Royal Roads Military College

Calendar 1989-90

Victoria, B.C.

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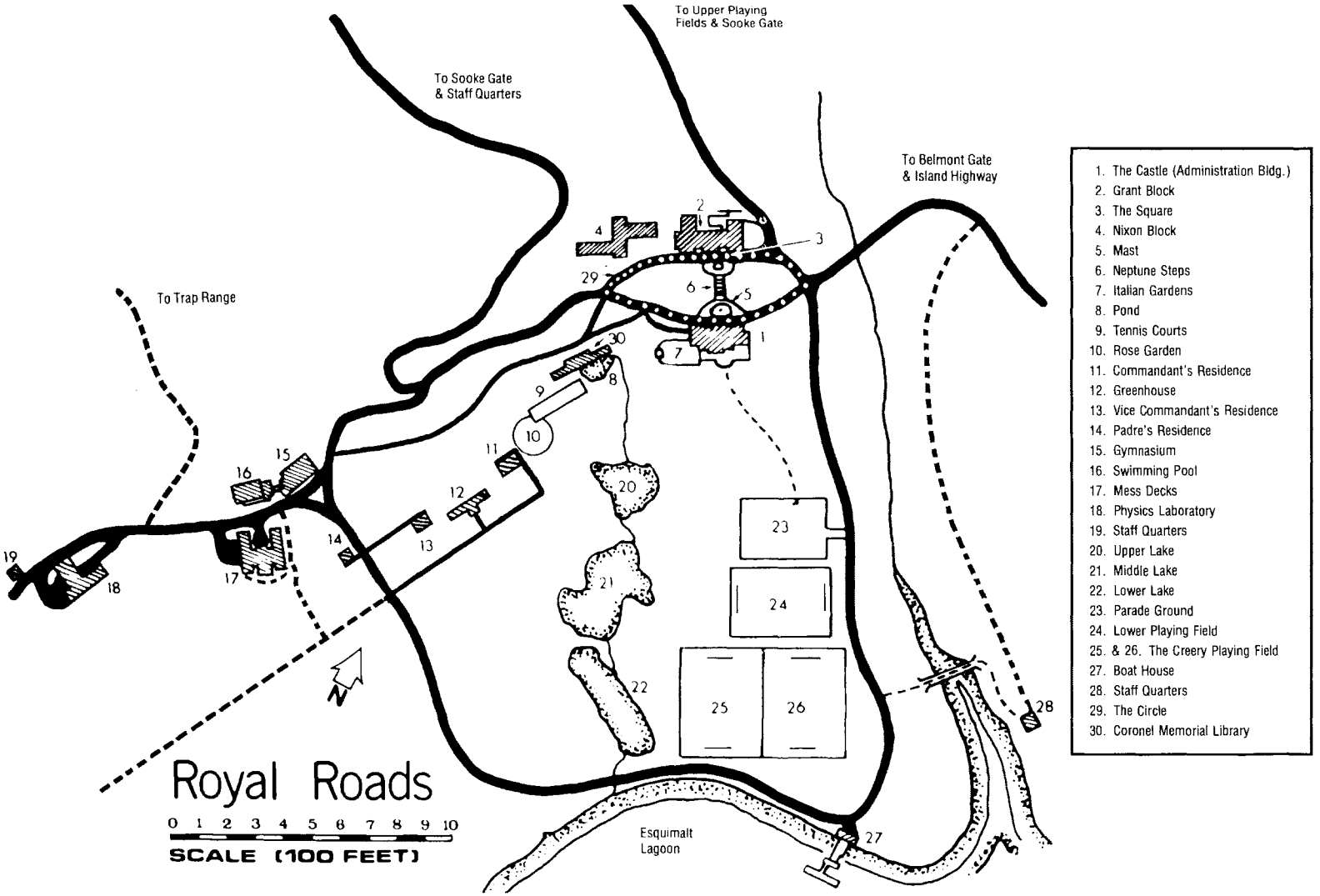
To Upper Playing Fields & Sooke Gate
To Sooke Gate & Staff Quarters
To Belmont Gate & Island Highway
To Trap Range
Esquimalt Lagoon
Royal Roads
0 1 2 3 4 5 6 7 8 9 10
SCALE (100 FEET)
1. The Castle (Administration Bldg.)
2. Grant Block
3. The Square
4. Nixon Block
5. Mast
6. Neptune Steps
7. Italian Gardens
8. Pond
9. Tennis Courts
10. Rose Garden
11. Commandant's Residence
12. Greenhouse
13. Vice Commandant's Residence
14. Padre's Residence
15. Gymnasium
16. Swimming Pool
17. Mess Decks
18. Physics Laboratory
19. Staff Quarters
20. Upper Lake
21. Middle Lake
22. Lower Lake
23. Parade Ground
24. Lower Playing Field
25. & 26. The Creery Playing Field
27. Boat House
28. Staff Quarters
29. The Circle
30. Coronel Memorial Library

1989

JANUARY

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1990

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ACADEMIC YEAR
CALENDAR OF EVENTS 1989-90

First Semester

Aug 21	Cadet Officers return
Aug 25	BOTC Graduation/Recruits arrive
Aug 26	Recruit Term commences
Sept 8	Recruit Term ends
Sept 11	Classes start
Oct 7-9	Thanksgiving Stand-down (no classes)
Oct 27	Last day for course registration changes
Nov 11	Remembrance Day (no classes)
Dec 8	Classes end
Dec 9-18	First semester examinations
Dec 19	0900 – Results due Registrar
Dec 20	1030 – Faculty Board/Faculty Council
Dec 21	Christmas Ball
Dec 22-Jan 6	Christmas Leave

Second Semester

Jan 7-12	Military Training
Jan 9-11	Supplemental Examinations
Jan 15	Classes start
Feb 23	Last day for course registration changes
Mar 10-13	Reading Break (no classes)
Apr 20	Classes end
Apr 21-May 4	Second semester examinations
May 5-7	Stand-down
May 7	0900 – Results due Registrar
May 8	1030 – Faculty Board/Faculty Council
May 14-16	Supplemental Exams
May 18	Convocation, Sunset Ceremony
May 19	Ceremonial Parade and Graduation Ball
May 20	Successful cadets to summer duties

CANADIAN MILITARY COLLEGES

ADVISORY BOARD 1989

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L.J. Régimbal, BA, BSc

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J.L. Bolduc, rmc, BEng, MBA, PEng
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W.E. Tatarchuk, CD, BPE, MPE
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J.R.L.B. Veilleux, CD, rmc, psc, BSc, PAdmin

