apply for admission in writing to the Dean concerned, no later than the first week of May of the Second Year for Arts students and of the Third Year for Science students. A candidate for a thesis Honours program will have a detailed thesis proposal submitted to Faculty Council in accordance with thesis regulations not later than the first day of October in the Fourth Year.
- 13c. Admission into the Arts Honours programs requires completion of Second Year Arts with a minimum of second class honours. Students who have achieved less than second class honours may be admitted to an Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Arts program, a candidate must complete an additional six units of credit as directed by the departments concerned.
- 13d. Admission into the Science Honours programs requires completion of Third Year Science Combined Major with a minimum weighted average of second class honours in Third Year science and engineering courses. Students who have achieved less than the required average may be admitted to an Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Science program, a candidate must complete an additional four units of credit as directed by the departments concerned.
- 13e. To be graduated with an Honours Degree a candidate must normally maintain an overall weighted average of 66 percent or better with no failures throughout the Third and Fourth Years of studies.

### **Extra Courses**

14. In certain years of some programs of study a student may, with the permission of Faculty Council, register in an extra course over and above those required for the given program of study. In this case the extra course must be designated in advance and may not be counted for standing and for calculating the student's overall average. A grade will be recorded unless a student formally withdraws from the extra course by application to the Registrar (see Academic Regulation 20). Credit for extra courses taken in the First or Second Years will not normally be granted in lieu of credit for elective courses in the Third and Fourth Years.

### **Limitation of Selection of Third Year Program of Study**

15. A student who has been recommended not to take a certain program of study by a Canadian Military College on the completion of the Second Year may be refused permission to register in that program of study in the Third Year.

**DRILL AND PHYSICAL EDUCATION**

16. Courses in drill and physical education must be taken by all officer cadets in all years.

**SECOND LANGUAGE TRAINING**

17. Courses in second language training must be taken by all officer cadets in all years.

**CONTINUITY OF STUDY**

18. Under normal circumstances a student may not postpone a semester or a year of study.

**CHANGES IN REGISTRATION (RRMC)**

19. Any change in registration in a program of study requires the permission of Faculty Council. Within a program of study, the courses selected by any student may not be altered later than one month after the beginning of the academic year without the permission of Faculty Council. One semester courses may not be altered later than one month after the beginning of the semester without the permission of Faculty Council.
20. Changes in registration in a program of study or in a course will be considered by Faculty Council up to the end of the seventh week from the beginning of lectures without academic penalty. A student withdrawing from a course subsequent to that date will have failed attempt (FA) entered on the record. A grade of FA will not be included in the student's weighted average, and if the course is an extra course, for academic regulation purposes it will not count as a failed course. Withdrawal at any time without academic penalty may be allowed in cases of illness or other compelling reasons.
21. Students may not normally transfer from one program of study to another without having completed full prerequisite standing in the courses of the program of study they wish to enter.

**ATTENDANCE**

- 22a. Students are required to attend all classes except that those students with a weighted average of First Class standing on end semester examinations may attend classes in the next semester on a voluntary basis and those with a weighted average of Second Class standing may attend course classes on a voluntary basis with the consent of individual course instructors.
- 22b. A student who does not attend classes through illness or any other cause must complete term work and all assignments to the satisfaction of the department concerned.

**ACADEMIC STANDING**

**Grades**

23. Final grades in all courses will be reported as follows:
- |                      |                |         |
|----------------------|----------------|---------|
| First Class Honours  | (75% and over) | grade A |
| Second Class Honours | (66 to 74%)    | grade B |
| Third Class Honours  | (60 to 65%)    | grade C |

## ACADEMIC REGULATIONS

Pass	(50 to 59%)	grade D
Failure	(40 to 49%)	grade F
Serious Failure	(less than 40%)	grade FF
Failed Attempt	(final examination not written)	grade FA
Failed Credit		grade FC

### Pass Standing

- 24a. To be permitted to continue into the second semester of a year or into the next year, a student must be granted pass standing in an approved program of study, except that a student in the first semester of the First Year may be permitted to continue into the second semester provided that the student's overall weighted grade average is not less than 40 percent.
- 24b. To be granted pass standing in the first semester of a year, a student must obtain:
- a minimum overall weighted grade average of 50 percent in an approved program of study; and
  - a minimum final grade in course of 50 percent in each one semester course of the program of study except that a student may be passed with a failed-credit standing in one course. However, with the permission of Faculty Council, a student who fails to obtain a final grade of 50 percent in one subject may carry that course or an authorized equivalent into the subsequent semester or year and register in the next semester of the program of study.
- 24c. To be granted pass standing in a year, a student must obtain:
- an overall final weighted grade average over the year's work of at least 50 percent;
  - a minimum final grade of 50 percent in each course of the program of study except that a student may be passed with failed-credit standing in one course. However, with the permission of Faculty Council, a student who fails to obtain a final grade of 50 percent in one subject may carry that course or an authorized equivalent into the subsequent semester or year and register in the next semester of the program of study;
  - a satisfactory standard in Second Language Training;
  - a satisfactory standard in Physical Training and Drill; and
  - a favourable report in Officer-Like Qualities.

### Aegrotat Standing

25. Aegrotat standing may be granted by the Faculty Council, upon the recommendation of the head of the department concerned, to any student or special student who has been unable to write one or more of the final examinations but who has achieved a satisfactory standing in the course or courses concerned.

### Grade Average and Rank in Class

26. At the end of the first semester in each year a student's overall numerical weighted grade average will be calculated based on all courses taken in the

semester excluding any extra courses. The calculation is the sum of the products of the numerical end-semester or final grade in course in each course and the units of credit assigned to that course divided by the total number of units of credit carried.