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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

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ACADEMIC WING

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DEAN OF ARTS – J.A. Boutilier, BA (Dalhousie), MA (McMaster), PhD (London)

DEAN OF GRADUATE STUDIES – D.P. Krauel, ndc, BSc (McMaster), MSc (Dalhousie), PhD (Liverpool), Associate Professor of Physics

REGISTRAR – Colonel M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc (BritCol), AdeC*

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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 K.L. Beeman, 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)*

PHYSICAL EDUCATION OFFICER – Second Lieutenant K.W. Fogalin, BA (Western Ontario)

UNIVERSITY LIAISON OFFICERS–
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Captain B.H. McKay, CD

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PERSONNEL ADMINISTRATIVE OFFICER Captain H.F. Read, BA (RMC)

COMPTROLLER AND LOGISTICS OFFICER – Captain K.P. Moore, BA (RMC)*

PUBLIC INFORMATION OFFICER – Captain M.K. Marshall, CD, BSc (RRMC)

CHAPLAIN – Chaplain (P) Major G.W. Scharf, CD, BA (Carleton), MDiv (Western)

* Attended Royal Roads

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, 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)

ACADEMIC STAFF

A. Allard, BA (Brit Col), MA (Berkley), 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

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

P.A. Black, BA, MA (Brit Col), PhD (S Fraser), Assistant Professor of Literature

J.A. Boutilier, BA (Dalhousie), MA (McMaster), PhD (London), Professor of History and Dean of Arts

G.W.S. Brodsky, CD, BA (Queen's), MA (Victoria), PhD (York, U.K.), Assistant Professor of 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

E.R. Chappell, rmc, BSc (Queen's), MASc (Brit Col), MEIC, MCSCE, MCASI, PEng, Associate Professor of Engineering*

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

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

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

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

Lieutenant (N) W.R. Glover, CD, BA (Queen's), MA (London), Lecturer in History and Political Science

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

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

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), Assistant 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), MAS (Waterloo), Assistant Professor of Military Leadership and Applied Psychology

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

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 and Head of the Department of Military Leadership and Applied Psychology

W.T. Mann, BComm (Brit Col), FCGA, Special Lecturer in Accounting

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

F. Milinazzo, BSc, PhD (Brit Col), Associate Professor of Mathematics

Captain D.P. Mulders, BSc (RRMC), MSc (Waterloo), Lecturer in Mathematics

Captain M.L. Muzzerall, CD, BSc (RMC), MSc (USNPS), Lecturer in Physics*

F. Nantais, BA, BacEd (Montreal), Language Teacher

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

G.D. Resch, OMM, CD, BA (Brandon), MA (Sask), Special Lecturer in Military Leadership and Applied Psychology

J. Robichaud, BA (Edmunston), BAEd (Montreal), Licence th'eologie (Laval), Language Teacher

SENIOR STAFF

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

Captain H.P.R. Smith, CD, BSc (Victoria), MA (Carlton), MSc (RIT), Lecturer in Psychology

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), Assistant 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

R.B.J. Walker, BA (Wales), MA, PhD (Queens), Special Lecturer in Political Science

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 S. Hall, BSc (Victoria)
M. Chan, BSc (Victoria)
W. Baskett

* Attended Royal Roads

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, asc, pcsc, 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)

DEAN, ARTS DIVISION

J.A. Boutilier, BA (Dalhousie), MA (McMaster), PhD (London)

DEAN, GRADUATE STUDIES DIVISION

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

REGISTRAR AND SECRETARY OF THE SENATE

Colonel M.D. Thom, CD, rmc, pfsc, aws, BASc (BritCol), AdeC*

ELECTED MEMBERS

P.J. Schurer, BSc, MSc, PhD (Groningen)
A.G. Martel, BA (S. Fraser), MA (Fletcher), PhD (Toronto), FRHistS
M.J. Wilmut, ndc, BSc (Sir Geo. Williams), MA, PhD (Queen's)

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.

THE FACULTY COUNCIL

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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

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

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

Squadron Leader (retired) A.T. Malcolm, CD, pcsc, asc, BA, MA, PhD (Manitoba), Assistant Professor and Head of the Department of Military Leadership and Applied Psychology

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

Colonel 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.

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M.R. Barr, A.G. Buckley *(Chairman)*, J.R. Buckley, E.R. Chappell, J.S. Collins, J.L. Dorscher, L.J. LaCombe, G.M. Lancaster (ex-officio), F. Milinazzo, J.S. Mothersill (ex-officio), B.P. Mulders, M.J. Press, D.J. Shpak, M.J. Wilmut, W.W. Wolfe.

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FACULTY-CADET ACADEMIC COMMITTEE

The Principal and Director of Studies *(Chairman)*, the Dean of Arts, the Dean of Science and Engineering, the Heads of the Academic Departments, the Registrar, the Cadet Wing Academic Officer *(Secretary)*, the Flight Proctors, a UTPM cadet, one third year cadet, and one fourth year cadet (to be appointed).

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LECTURESHIPS COMMITTEE

E.R. Chappell, A.T. Malcolm, P.G. Nixon, and one member of the Cadet Wing (to be appointed).

LIBRARY COMMITTEE

A.J. Lavoie, (ex officio), S.E. Day (ex-officio), J.M. Gilliland *(Secretary)*, W.R. Glover, L.P.K. LeGras, J.S. Mothersill (ex- officio), M.G. Robinson, R.C. Snell, P.S. Sri, M.W. Stacey *(Chairman)*, a Science and an Arts member of the Cadet Wing in either third or fourth year (to be appointed).

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PICTURES AND RELICS COMMITTEE

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TRAINING AND RESEARCH AIDS COMMITTEE

R.E. Cockram, J.M. Gilliland, A. Hadley (ex-officio), L.P.K. LeGras *(Chairman)*, C.N. Ramkeesoon.

HATLEY CASTLE

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 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 Roya 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 80,000 volumes and includes faculty offices, a conference room an audio visual facilities for cadets.

The current library collection includes 75,000 bound volumes, a subscription list of over 550 periodicals, and a growing collection of microfilms, recordings, films, and slide transparencies.

Grant Block

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

This building houses a large general chemistry laboratory, capable ofaccommodating 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 microcomputer-based systems for use in computer science laboratories and laboratories of other teaching disciplines (Apple II, Apple III, Commodore Super Pet, HP85, HP 87, Superbrain, IBM PC, and Micro Vax II).

One College facility consists of 25 Apollo microcomputers on a network which are used by the Engineering Department for Computer Aided Drafting (CAD).

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 thecollege 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 fibreglas 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.

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 recent addition provides space for a wrestling/combative 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^{0}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 rugger field, two ball diamonds, a mile (400 metres) track, a 6.1 kilometre cross country course and a 10 kilometre Harrier course.

Boat House

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.

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 availablity 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; and the sailing and cross- country teams are in the North West Collegiate (B.C., Washington State, Oregon) and the Vancouver Island series respectively.

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

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.

UNIVERSITY DEGREE

AND A QUEEN'S COMMISSION

ADMISSION 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.

ADMISSION 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.

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 – MEMBERS (UTPM)

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, UTPM 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).

SPECIAL STUDENTS

Members of the Canadian Forces, civilian staff members, or the dependents of either group, 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 Graduate Study General 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 UTPM 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.

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) at the Grade 13 level are required; and Quebec, where CEGEP 1 or equivalent is required. New Brunswick applicants must offer 121 or 122 level courses, the former preferred.

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.

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 Saskatchewan, both Algebra 30 and Geometry/Trigonometry 30 are required.
4. In Ontario, candidates require six Ontario Academic Credits (OACs). These are English, Calculus, Algebra/Geometry, Chemistry, Physics and one elective.
5. In Nova Scotia, Math 441 is required.
6. 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 RRMC 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.
3. In Saskatchewan, Algebra 30 is required, Trigonometry 30 is preferred.
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.

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.

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 UPTM or the UTPO should refer to CFAO 9-13 or CFA0 9-40 respectively.

Officers or non-commissioned members wishing to enrol as special students at RRMC 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.

ADMISSION INFORMATION

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 UTPM and UTPO is made by military and academic boards convened by NDHQ each year.

Admission with advanced standing may be granted to UTPM 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.

NOTES:

1. 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.
2. 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 RRMC for a degree.
3. 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 and 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).

Special students will be selected by the RRMC 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 RRMC. 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 RRMC. Candidates who successfully complete Basic Officer Training will commence their first year at RRMC in late August.

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 enroled 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 $1,768 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 UTPM and UTPO

An officer cadet who is a member of the UTPM 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.

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

Scholarships

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.

Officer cadets who are members of the Regular Officer Training Plan (ROTP) are not normally eligible for scholarships. However, scholarships awarded in recognition of academic achievement may be retained.

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.

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 1989-90, the amount of the bursary will be $500.00. The presentation of the bursary to the winner will normally be made at the Autumn Honours Day 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 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 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

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 to commence in 1987. This program will provide 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 dependants per family, will be available to qualified applicants each year. Repayment will be 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) Graduation-Convocation, conducted in May to confer degrees and present academic medals, awards, prizes and honours certificates to those officer cadets 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 officer cadets from the previous year.

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

Medals

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

The Lieutenant-Governor of British Columbia's Silver Medal, awarded to the officer cadet 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 officer cadet 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 officer cadets 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 officer cadet 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 officer cadet 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 officer cadet who achieves the highest standing in the Military and Strategic Studies Honours program.

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

The Colonel W.R.N. Blair, CD, 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 is made in recognition of 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 officer cadet 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 Fourth Year officer cadet in an engineering classification.

The Royal Canadian Armoured Corp Award, presented to the best Second 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.

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 UTPM 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 al 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 UTPM 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

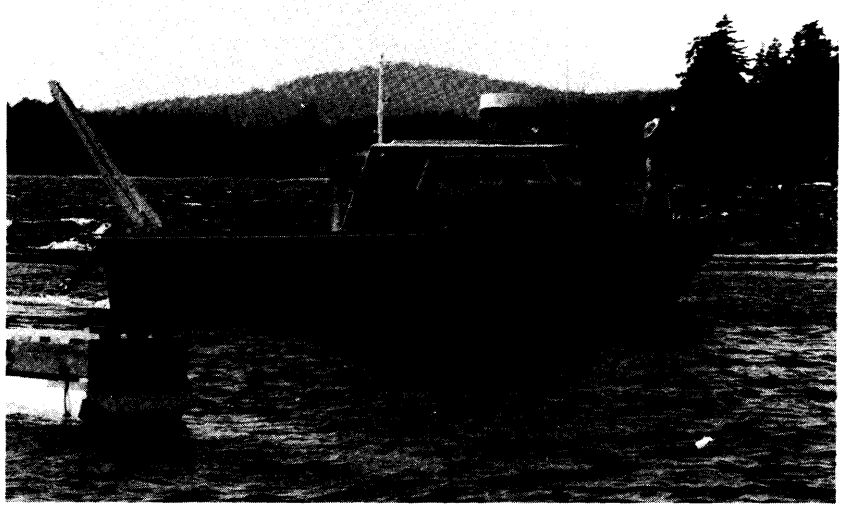
Academic book prizes are awarded annually to officer cadets who achieve the highest standing in the disciplines of science/engineering, French, and humanities/social sciences.

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.

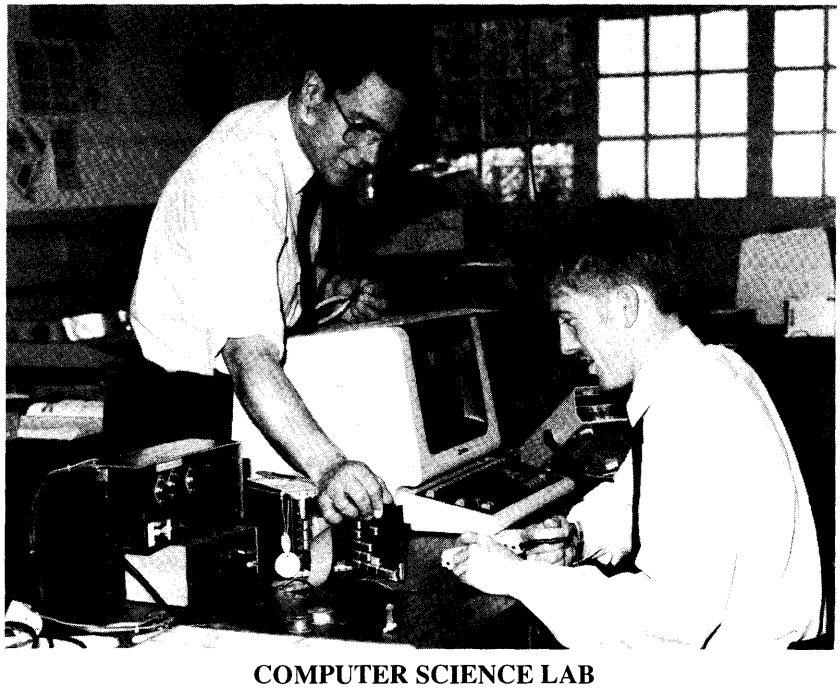
Certificates

First Class Honours certificates are awarded to officer cadets of the First, Second, or Third Year who obtain an overall A average in their final examinations, with no 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 certificate will be awarded to those meeting the requirements of the Bachelor of Science or Bachelor of Arts degree at the end of the Fourth Year.