27. At the end of each year a student's overall numerical weighted grade average will be calculated based on all courses taken in the year excluding any extra courses. The calculation is the sum of the products of the numerical final grade in course in each course and the units of credit assigned to that course divided by the total number of units of credit carried.

#### FINAL EXAMINATIONS

28. Final examinations will be held for all non-laboratory courses at dates and times to be specified in the examination timetables. With the permission of Faculty Council, the requirement for a final examination in Third and Fourth Year courses may be waived.
29. A student or special student may write examinations in either English or French, except that the examinations in language courses must be written in the language concerned.
- 30a. The Faculty Board constitutes the examining board for all non-final end-semester and final examinations. Academic standing in both end-semester and final examinations, and end-semester and final grades in course are granted by the Faculty Board subject to confirmation by the Faculty Council.
- 30b. A student who wishes to appeal a non-final end-semester or final grade in course shall do so in accordance with Academic Regulations 45 and 46. For a student who is eligible to write a supplemental examination in that course, no appeal or petition will be heard prior to the supplemental examination.
31. A student or special student may be refused permission by Faculty Council on the recommendation of the department concerned to write the final examination:
  - i) in any course involving practical work in a laboratory if laboratory work has been unsatisfactory; or
  - ii) in any course if requirements with regard to assignments have not been met.
32. Students taking a year course who, at the end of the first semester, have received approval to transfer into a program of study for which the second semester of the year course is not required may have the end-semester examination considered a final examination in the first semester's work of the year course and retain credit for the work thus completed.

#### SUPPLEMENTAL EXAMINATIONS

33. A student may be granted the privilege of writing supplemental examinations only for courses in which final examinations have been written and for which final grades of less than 50 percent were received, provided:
  - i) the overall weighted grade average in the first semester or the year is not less than 50 percent, except in the first semester of the First Year;

## **ACADEMIC REGULATIONS**

- ii) a final grade of at least 35 percent has been achieved in the failed course; and
  - iii) no more than two courses where grades are final have been failed in the semester, or not more than three courses if one of the failed courses carries not more than one-half unit of credit.
34. Supplemental examinations will be held at dates and times specified in the supplemental examination timetables and shall normally be written within three weeks of the completion of final examinations.
35. To obtain a pass standing in a failed course, a student must obtain a final course grade of 50 percent, normally including previous term work and the supplemental examination mark replacing the final examination mark. The weighting of the supplemental mark shall not be less than that assigned to the final examination mark; however, the weight assigned to the supplemental examination mark shall not be less than 50 percent.
36. Marks obtained in supplemental examinations may not be used to advance a student's overall weighted grade average for the semester or year.
37. With the consent of Faculty Council, and under extenuating circumstances, a special student may write a supplemental examination.

### **FAILURE OF A YEAR**

38. A student shall fail the semester and year if:
- i) the student's overall weighted grade average for the year is less than 50 percent except in the first semester of the First Year; or
  - ii) the student fails in more than two courses and is ineligible to write supplemental examinations under the conditions of Academic Regulation 33; or
  - iii) the student fails one or more supplemental examinations and is not granted failed-credit standing or is not allowed to carry a failed course; or
  - iv) the student fails a course that the student has been permitted to carry; or
  - v) the student is required to withdraw under Academic Regulation 41.

### **REPEATING A SEMESTER OR YEAR**

- 39a. A student who has failed a first semester or year will be considered for a repeat semester or year unless the Faculty Council has determined that the student must withdraw from the College. (See Academic Regulations 41 to 44).
- 39b. A student may be permitted to repeat any first semester or year, including the Fourth Year.
- 39c. A student may repeat a first semester or year only once during the student's entire program of studies.
- 39d. A student may be permitted to repeat the Second Year in Engineering if the student has failed to qualify for Engineering as required by Academic Regulations.

40. A student permitted to repeat a semester or year must carry the equivalent work load of the student's full program of study. Normally, no credit will be granted for courses which constitute part of a failed year.

#### **WITHDRAWAL**

41. A student whose overall weighted grade average at the end of a semester or year is less than 40 percent or who fails in more than 50 percent of the units of credit for courses with final grades in a semester shall normally be required to withdraw.
42. A student who fails a semester or year may be required to withdraw from the College.
- 43a. A student who fails a semester or year, having previously failed a semester or year, must withdraw.
- 43b. A student who fails a course that the student has been allowed to carry shall normally be required to withdraw.
44. A cadet who, in the opinion of the staff, fails to develop the necessary officer-like qualities or achieve the required standards in Second Language Training or Physical Training will, on the approval of the Commandant for such action, be required to withdraw.

#### **APPEALS AND PETITIONS**

45. A student with a complaint or grievance which is academic in nature should communicate that concern to the instructor, Head of Department and/or Dean of the faculty involved. If the matter remains unresolved in this informal process, a formal petition to the Faculty Council can be initiated.
46. Formal petitions to the Faculty Council must be made in writing on the form available from the Office of the Registrar. Normally, petitions will only be heard if submitted within ninety days of the event or academic decision giving rise to the appeal. For more specific information and other principles governing student appeals, the Registrar, as Secretary to the Faculty Council, should be consulted.

## ACADEMIC REGULATIONS

### ACADEMIC MISCONDUCT

47. **Cheating:** This includes, but is not limited to, dishonest or attempted dishonest conduct at tests or examinations in which use is made of books, notes, diagrams or other aids excluding those authorized by the examiner. It includes communicating with others for the purpose of obtaining information, copying from the work of others and purposely exposing or conveying information to other students who are taking the test or examination.