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



OCEANOGRAPHY RESEARCH VESSEL



COMPUTER SCIENCE LAB

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.

Officer cadets 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, Oceanography and Computer 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, Political Science and Economics and Bachelor of Arts (Honours or Major) in Applied Military Psychology.

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 Study General Requirements section of the Calendar for further details of graduate programs.

HONORARY DEGREES

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

a. Doctor of Law (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.

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 – Leadership and Management Theories
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 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 $1\frac{1}{2}$ 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

$\frac{1}{2}$ 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.

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.

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 $7\frac{1}{2}$ 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 in Political Science courses and 9 units in either History or Economics courses at the 300 and 400 level are required for the concentrations of the Military and Strategic Studies Interdisciplinary program. An additional 3 units in Arts courses at the 300 and 400 level outside these fields are normally required. Details of required and elective courses are found in the Department of History and Political Economy section of the Calendar.

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 1989-90, 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.

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 6 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 7-1/2 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 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 1989-90, 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 Physics and 12 units in the second field 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.

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 COLLEGE 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 RRMC INTO THIRD YEAR AT CMR

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

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.

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.

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.

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.

RRMC PROGRAM TABLES

Tables 1 to 5 outline the programs available for First and Second Year students at Royal Roads Military College. Tables 6 to 13 outline Third and Fourth Year options for those who remain at, or transfer to, Royal Roads. Note that some tables (6, 7, and 10) do not have totals for the various categories, since the intent is to indicate the range of courses available to Third and Fourth Year Arts and General Science students. Other courses have fewer electives, hence tables can indicate more accurately a student's expected credit loading and total class hours.

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

RRMC PROGRAM TABLES

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	
Military Leadership 111	Psychology of the Individual – Part I	1-1/2	3	0	0	–	–	–	
Mathematics 103	Calculus and Analytical Geometry	3	3	2	0	3	2	0	3
Computer Science 102	Introduction to Computer Programming	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 at 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 103	Composition, Logic, 14-16th Century Literature, Utopian Literature	3	3	1	0	3	1	0	
Military Leadership 111	Psychology of the Individual – Part I	1-1/2	3	0	0	–	–	–	
Mathematics 113	Calculus and Linear Algebra	5	5	3	0	5	2	0	
Computer Science 122	Introduction to Computing	1-1/2	–	–	–	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		19	19	7	11	18	6	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	1-1/2	3	0	0	–	–	–	
English 242	Canadian and American Literature	1-1/2	–	–	–	3	0	0	
History 211	Europe and the Wider World, 1763-1870	1-1/2	3	0	0	–	–	–	2,3
History 212	World History, 1870-1970	1-1/2	–	–	–	3	0	0	
Economics 213	Principles of Economics	3	3	0	0	3	0	0	
Military Leadership 212	Social Psychology	1-1/2	–	–	–	3	0	0	
Mathematics 203	Finite Mathematics, Probability & Statistics	3	3	2	0	3	2	0	
Physics 123	Introductory Physics	3	3	0	0	3	0	3	
PE 203		0	0	0	2	0	0	2	
Drill 203		0	0	0	1	0	0	1	
Total		16-1/2	15	5	5	18	5	8	8
Optional Courses:									
Commerce 203	Accounting	3	3	0	0	3	0	0	4
Political Science 213	Introduction to International Politics	3	3	0	0	3	0	0	5,6
Applied Psychology 221	Psychology of the Individual – Part 2	1-1/2	3	0	0	–	–	–	7

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. Required for entry to BAdm degree program (CMR).
5. Political Science 102, if not completed in First Year, is required if Political Science 213 is not selected as an elective.
6. Optional, but recommended for cadets intending to remain at RRMC 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 RRMC Joint Concentration in Politics and Economics.
7. Optional, but prerequisite for Applied Military Psychology degree program.
8. 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	1-1/2	3	0	0	–	–	–	
Military Leadership 212	Social Psychology	1-1/2	–	–	–	3	0	0	
Mathematics 223	Calculus, Vector Calculus, Differential Equations	3	3	1	0	3	1	0	
Mathematics 241	Probability and Statistics	1-1/2	3	0	0	–	–	–	
Physics 203	AC Circuits and Electromagnetism	3	2-1/2	0	3	2-1/2	0	3	
Physics 211	Vibrations and Waves	1	2-1/2	0	0	–	–	–	
Phyics 252	Modern Physics	1	–	–	–	2-1/2	0	0	
Chemistry 243	Thermodynamics	3	2	0	0	3	0	3	
Computer Science 201	Computer Applications	1-1/2	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		18	20	4	11	14	4	11	
Optional Courses:									
Mathematics 252	Linear Algebra	1-1/2	–	–	–	3	0	0	2,3
Engineering 232	Mechanics of Materials	2	–	–	–	3	0	2	4
Mathematics 233	Calculus, Vector Calculus, Differential Equations	4	4	1	0	4	1	0	5
Computer Science 202	Computer Applications II	1	–	–	–	2	0	1	6

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. Prerequisite for students wishing to continue in Physics and Computer Science program in Third Year at RRMC and recommended for students wishing to continue in Physics and Oceanography at Royal Roads, or for Naval Architecture at MIT.
3. Not required, but recommended, for Physics and Oceanography degree at RRMC, Science (Applied) degree at RMC, or General Science degree at RRMC or CMR. Required for other Science degree programs at RMC or CMR.
4. Optional, but recommended, for students who wish to continue in Physics and Oceanography at RRMC, or for Naval Architecture at MIT.
5. Recommended for students who plan to continue in Electrical Engineering, Engineering Physics or Honours Science, in lieu of Mathematics 223.
6. Students electing Computer Science 202 must take Chemistry 203 in lieu of Chemistry 243.
7. The Honours Science program is normally the entry level to the Honours combined major programs in Physics and Computer Science and in Physics and Oceanogrqphy.

TABLE 5

Second Year – Engineering Degree

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 201	Canadian History for Engineers	1-1/2	3	0	0	–	–	–	
Military Leadership 212	Social Psychology	1-1/2	–	–	–	3	0	0	
Mathematics 223	Calculus, Vector Calculus, Differential Equations	3	3	1	0	3	1	0	
Mathematics 241	Probability and Statistics	1-1/2	3	0	0	–	–	–	3,4,5
Mathematics 252	Linear Algebra	1-1/2	–	–	–	3	0	0	3,6
Physics 203	AC Circuits and Electromagnetism	3-1/2	2-1/2	0	3	2-1/2	0	3	
Physics 211	Vibrations and Waves	1	2-1/2	0	0	–	–	–	
Physics 252	Modern Physics	1	–	–	–	2-1/2	0	0	
Chemistry 203	Thermodynamics	3	2	0	0	3	0	0	
Computer Science 201	Computer Applications	1	2	0	2	–	–	–	
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		23-1/2	20	4	11	23	4	11	
Optional Courses: Mathematics 233	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 Physics and Computer Science at Royal Roads.
4. Required for students wishing to continue in Physics and Oceanography at Royal Roads.
5. Required for students wishing to continue in General Science at Royal Roads and for those students who wish to take the Applied Military Psychology program.
6. Recommended for students wishing to continue in Physics and Oceanography at Royal Roads, or for Naval Architecture at MIT.

TABLE 6

Third and Fourth Year Arts

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training III		0	0	3	2	0	3	2	1
Applied Psychology 322	Military Psychology – Part 1	1-1/2	–	–	–	3	0	0	
Applied Psychology 331	Abnormal Psychology	1-1/2	3	0	0	–	–	–	
Applied Psychology 332	Psychological Foundations of Sport	1-1/2	–	–	–	3	0	0	
Applied Psychology 341	Personality	1-1/2	3	0	0	–	–	–	
Applied Psychology 352	Selected Topics in Military Psychology	1-1/2	–	–	–	3	0	0	
Applied Psychology 361	Elements of Physiological Psychology	1-1/2	3	0	0	–	–	–	
Applied Psychology 362	Introduction to Research Methods	1-1/2	–	–	–	3	0	0	
Applied Psychology 372	Sensation and Perception	1-1/2	–	–	–	3	0	0	
Applied Psychology 381	Statistics for the Behavioural Sciences	1-1/2	3	0	0	–	–	–	
Applied Psychology 403	Psychology Thesis Project	3	0	3	0	0	3	0	2
Applied Psychology 411	Cognitive Processes	1-1/2	3	0	0	–	–	–	
Applied Psychology 422	Military Psychology – Part 2	1-1/2	–	–	–	3	0	0	
Applied Psychology 431	Organizational Behaviour	1-1/2	3	0	0	–	–	–	
Applied Psychology 432	Counselling Psychology	1-1/2	–	–	–	3	0	0	
Applied Psychology 442	Forensic Psychology	1-1/2	–	–	–	3	0	0	
Applied Psychology 452	Psychological Tests and Measurements	1-1/2	–	–	–	3	0	0	3
Applied Psychology 462	Human Factors in Engineering	1-1/2	–	–	–	3	0	0	
Applied Psychology 471	Research Project	1	1	0	1	–	–	–	
Applied Psychology 472	Human Psychology	1-1/2	–	–	–	3	0	0	
Applied Psychology 481	Statistics for Behavioural Sciences (Advanced)	1-1/2	3	0	0	–	–	–	3
Applied Psychology 482	Advanced Topics in Sensory Neurobiology	1-1/2	–	–	–	3	0	0	
Economics 311	The Canadian Economy	1-1/2	3	0	0	–	–	–	
Economics 321	Mathematical Economics	1-1/2	3	0	0	–	–	–	

TABLE 6 CONTINUED

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Economics 331	Quantitative Methods	1-1/2	3	0	0	–	–	–	
Economics 332	Canadian Economic History	1-1/2	–	–	–	3	0	0	
Economics 341	Intermediate Microeconomic Theory	1-1/2	3	0	0	–	–	–	
Economics 352	Intermediate Microeconomic Theory	1-1/2	–	–	–	3	0	0	
Economics 361	Applied Business Finance	1-1/2	3	0	0	–	–	–	
Economics 412	Industrial Organization	1-1/2	–	–	–	3	0	0	
Economics 421	The Economics of Defense	1-1/2	3	0	0	–	–	–	
Economics 422	Money and Banking	1-1/2	–	–	–	3	0	0	
Economics 432	International Trade & Finance	1-1/2	–	–	–	3	0	0	
English 304	Directed Studies	1-1/2	(0)	(3)	(0)	(0)	(3)	(0)	
English 311	Studies in Detective Fiction	1-1/2	3	0	0	–	–	–	offered alternate yrs
English 321	Literary Criticism	1-1/2	3	0	0	–	–	–	
English 312	Literature of War	1-1/2	–	–	–	3	0	0	
(French-Canadian) Lit 422	Introduction to French-Canadian Literature	1-1/2	–	–	–	3	0	0	
History 302	Technology and War, 1914-Present	1-1/2	–	–	–	3	0	0	
History 311	The Evolution of Modern Strategy	1-1/2	3	0	0	–	–	–	
History 312	Armies and Society	1-1/2	–	–	–	3	0	0	
History 331	Historiography and Methodology	1-1/2	3	0	0	–	–	–	
History 343	War and Diplomacy in Europe, 1848-1960	3	3	0	0	3	0	0	
History 411	America as a World Power	1-1/2	3	0	0	–	–	–	
History 421	Naval History in the 20th Century	1-1/2	3	0	0	–	–	–	
History 432	China and Japan in the 20th Century	1-1/2	–	–	–	3	0	0	
History 452	Russia in the 20th Century	1-1/2	–	–	–	3	0	0	
History 471	Pacific Rim and East Asia to 1905	1-1/2	3	0	0	–	–	–	
Military Leadership 311	Leadership and Management	1-1/2	3	0	0	–	–	–	
Military Leadership 402	Professional and Ethical Issues	1-1/2	–	–	–	3	0	0	
Military Studies 483	Honours Arts Research Seminar	3	0	3	0	0	3	0	