48. **Plagiarism:** This includes, but is not limited to, the presentation or submission of the work of another person, without citation or credits, as the student's own work.

Plagiarism is a form of academic dishonesty. Scholarship rests upon examining and referring to the thoughts and writings of others. A large part of the work done at the undergraduate level must involve the handling at second hand of ideas and material originally conceived or made accessible by others. There is a difference, however, between the use of an acknowledged restatement of such ideas and material after intelligent and critical assimilation and their unacknowledged, literal reproduction in the guise of new and original work. The latter amounts to plagiarism, whether it takes the specific form of verbatim and unacknowledged copying or appears in other forms, such as the use of commercially prepared essays in place of a student's own work or the fraudulent manipulation of laboratory processes in order to achieve desired results. Offences of this kind may occur in many different ways and circumstances in different disciplines. Substantial plagiarism exists when there is no recognition given to the author for phrases and sentences incorporated in an essay. Complete plagiarism exists when a whole essay is copied from an author or composed by another person and presented as original work. At the undergraduate level, fair treatment of these offences entails consideration of the contingent factors, requiring the flexible exercise of equal justice at all levels from the individual instructor upwards. Each instructor shall carefully define what constitutes plagiarism in the context of his particular course at the beginning of the term.

49. **Penalties:** Cheating and plagiarism as forms of academic dishonesty are considered serious offences at RRMCC. The minimum penalty for a student found to have plagiarized by a member of Faculty will be a zero for the plagiarized submission. A student accused of cheating or plagiarism may be charged under the Code of College Conduct or the National Defence Act. A student found guilty of cheating or plagiarism may be expelled from the College.

## HONOURS THESIS REGULATIONS

### General

1. The Honours Thesis is intended to provide the candidate with the opportunity to study a topic in depth. The following regulations govern in part the thesis requirements for an Honours (Thesis) Degree in Science.

### Regulations

2. A student wishing to enter an Honours (Thesis) program must apply in writing to the Dean of Science and Engineering, preferably not later than the end of the first week of May of his/her Third Year.
3. To be eligible as a candidate for an Honours (Thesis) program, a cadet normally must complete Third Year with a weighted average of at least 66 percent in Third Year Science and Engineering courses.
4. To be graduated with an Honours (Thesis) degree a candidate must:
  - (a) maintain an overall weighted average of 66 percent or better during the Fourth Year of studies; and
  - (b) must successfully complete an Honours Thesis, and present it at a seminar.
5. It is the responsibility of the student to produce the final typewritten copies of the thesis. Handwritten copy is not acceptable.
6. The format of the thesis shall conform to the **New Guide for the Preparation of Coastal Marine Science Laboratory Reports, and Honours Theses** by M.S. Madoff, Internal Manuscript Series Report 83-1, insofar as it is applicable.
7. The candidate will consult with the head of the department concerned to determine an appropriate thesis topic and supervisor.
8. When a candidate has selected his/her thesis topic, a Thesis Supervisory Committee will be named by the Dean of Science and Engineering and will consist of three members: the head of the major department or his designate, the supervisor, and one member from outside the major department but in a related field. The role of this committee, which is charged by the supervisor, shall be:
  - a. to approve the thesis topic and scope of work;
  - b. to ensure that reasonable progress is being made by the student in his/her thesis and course work;
  - c. to recommend to Faculty Council appropriate action in light of the student's progress; and
  - d. to determine the acceptability of the thesis for examination.
9. Candidates must draft a detailed thesis proposal for approval by his/her supervisory committee. The thesis proposal must not exceed 1000 words and must outline the issues to be addressed. A working bibliography should be attached. Further, the bibliography should indicate those materials available in the Royal Roads library as well as materials that will have to be obtained elsewhere. Three typed copies of the completed thesis proposal must be submitted to the Thesis Supervisory Committee not later than the first day of October. When approved by the Committee, a copy of the proposal will be



## *THESIS REGULATIONS*

submitted through the department head to Faculty Council as an information item at the first meeting in October.

10. During the preparatory stages of the thesis, the candidate must meet regularly with his/her Thesis Supervisory Committee. The following timetable is recommended:
  - a. October/December – research phase;
  - b. January – preparation of first draft for committee;
  - c. February – preparation of second draft for committee; and
  - d. early March – preparation of final draft for oral presentation at a seminar.
11. The candidate must submit the original and two copies of his/her completed thesis to the Thesis Supervisory Committee no later than 15 March.
12. If the 1 October deadline for the proposal or the 15 March deadline for the completed thesis is not met, it will be assumed the student has withdrawn from the Honours (Thesis) program. A student who has defaulted on one of these deadlines must apply in writing to Faculty Council for permission to re-enter the program. Such permission will not normally be granted.
13. The completed thesis will be examined privately and at a public seminar by the Thesis Supervisory Committee which, at the discretion of the Dean of Science and Engineering, may be augmented by an external examiner. The examining committee will be chaired by the head of the relevant department unless he is the supervisor, in which case the Dean of Science and Engineering will be the chairman.
14. The examiners will assign a mark and rule the thesis to be either:
  - a. acceptable as it stands;
  - b. acceptable with minor revisions;
  - c. acceptable with major revisions; or
  - d. unacceptable
15. Thesis revisions, if required, must be submitted to a designated examiner one week before the end of the final examination period in the spring. The revisions must be completed on the original and two copies. The original must be deposited with the RRMCL librarian for shelving.
16. The Registrar and the candidate will be informed in writing by the chairman of the examining committee of the decisions of the committee before the last day of the RRMCL spring final examination period.