TABLE 6 CONTINUED

Course	Description	Credit	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Philosophy 311	Introduction to Philosophy	1-1/2	3	0	0	–	–	–	
Philosophy 422	Philosophical Perspectives	1-1/2	–	–	–	3	0	0	
Political Science 213	Introduction to International Politics	3	3	0	0	3	0	0	6
Political Science 302	Crisis and War in International Relations	1-1/2	–	–	–	3	0	0	
Political Science 312	Contemporary Strategic Thought	1-1/2	–	–	–	3	0	0	
Political Science 321	Irregular Warfare	1-1/2	3	0	0	–	–	–	
Political Science 322	Issues in Canadian Politics	1-1/2	–	–	–	3	0	0	
Political Science 342	Asia Pacific Defense and Security Issues	1-1/2	–	–	–	3	0	0	
Political Science 361	Modern Political Thought	1-1/2	3	0	0	–	–	–	
Political Science 401	Canadian Public Administration	1-1/2	3	0	0	–	–	–	
Political Science 402	American Government and Politics	1-1/2	–	–	–	3	0	0	
Political Science 432	Arms Control	1-1/2	–	–	–	3	0	0	
Political Science 424	Canadian Foreign Policy	1-1/2	3	0	0	–	–	–	
Ec/Hist/PSc 304/314	Directed Reading and Research	1-1/2	(0)	(3)	(0)	(0)	(3)	(0)	
Physical Education 303		0	0	0	2	0	0	2	
Drill 303		0	0	0	1	0	0	1	

TABLE 6 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. Candidates for honours degree must complete and defend a psychology thesis project in their Fourth Year.
3. Required by students in honours degree program.
4. Replaced Economics 201, and first offered in 1990-1991.
5. 7-1/2 credits per semester is minimum required; 9 credits/semester for honours.
6. If Political Science 213, or its equivalent, was not completed in Second Year, it must be taken in Third Year in lieu of two electives.

TABLE 7

Third Year – General Degree in Science

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training III	Conversational French	0	0	3	2	0	3	2	1
Military Leadership 311	Leadership and Management Theories and Techniques	1-1/2	3	0	0	–	–	–	
Arts Elective		3	3	0	0	3	0	0	2,4
Mathematics 241	Probability and Statistics	1-1/2	3	0	0	–	–	–	3
Mathematics 301	Differential Equations	1-1/2	3	0	0	–	–	–	
Physics 332	Electromagnetic Wave Propagation	2	–	–	–	3	0	3	
Physics 312	Solid State Physics	1-1/2	–	–	–	3	0	0	
Physics 362	Acoustics	1-1/2	–	–	–	3	0	0	
Physics 371	Electronics and Microcomputers	2	3	0	3	–	–	–	
Oceanography 301	Descriptive Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 321	Biological Oceanography	1	2	0	1	–	–	–	
Oceanography 331	Chemical Oceanography	2	3	0	2	–	–	–	
Oceanography 352	Oceanographic Methods	1-1/2	–	–	–	2	0	4	
Computer Science 301	Introduction to Computer Systems	2	4	0	2	–	–	–	
Computer Science 312	Numerical Analysis	1-1/2	–	–	–	3	0	0	
Computer Science 322	Microcomputer Architecture	1-1/2	–	–	–	2	0	4	
Computer Science 332	Organization of Programming Languages	1-1/2	–	–	–	3	0	1	
Computer Science 341	Advanced Programming Techniques	1-1/2	3	1	0	–	–	–	
Engineering 311	Applied Fluid Mechanics	2	4	0	2	–	–	–	
PE 303		0	0	0	2	0	0	2	
Drill 303		0	0	0	1	0	0	1	

TABLE 7 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. Arts electives are any 300 or 400 level courses offered in economics, psychology, history, literature, philosophy, political science or psychology as timetable permits.
3. Required if not completed in Second Year.
4. In Third and Fourth Years, a minimum of 30 units of credit in 300 or 400 level courses must be obtained. Three units of credit must be in MLAP; a minimum of 3 or a maximum of 6 must be in Arts electives; and the remainder must be in Science subjects. SLT, Drill and PE are also required in each year. A student will normally be required to take a minimum semester course loading of 7-1/2 units of credit and pass a minimum semester load of 6 units of credit.

TABLE 8

Third Year – Combined Major Degree in Physics and Computer Science

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training III	Conversational French	0	0	3	2	0	3	2	1
Military Leadership 311	Leadership and Management Theories and Techniques	1-1/2	3	0	0	–	–	–	
Arts Elective		(3)	(3)	(0)	(0)	3	0	0	2
Mathematics 241	Probability and Statistics	(1-1/2)	(3)	(0)	(0)	–	–	–	3
Mathematics 252	Linear Algebra	(1-1/2)	–	–	–	(3)	(0)	(0)	3
Mathematics 301	Differential Equations	1-1/2	3	0	0	–	–	–	
Physics 332	Electromagnetic Wave Propagation	2	–	–	–	3	0	3	
Physics 312	Solid State Physics	1-1/2	–	–	–	3	0	0	
Physics 371	Electronics and Microcomputers	2	3	0	3	–	–	–	
Computer Science 301	Introduction to Computer Science	2	4	0	2	–	–	–	
Computer Science 311	Interactive Computer Systems	1-1/2	3	0	0	–	–	–	
Computer Science 312	Numerical Analysis	1-1/2	–	–	–	3	0	0	
Computer Science 322	Microcomputer Architecture	1-1/2	–	–	–	2	0	4	
Computer Science 332	Organization of Programming Languages	1-1/2	–	–	–	3	0	1	
Computer Science 341	Advanced Programming Techniques	1-1/2	3	1	0	–	–	–	
PE 303		0	0	0	2	0	0	2	
Drill 303		0	0	0	1	0	0	1	
Total		18	19	4	10	17	3	13	

TABLE 8 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. Arts electives are any 300 or 400 level courses offered in economics, history, literature, philosophy, or political science as timetable permits. A minimum of three Arts electives must be taken during the Third and Fourth Years. Arts electives may be taken in either semester.
3. Required if not completed (or its equivalent not completed) in Second Year.
4. Over the Third and Fourth Years three science electives worth at least 5 units of credits must be taken by Honours (course) students and two Science electives worth at least 3 units of credit must be taken by Combined Major students. Science electives may be taken in either semester.