**RULES GOVERNING  
HONOURS ARTS RESEARCH SEMINAR**

1. A student may elect to take the Honours Arts Research Seminar in the Fourth Year to make up 3 of the additional 6 units of work required. This course is intended to provide the student with the opportunity to research a topic in depth, though research of an archival nature is not necessarily expected. The course will consist of directed readings in the first term and the completion of a major research paper in the second term.
2. The topic selected for an Honours Arts Research Seminar may be drawn from the offered disciplines provided that the topic is considered appropriate to the Military and Strategic Studies program or to the Applied Military Psychology program.
3. A student wishing to take the Honours Arts Research Seminar must apply in writing to the Coordinator of the Honours program, Department of History and Political Economy or to the Head, Military Leadership and Applied Psychology Department not later than 21 May of his/her Third Year in the program. The application must include the proposed topic for study in the Honours Arts Research Seminar.
4. The appropriate department will meet before the end of May to rule upon the suitability of the proposed topics and to assign instructors to successful candidates. Applicants will be informed of the Department's decisions by the Honours Coordinator or Department Head.
5. A candidate who receives permission to take the Honours Arts Research Seminar will meet with the assigned instructor on a regular basis throughout the first term to discuss readings related to the proposed topic. To be eligible to continue in the Honours program, a candidate must normally receive a mark at Christmas of 66 percent or better in the Honours Arts Research Seminar.
6. In the second term, a candidate taking the Honours Arts Research Seminar must write a research paper on the proposed topic. The research paper normally will range from a minimum of 30 to a maximum of 35 double-spaced, typewritten pages (excluding footnotes and bibliography). Research papers exceeding these limitations must receive departmental approval. The candidate must continue to meet regularly with the assigned instructor during the preparation of the research paper.
7. The candidate must submit the original and two copies of the completed research paper to the Departmental Honours Program Coordinator no later than 1 April. The department may, in extenuating circumstances, grant an extension of the due date.
8. The research paper will be read by a Committee of Examiners before the end of the April examination period. Under exceptional circumstances the candidate may be asked to appear before the Committee to defend the research paper orally. The Committee of Examiners will consist of a chairman and two readers. One reader will be the candidate's research instructor, the second reader will normally be a member of the appropriate department.
9. The Coordinator of the Honours program will organize the Committee of Examiners upon receipt of the completed research paper and two copies. The

## *HONOURS RESEARCH*

Head of the Department retains final authority for the selection of Committee chairman and second reader except where the head is also the candidate's research instructor. In this case final authority for the selection of chairman and second reader will rest with the Dean of Arts. Any dispute arising as to membership on the Committee will be resolved by the Principal.

10. The Chairman of the Committee of Examiners will convene a meeting of the Committee. A final mark for the research paper will be determined by the two readers. In the event that the two readers are deadlocked, the Chairman of the Committee will cast a deciding vote. A research paper must receive a minimum mark of 66 percent in order to pass.
11. To receive full credit for the Honours Arts Research Seminar a candidate must attain a minimum mark of 66 percent in both the directed reading and research paper portions of the course. For candidates who meet this requirement, the final grade for the Honours Arts Research Seminar will be determined by averaging the mark received for directed readings with the mark received for the research paper. Both the directed readings and the research paper will be accorded equal weighting in determining this final mark. Students who fail to meet this requirement may be granted a general degree if a minimum mark of 50 percent is achieved on the research paper.

## GRADUATE STUDIES

### **General Requirements - Graduate Programs**

Royal Roads Military College offers postgraduate study programs leading to a diploma or the degrees of MSc (Course) and MSc (Thesis) to serving and reserve Commissioned Officers of the Canadian Armed Forces and to civilian employees of the Federal Government.

The following General Regulations specify the minimum academic requirements for these programs.

Policies and procedures governing postgraduate training are presented in CFAO 9- 33. Selection of officer candidates will be made by NDHQ.

### **Academic Admission Requirements and Definitions**

Decisions on academic admissibility are made by the Graduate Studies Committee on the recommendation of the major department.

All persons already possessing a degree who take any RRMCC courses, whether postgraduate or undergraduate, and whether for degree credit or not, will register as graduate students.

Students are registered as **Regular Graduate Students, Probationary Graduate Students or Special Graduate Students.**

**A Regular Graduate Student** is a candidate who aspires to a diploma or graduate degree and has given evidence of capacity for postgraduate work acceptable to the major department, and to the Graduate Studies Committee.

**A Probationary Graduate Student** is a candidate who aspires to a diploma or graduate degree and who is acceptable on probation to the Graduate Studies Committee. Normally he/she will be required to complete prerequisite undergraduate or other work at a satisfactory standard in order to qualify for admission as a regular graduate student. When qualification for such admission is recommended to the Graduate Studies Committee by the major department concerned, admission will be considered on the same or equivalent basis as for direct admission as a Regular Graduate Student.

**A Special Graduate Student** is a graduate from a recognized university who is not a candidate for a diploma or degree, but who wishes to take one or more courses at either the postgraduate or undergraduate level or both. Permission of the major department concerned must be obtained prior to admission.

For direct admission as a Regular Graduate Student to courses of study, an applicant must hold a science or engineering degree from a recognized university with at least Second Class Honours and a sound background in Mathematics and Physics.

## *GRADUATE STUDIES*

### **Programs of Studies**

#### **a. Diploma program in Oceanography**

Entrance requirement: a degree in Science or Engineering with a sound background in Mathematics and Physics.

Minimum residence: 2 sequential semesters; last day to start, 15 August.

Course content: Undergraduate oceanography core courses in the Physics and Oceanography Degree program plus electives, totalling at least 6 units of credit each semester. (See Table 6 at the end of this section).

#### **b. MSc in Oceanography and Acoustics (Course)**

Entrance requirements: a degree in Science or Engineering with undergraduate specialization in physical oceanography.

Minimum residence: 22 consecutive months; last date to start, 15 August.

Course content: A refresher semester of selected undergraduate courses plus a minimum of five full (2 semester) postgraduate courses including not more than one 2 semester or two 1 semester undergraduate courses and a project totalling at least 16 credits each semester.

#### **c. MSc in Oceanography and Acoustics (Thesis)**

Entrance requirement: a degree in Science and Engineering with a sound background in Mathematics and Physics.

Minimum residence: 22 consecutive months; last date to start, 15 August.

Normal residence: 2 years.

Course content: A refresher semester of selected undergraduate courses plus a minimum of three full (2 semester) postgraduate courses and a thesis.

The minimum RRMC content required for the awarding of an RRMC postgraduate degree or diploma is work equivalent to one full academic year under the RRMC faculty. Credit may be assigned for equivalent courses taken elsewhere.

### **Registration**

All graduate students will register every term, before starting the term. Each graduate student is responsible for ensuring his/her own registration in each term. An outline of the registration procedure is available to graduate students at the Registrar's office. All registrations are provisional until approved by the Graduate Studies Committee.

### **Academic and Military Responsibilities**

The Dean of Graduate Studies is responsible to the Principal for the control and direction of all academic matters affecting postgraduate studies and in-service short courses. In academic matters, the graduate student is responsible directly to the head of the major department, and thence to the Dean of Graduate Studies. For military purposes, command of all officers posted to RRMC on postgraduate training is vested in the Vice-Commandant.

Full-time graduate students may be required to perform laboratory, tutorial and minor military duties but not marking, for up to six hours a week.

A Postgraduate Class Senior will be appointed annually by the Vice-Commandant in consultation with the Dean of Graduate Studies. The Class Senior shall be responsible to the Vice-Commandant for general control and deportment of the graduate students, and shall also provide liaison between the academic and military wings and the graduate students.

### **Academic Regulations**

#### **a. Standing**

A candidate for a diploma in Oceanography must achieve a minimum standing of D or higher in each "Required Course."

A candidate for an MSc degree must achieve a minimum standing of Second Class Honours or higher in each "Required Course." A "Required Course" is considered failed if a lesser mark is obtained. This regulation applies only to MSc candidates registered as Regular Graduate Students.

#### **b. Required Courses**

A "Required Course" is defined as a course required for the degree sought. This definition is intended to include all courses required for the program, no matter whether in fields considered major or minor to the program, and no matter whether graduate or undergraduate.

Information recorded on the candidate's term registration forms and marks transcript will indicate which courses taken are "Required Courses," and which (if any) are extra courses not required for the program. Extra courses are graded on the pass standard applied to undergraduate courses. The decision as to whether each course taken is required or extra to the program is made by the Graduate Studies Committee at the time of registration, but may be changed at a later date on their recommendation.

#### **c. Supplemental Examinations**

Candidates for the diploma will be governed by Academic Regulations 33 to 37 inclusive regarding supplemental examinations. In the case of a candidate for an MSc degree who has failed (i.e. achieved less than Second Class standing) in a "Required Course," his/her department may petition Faculty Council through the Dean of Graduate Studies for permission to assign a supplemental examination in the failed "Required Course."

Normally a total of only one supplemental examination will be permitted each MSc candidate in his/her entire program of "Required Courses" for a graduate degree. If this supplemental examination is failed (i.e. achievement of less than Second Class standing), the candidate will be required to withdraw from the postgraduate program in which he/she is then registered.

Grades for individual courses will be accepted from departments as numerical grades, and will be recorded on the candidate's transcript by the Registrar.

## *GRADUATE STUDIES*

No grades will be assigned to theses credited toward postgraduate degrees. An accepted thesis will be recorded in the transcript only as "Accepted."

The progress of graduate students will be reviewed at regular intervals by the Graduate Studies Committee. Candidates who fail to maintain satisfactory levels of performance will be recommended by the Graduate Studies Committee to Faculty Council for withdrawal from their respective programs of postgraduate studies.

### **Supervision**

A supervisory committee for each MSc candidate undertaking a thesis shall be named by the Graduate Studies Committee and shall consist of three members, the head of the major department or his designate, the supervisor and one member from outside the major department but in a related field. The supervisor shall be the committee chairman.

The role of the committee shall be:

- a. To ensure that reasonable progress is being made by the student in his/her research and course work. The supervisor shall submit a report on this progress to the Graduate Studies Committee at the end of each semester;
- b. To approve the thesis topic and scope of work;
- c. To recommend to the Graduate Studies Committee appropriate action in light of the student's progress;
- d. To determine the acceptability of the thesis for examination; and
- e. To examine the thesis and conduct a final oral examination of the candidate on the thesis.

### **Examination and Acceptance of Thesis**

A graduate student wishing to be considered as a candidate for receiving an MSc degree involving a thesis at a particular Convocation shall so inform the head of his/her major department in writing no later than eight full weeks before the date on which the Convocation is scheduled to be held. At this time, if the supervisory committee agrees that an acceptable thesis will be ready for examination, the department head will so inform the Dean of Graduate Studies and the Registrar.