TABLE 9

Third Year – Combined Major in Physics and Oceanography

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training III	Conversational French	0	0	3	2	0	3	2	1
Military Leadership 311	Leadership and Management Theories and Techniques	1-1/2	3	0	0	–	–	–	
Arts Elective		(3)	(3)	(0)	(0)	3	0	0	2
Mathematics 241	Probability and Statistics	(1-1/2)	(3)	(0)	(0)	–	–	–	3
Mathematics 252	Linear Algebra	(1-1/2)	–	–	–	(3)	(0)	(0)	3
Mathematics 301	Differential Equations	1-1/2	3	0	0	–	–	–	
Computer Science 312	Numerical Analysis	1-1/2	–	–	–	3	0	0	
Physics 332	Electromagnetic Wave Propagation	2	–	–	–	3	0	3	
Physics 312	Solid State Physics	1-1/2	–	–	–	3	0	0	
Physics 362	Acoustics	1-1/2	–	–	–	3	0	0	
Physics 371	Electronics and Microcomputers	2	3	0	3	–	–	–	
Oceanography 301	Descriptive Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 321	Biological Oceanography	1	2	0	1	–	–	–	
Oceanography 331	Chemical Oceanography	(2)	3	0	2	–	–	–	
Oceanography 352	Oceanographic Methods	1-1/2	–	–	–	2	0	4	
Engineering 232	Mechanics of Materials	2	–	–	–	(3)	(0)	(2)	4
Engineering 311	Applied Fluid Mechamics	2	4	0	2	–	–	–	
PE 303		0	0	0	2	0	0	2	
Drill 303		0	0	0	1	0	0	1	
Total			21	3	13	17	3	12	

TABLE 9 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. Arts electives are any 300 or 400 level courses offered in economics, history, literature, philosophy, or political science as timetable permits. A minimum of three units of Arts electives must be taken during the Third and Fourth Years. Arts electives may be taken in either semester.
3. Required if not completed (or its equivalent not completed) in Second Year.
4. Recommended if not taken in Second Year, especially if proceeding to Naval Architecture at MIT.

TABLE 10

Fourth Year – General Degree in Science

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training IV	Conversational French	0	0	3	2	0	3	2	1
Military Leadership 402	Professional and Ethical Issues	1-1/2	–	–	–	3	0	0	
Arts Elective		1-1/2	3	0	0	3	0	0	2
Mathematics 401	Complex Analysis	1-1/2	3	0	0	–	–	–	
Mathematics 411	Signal Processing I	1-1/2	3	0	0	–	–	–	
Mathematics 422	Signal Processing II	1-1/2	–	–	–	3	0	0	
Mathematics 432	Advanced Applied Mathematics	1-1/2	–	–	–	3	0	0	
Physics 401	Experimental Physics	1/2	0	0	3	–	–	–	3
Physics 421	Quantum Mechanics	1-1/2	3	0	0	–	–	–	
Physics 432	Applied Nuclear Physics	1-1/2	–	–	–	3	0	0	
Physics 451	Intermediate Mechanics	1-1/2	3	0	0	–	–	–	
Chemistry 401	Applied Thermodynamics	1-1/2	3	0	0	–	–	–	
Oceanography 401	Geophysical and Geological Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 412	Aeronomy	1-1/2	–	–	–	3	0	0	
Oceanography 422	Geochemistry of Marine Sediments	1	–	–	–	2	0	0	
Oceanography 442	Practical Marine Oceanography	1-1/2	–	–	–	0	0	3	4
Oceanography 451	Introduction to Dynamic Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 462	Advanced Dynamic Oceanography	1-1/2	–	–	–	3	0	0	
Oceanography 492	Oceanography Seminar	0	–	–	–	0	0	2	
Computer Science 401	Digital Design	1-1/2	2	0	4	–	–	–	
Computer Science 411	Operating Systems	1-1/2	3	0	1	–	–	–	
Computer Science 422	Topics in Computer Systems	1-1/2	–	–	–	3	0	0	
Computer Science 432	Solid State Device Technology	1-1/2	–	–	–	3	0	0	5
PE 403		0	0	0	2	0	0	2	
Drill 403		0	0	0	1	0	0	1	

TABLE 10 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. Arts electives may be taken in either semester. Elective choices are any 300 or 400 level course offered in economics, psychology, history, literature, philosophy or political science as timetable permits.
3. Required if Physics 421 or 451 selected.
4. Final grade based on semester's work; no end-of-semester examination.
5. In Third and Fourth Years a minimum of 30 units of credit in 300 or 400 level courses must be obtained, of which a minimum of 22 must be in science courses. 3 units of credit must be in ML or AP. A minimum of 4-1/2 or a maximum of 6 must be in Arts electives and the remainder must be from Science subjects. SLT, Drill and PE are also required each year. A student will normally be required to take a minimum semester course loading of 7-1/2 units of credit and pass a minimum semester load of 6 units of credit.

TABLE 11

Fourth Year – Combined Major/Honours Degree in Physics and Computer Science

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training IV	Conversational French	0	0	3	2	0	3	2	1
Military Leadership 402	Professional and Ethical Issues	1-1/2	–	–	–	3	0	0	
Arts Elective		3	3	0	0	3	0	0	2
Mathematics 411	Signal Processing I	1-1/2	3	0	0	–	–	–	
Mathematics 432	Advanced Applied Mathematics	(1-1/2)	–	–	–	(3)	(0)	(0)	3
Physics 401	Experimental Physics	1/2	0	0	3	–	–	–	4
Physics 421	Quantum Mechanics	1-1/2	3	0	0	–	–	–	
Physics 432	Applied Nuclear Physics	1-1/2	–	–	–	3	0	0	
Physics 451	Intermediate Mechanics	1-1/2	3	0	0	–	–	–	
Computer Science 401	Digital Design	1-1/2	2	0	4	–	–	–	
Computer Science 411	Operating Systems	1-1/2	3	0	1	–	–	–	
Computer Science 422	Topics in Computer Systems	1-1/2	–	–	–	3	0	0	
Computer Science 432	Solid State Device Technology	1-1/2	–	–	–	3	0	0	
Computer Science 443	Computer Science Project	(1)	(0)	(0)	(2)	(0)	(0)	(2)	3
Science Elective		(1-1/2)	(3)	(0)	(0)	3	0	0	5
PE 403		0	0	0	2	0	0	2	
Drill 403		0	0	0	1	0	0	1	
Total		18	17	3	13	18	3	5	

TABLE 11 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. Arts electives are any 300 or 400 level course offered in economics, history, literature, philosophy or political science as timetable permits. A minimum of three units of Arts electives must be taken during the Third and Fourth Years.
3. Required by those in the Honours (course) program.
4. Required if Physics 421 or 451 selected.
5. Over the Third and Fourth Years, three science electives worth at least 5 units of credit must be taken by Honours (course) students and two science electives worth at least 3 units of credit must be taken by Combined Major students. Science electives may be taken in either semester.