The candidate shall submit to his/her supervisor, no later than six full weeks before the scheduled date of the Convocation, the original and three copies of the thesis, each complete but unbound.

The format of the thesis must conform to the **New Guide for the Preparation of Coastal Marine Science Laboratory Reports and Honours Theses**, by M.S. Madoff, Internal Manuscript Series Report 83-1, insofar as it is applicable.

The oral examination will be chaired by the Dean of Graduate Studies. The examination committee will consist of the Dean of Graduate Studies and the supervisory committee but may also include a member appointed by the Graduate Studies Committee from outside the College.

Once a thesis has been accepted, no major revisions or additional work relating to the thesis can be required of the candidate. Should major revisions or additions to the thesis be required, it shall remain unaccepted until these are completed.

A rejected thesis may be submitted once for re-examination, but not before the elapse of at least three months from the time of its rejection.

The bound original and one copy of the thesis will remain in the permanent possession of the College. The original will be stored in the College library and the copy with the candidate's major department. Each candidate is also requested to provide a copy for D.S.I.S.

### **Time Limit**

The period allowed from first registration for the thesis to its final submission normally shall be no more than five years.

### **Submission of Results**

All marks for graduate students, including thesis acceptance or rejection, are submitted to the Registrar by the department heads.

Results for graduate students for consideration of the Graduate Studies Committee will be requested by the Registrar from department heads on completion of each academic term. However, in the case of graduate students who complete their programs or withdraw at other times of the year, completed records may be submitted to the Registrar at the time of completion or withdrawal.

Marks and thesis results are presented by the Registrar to the Faculty Board. Results approved and recommended by the Faculty Board for confirmation by Faculty Council are presented to the Senate by the Registrar.

### **Convocation**

In order for a graduate student to be considered for the awarding of a diploma or degree at a particular Convocation, all results of his/her work including all marks for "Required Courses" and thesis acceptance must be reported by department heads to the Registrar on or before the date listed in the calendar for "Reports from Departments on Graduates" for that Convocation.

The Graduate Studies Committee will adjudicate whether or not the requirements for the degree have been met, and will report its recommendation to Faculty Council.

### **Publication of Results of Research**

Publication of results of research is encouraged. Agreement on publication must be reached between supervisor and graduate student and communicated to the Dean of Graduate Studies prior to publication. Officers are reminded that the provisions of Queen's Regulations and Orders for the Canadian Forces, Articles 19.36 and 19.37 govern publication of thesis and journal articles.



**TABLE 6**  
**Diploma in Oceanography**

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Oceanography 301	Descriptive Oceanography	1½	3	0	0	–	–	–	
Oceanography 352	Oceanographic Methods	1½	–	–	–	2	0	4	
Oceanography 401	Geophysical and Geological Oceanography	1½	3	0	0	–	–	–	
Oceanography 451	Introduction to Dynamic Oceanography	1½	3	0	0	–	–	–	
Oceanography 462	Advanced Dynamic Oceanography	1½	–	–	–	3	0	0	
Oceanography 473	Oceanography Project	1	0	0	2	0	0	2	
Science 492	Seminar	0	–	–	–	0	0	2	
Oceanography 362	Acoustics	1½	–	–	–	3	0	0	
Science Electives		3	3	0	0	3	0	0	1
Total		13	12	0	2	11	0	8	

NOTES – 1. Particularly relevant courses from which to elect a course are listed below. Other courses offered in the Calendar may also be taken, subject to timetabling.

#### RELEVANT ELECTIVE LIST

##### First Semester

Oceanography 321 – Biological Oceanography  
 Oceanography 331 – Chemical Oceanography  
 Mathematics 411 – Signal Processing I

##### Second Semester

Engineering 322 – Applied Fluid Mechanics  
 Physics 342 – Applied Optics and Remote Sensing  
 Oceanography 412 – Aeronomy  
 Oceanography 432 – Geochemistry of Marine Sediment  
 Oceanography 442 – Practical Marine Oceanography  
 Mathematics 422 – Signal Processing II  
 Mathematics 432 – Advanced Applied Mathematics

## OCEANOGRAPHY AND ACOUSTICS

### General

Candidates for the degree of Master of Science will be admitted under the General Requirements - Graduate Programs. A degree of Master of Science in Oceanography and Acoustics will be granted to candidates who successfully complete a program of studies comprised of a refresher semester plus either of the following patterns:

- a. Thesis pattern (minimum of 6 semester graduate courses plus a thesis)
- b. Course pattern (minimum of 10 semester graduate courses and a project)

Most graduate students will require some preparation and review in the first semester and relevant undergraduate courses will be provided according to individual need.

A typical course load for the MSc program is as follows:

Fall Semester I:	Math 301 Oceanography 451 Oceanography 501 Oceanography 511 Oceanography 531
Winter Semester I:	Physics 362 Physics 502 Oceanography 522 Oceanography 542 Oceanography 552
Fall Semester II:	Physics 511 Oceanography 561 Oceanography 583 or Oceanography 593
Winter Semester II:	Oceanography 583 or Oceanography 593

## COURSES OF INSTRUCTION

### **PHYSICS 502: Acoustic Propagation and Modelling (1½) (3,0,0)**

A study of the fundamental equations used to describe acoustic propagation in the ocean is undertaken in the context of military acoustic requirements. The effect of oceanic variability in one, two and three dimensions on acoustic propagation forecasting is evaluated and discussed to better understand the limitations imposed by the environment upon prediction capabilities. The approximations inherent in such models for transmission loss calculation as FACT, Generic Sonar Model, Ray Mode, and Parabolic Equation are studied to gain understanding of the physical principles behind these models and the implicit strengths and weaknesses of each. Through assignments and class projects the student will have an opportunity to work with some of these current acoustic models and to conduct numerical experiments to show some of the characteristics of each model tested.

Oceanic factors affecting acoustic propagation which are discussed include temporal and spatial variability of sound speed profiles, interpolation and digitization of sound speed profiles, calculation of sound speed without using salinity data, reflection characteristics of the ocean surface and bottom, fronts and various kinds of eddy structures. The student is expected to understand the implications of the course and to be able to describe the limitations if any imposed by the environment on the choice of a particular model to predict transmission loss.

Prerequisite: Physics 362 or concurrent registration in Physics 362 or equivalent underwater acoustic preparation and consent of the Department.

### **PHYSICS 511: Acoustic System Analysis (1½) (3,0,0)**

Using a system approach the student will learn the characteristics of and limitations of a number of active and passive acoustic detection and tracking systems. The design, construction and deployment of passive and active acoustic transducers is discussed from the viewpoint of overall system performance. Fourier methods are introduced so that signal decomposition in frequency space and in wave number space can be described. This leads ultimately to a discussion of spatial beam forming using such systems as difar, vertical line arrays and towed arrays as examples. A study of correlation methods as applied to random noise leads on to a discussion of oceanic ambient noise in both temperate and polar seas and a study of the concepts of detection of signals in noise.

During the course, students will be expected to apply their new knowledge and expertise to the evaluation of current or proposed acoustic detection, tracking or communication systems through individual and/or class case study projects.

Prerequisite: Physics 362 or equivalent underwater acoustics propagation and consent of the Department.

Note: This course would normally follow Physics 502 and depends in part upon material from this course. Students proposing to take only Physics 511 should discuss this matter with the Department.

**OCEANOGRAPHY 501: Applied Topics (1½)****(3,0,0)**

This course is normally taken by graduate students in the first semester of an oceanography and acoustics program. The course involves lectures and self-study under the supervision of Physics Department faculty on topics such as differential equations, descriptive oceanography, FORTRAN, C, UNIX, Star-Base graphics, and other topics chosen to prepare the student for advanced studies and thesis research.

**OCEANOGRAPHY 511: Ocean Physics (1½)****(3,0,0)**

As well as becoming familiar with the important features of the ocean, including temperature and salinity distributions, sound velocity profiles, currents, tides, eddies, meanders, fronts, and ice formation, distribution and decay, the student will become familiar with the analysis and interpretation of synoptic oceanographic information. Both in situ and remotely sensed observations will be considered. The theory and prediction of wind-generated ocean waves and the basic principles and methods of remote sensing and marine geophysics such as gravity and magnetism will be studied. The student will become familiar with obtaining, analyzing and applying the appropriate marine and acoustic products for any oceanic region of the world. He will be knowledgeable in the environmental suitability of platforms, sensors, and weapon concepts in any region with respect to the marine environmental parameters. Short-climatology and essential dynamics will be undertaken.

**OCEANOGRAPHY 522: Synoptic/Mesoscale Oceanography (1½)****(3,0,0)**

A detailed study of the nature and distribution of synoptic scale and mesoscale features of the oceans is pursued with particular emphasis on the waters contiguous with Canada including the Arctic Ocean. Modern knowledge and theories of ocean eddies, fronts and meandering currents is examined in seminar format by means of a detailed examination of the current literature.

Prerequisite: Oceanography 511 or permission of the Department

**OCEANOGRAPHY 531: Time Domain Analysis  
of Marine Data (1½)****(3,0,0)**

A principal aim of data analysis is the creation of reliable models of physical processes for purposes of interpolation, prediction and interpretation. This course is directed toward those process models which are based on the time-domain statistics of the data.

Starting with a general survey of the basic properties of probability and statistics for finite sample spaces, this course will discuss a range of modern techniques used in the processing in the time domain of the random data associated with oceanographic and acoustic observations. Topics will include autocorrelation and regression analysis, maximum likelihood analysis, velocity estimation in over- and under- determined systems, interpolation techniques, objective analysis and empirical orthogonal eigenfunction analysis. Auto-regressive (AR) and moving-average (MA) process models in the time domain will be discussed.

## *OCEANOGRAPHY AND ACOUSTICS*

### **OCEANOGRAPHY 542: Frequency Domain Analysis of Marine Data (1½)**

**(3,0,0)**

This course is centered on the creation of models of oceanographic and acoustic systems based in the frequency domain. The principles of the Fourier analysis of periodic, a periodic, stochastic and discretely sampled time series will be reviewed. From these principles the techniques of spectral analysis, cross-spectral analysis and the determination of coherence and phase between discretely sampled time series will be developed and applied to the particular problems associated with oceanographic time series. Other forms of frequency domain analysis will be described, such as rotary, harmonic, maximum likelihood and maximum entropy analysis. Topics such as beamforming, digital filtering and the analysis of non-stationary time-series will be discussed.

The survey of interpolation and prediction will be continued to include techniques such as Kalman filtering, which are based on integrating the physics of the system with observations.

Prerequisite: Oceanography 531 or permission of the Department.

### **OCEANOGRAPHY 552: Ocean Dynamics (1½)**

**(3,0,0)**

The physics and mathematics of motion in the ocean will be examined at scales ranging from microstructure up to the general oceanic circulation. The hydrodynamic equations governing fluid motion will be developed from the fundamental laws of physics and examined in various forms to study such phenomena as geostrophic currents, inertial currents, Ekman spirals, barotropic and baroclinic currents, the large-scale, wind-forced, oceanic circulation, the thermohaline circulation and western intensification. Wave theory for an unstratified ocean will also be covered and will include an investigation of Rossby, shelf, Poincare and Kelvin waves.

### **OCEANOGRAPHY 561: Dynamical Oceanography (1½)**

**(3,0,0)**

Long waves such as shelf, Rossby, Poincare and Kelvin waves will be studied for two-layer and continuously stratified fluids. The quasi-geostrophic potential vorticity equation will be derived. Barotropic and baroclinic instability of mean flows will be investigated both by doing linear stability analysis and by examining eddy resolving numerical models. Modern theories of the ocean circulation that incorporate the ventilated thermocline and the homogenization of potential vorticity will be covered and compared with observations.

Prerequisite: Oceanography 552 or permission of the Department.

### **OCEANOGRAPHY 583: Oceanography Project**

The purpose of the project is to provide students taking the MSc (Course) program in Oceanography and Acoustics with experience in supervised research. The subject will be in the general area of oceanography or marine science and the report shall be on experimental or theoretical work done under the supervision of a member of the RRMC Chemistry, Engineering, Mathematics or Physics Departments, or by arrangement with Defense Research Establishment, Pacific (DREP); University of Victoria (UVIC); or Institute of Ocean Sciences (IOS). Regulations regarding

acceptance, format and evaluation shall be the same as for an undergraduate project as found in the calendar. The project may be completed after the end of the second semester but while the student is still posted to RRMC.

**OCEANOGRAPHY 593: Oceanography Thesis**

Preparation of the thesis is a major part of the MSc (Thesis) program in Oceanography and Acoustics. It is the method by which the student is expected to achieve a professional depth of understanding in an area of specialization relating to his career. The thesis supervisor would normally be a member of the RRMC staff, and the work would be performed at RRMC. However, the work could well be performed using the facilities of the Defence Research Establishment, Pacific; the Institute of Ocean Sciences, Pat Bay; the University of Victoria or the University of British Columbia. RRMC is involved in joint research projects with all these institutions. Regulations regarding acceptance, format and evaluation shall be the same as for an undergraduate honours thesis as found in the calendar.

## ROYAL ROADS MILITARY COLLEGE

FORMER COMMANDANTS		YEARS
Captain J.M. Grant, CBE	RCN	1942-1946
Captain W.B. Creery, CBE, CD	RCN	1946-1948
Captain H.S. Rayner, DSC, CD	RCN	1948-1949
Group Captain J.B. Millward, DFC, CD	RCAF	1949-1952
Colonel C.B. Ware, DSO, CD	PPCLI	1952-1954
Captain J.A. Charles, CMM, CD	RCN	1954-1957
Colonel P.S. Cooper, OBE, CD	L EDMN R	1957-1960
Group Captain A.F. Avant, DSO, DFC, CD	RCAF	1960-1963
Captain W.P. Hayes, CD	RCN	1963-1965
Group Captain D.B. Wurtele, CD	RCAF	1965-1968
Colonel K.E. Lewis, CMM, CD	CF	1968-1970
Captain (N) R.C.K. Peers, CD	CF	1970-1976
Colonel J.H. Roddick, CD	CF	1976-1979
Colonel G.L. Logan, CD	RHC	1979-1983
Captain (N) W.J.A. Draper, CD	CF	1983-1984
Captain (N) A.J. Goode, CD	CF	1984-1987
Colonel K.R. Betts, CD	CF	1987-1989

### FORMER DIRECTORS OF STUDY OR PRINCIPALS

Commander K.G.B. Ketchum	1942-1945
Captain W.M. Ogle	1945-1951
Professor L.A. Brown	1951-1955
Professor C.C. Cook	1955-1961
Doctor E.S. Graham	1961-1984

## HONORARY DEGREE RECIPIENTS

### 1977

John Moreau Grant, Doctor of Military Science  
Clennell Haggerston Dickins, Doctor of Military Science

### 1978

Charles Perry Stacey, Doctor of Military Science  
Keith Rogers Greenaway, Doctor of Military Science

### 1979

Owen Connor Struan Robertson, Doctor of Military Science  
Robert Thomas Duff Wallace, Doctor of Laws  
John William Tranter Spinks, Doctor of Military Science

### 1980

George Lawson Pickard, Doctor of Military Science  
Harry George DeWolf, Doctor of Military Science

### 1981

Henry Pybus Bell-Irving, Doctor of Military Science

### 1982

Louis de la Chesnaye Audette, Doctor of Military Science

### 1983

John Gellner, Doctor of Military Science

### 1984

John Arthur Davies, Doctor of Science  
James Maurice Stockford Careless, Doctor of Military Science  
Alan George Bricknell, Doctor of Military Science

### 1985

Desmond Dillon Paul Morton, Doctor of Military Science  
Thomas Charles Pullen, Doctor of Science

### 1986

Robert Waugh Murdoch, Doctor of Military Science

### 1987

Sir Francis Harry Hinsley, Doctor of Military Science  
Robert Gordon Rogers, Doctor of Military Science

### 1988

Eric Stanley Graham, Doctor of Military Science  
Charles Roy Slemon, Doctor of Military Science

### 1989

William Robert Nelson Blair, Doctor of Military Science  
Jeanne Sauv , Doctor of Laws

### 1990

Paul David Manson, Doctor of Military Science  
Robert Claude Kenrick Peers, Doctor of Military Science