TABLE 12

Fourth Year – Combined Major/Honours Degree in Physics and Oceanography

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Language Training IV	Conversational French	0	0	3	2	0	3	2	1
Engineering 232	Mechanics of Materials	(2)	–	–	–	(3)	(0)	(2)	2
Military Leadership 402	Professional and Ethical Issues	1-1/2	–	–	–	3	0	0	
Arts Elective		1-1/2	3	0	0	3	0	0	3
Mathematics 252	Linear Algebra	(1-1/2)	–	–	–	(3)	(0)	(0)	2
Mathematics 401	Complex Analysis	1-1/2	3	0	0	–	–	–	
Mathematics 432	Advanced Applied Mathematics	(1-1/2)	–	–	–	(3)	(0)	(0)	4
Physics 401	Experimental Physics	1-1/2	0	0	3	–	–	–	5
Physics 421	Quantum Mechanics	1-1/2	3	0	0	–	–	–	
Physics 432	Applied Nuclear Physics	1-1/2	–	–	–	3	0	0	
Physics 451	Intermediate Mechanics	1-1/2	3	0	0	–	–	–	
Chemistry 401	Applied Thermodynamics	1-1/2	3	0	0	–	–	–	
Oceanography 401	Geophysical and Geological Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 442	Practical Marine Oceanography	1-1/2	–	–	–	0	0	3	6
Oceanography 451	Introduction to Dynamic Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 462	Advanced Dynamic Oceanography	1-1/2	–	–	–	3	0	0	
Oceanography 473	Oceanography Project	(1)	(0)	(0)	(2)	(0)	(0)	(2)	4
Oceanography 483	Oceanography Thesis Project	(3)	(0)	(1)	(4)	(0)	(1)	(4)	7
Oceanography 492	Oceanography Seminar	0	–	–	–	0	0	2	
Science Elective		1-1/2	(3)	(0)	(0)	3	0	0	8
Science Elective		1-1/2	–	–	–	3	0	0	8
PE 403		0	0	0	2	0	0	2	
Drill 403		0	0	0	1	0	0	1	
Total		21	21	3	8	18	3	10	

TABLE 12 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 if not previously completed.
3. Arts electives are any 300 or 400 level course offered in economics, history, literature, philosophy or political science as timetable permits. A minimum of three units of Arts electives must be taken during the Third and Fourth Years.
4. Required by those in the Honours (course) program.
5. Required if Physics 421 or 451 selected.
6. Final grade based on semester's work; no end-of-semester examination.
7. Required of cadets in the Honours (thesis) program.
8. Two science electives worth at least 3 units of credit must be taken by Combined Major and Honours (thesis) students and three science electives worth at least 4 units of credit must be taken by Honours (course) students. Science electives may be taken in either semester.

TABLE 13

Diploma in Oceanography

Course	Description	Credits	First Semester			Second Semester			Notes
			Lect	Tut	Lab	Lect	Tut	Lab	
Oceanography 301	Descriptive Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 352	Oceanographic Methods	1-1/2	–	–	–	2	0	4	
Oceanography 401	Geophysical and Geological Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 451	Introduction to Dynamic Oceanography	1-1/2	3	0	0	–	–	–	
Oceanography 462	Advanced Dynamic Oceanography	1-1/2	–	–	–	3	0	0	
Oceanography 473	Oceanography Project	1	0	0	2	0	0	2	
Oceanography 492	Oceanography Seminar	0	–	–	–	0	0	2	
Physics 362	Acoustics	1-1/2	–	–	–	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

Engineering 311 – Applied Fluid Mechanics
Oceanography 321 – Biological Oceanography
Oceanography 331 – Chemical Oceanography
Mathematics 411 – Signal Processing I

Second Semester

Physics 342 – Applied Optics and Remote Sensing
Oceanography 412 – Aeronomy
Oceanography 422 – Geochemistry of Marine Sediment
Oceanography 442 – Practical Marine Oceanography
Mathematics 422 – Signal Processing II
Mathematics 432 – Advanced Applied Mathematics

COURSE DESCRIPTIONS

The different courses offered at RRMC are described in detail in the sections that follow (listed alphabetically by departments). For each course at RRMC 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 RRMC 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 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 its credit allocation, followed by 3 numbers in parentheses that indicate respectively the number of lectures, tutorials, and laboratory periods each week in whatever semester it is offered (6 numbers if course covers both semesters). 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, however, 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 3 times each week over both semesters for lectures.

PHYSICS 312: Solid State Physics (1-1/2) **(3,0,0)**

This is a one semester course offered by the Department of Physics in the second semester of the Third 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 the 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, BASc, MASc, 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.

Kotz & Purcell, *Chemistry & Chemical Reactivity*
Nyman, King & Weyh, *Problems for General Chemistry and Qualitative Analysis (4th Ed.)*
Barrow, *Computer Based Studies for General Chemistry*

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.

Dickerson & Geis, *Chemistry: Matter and the Universe*
Jones, Netterville, Johnston & Wood, *Chemistry: Man and Society (3rd Ed.)*
Brown & Lemay, Chemistry, *The Central Science (3rd Ed.)*

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.

Barrow, *Physical Chemistry (5th Ed.)*

CHEMISTRY 243: Thermodynamics (3) **(3,0,0/3,0,3)**

Taken by Science students 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 311: Applications of Chemistry (1-1/2) **(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 (1-1/2) **(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.

Holman, *Thermodynamics (3rd Ed.)*

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

COMPUTER SCIENCE

The undergraduate degree in Physics and Computer Science is 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 & PIC – A.G. Buckley, BSc, MSc, PhD	Mathematics
Associate Professor – J.S. Collins, BSc, BEng, MEng, PhD, MCSEE, MEIC, MIEEE, PEng	Mathematics Engineering
Associate Professor – F. Milinazzo, BSc, PhD	Mathematics
Associate Professor – M.J. Press, BSc, MSc, PhD	Physics
Associate Professor – W.W. Wolfe, BSc, MSc, PhD	Mathematics
Assistant Professor – J.R. Buckley, BSc, PhD	Physics
Assistant Professor – J.L. LaCombe, BSc, MSc, PhD	Physics
Assistant Professor – D.J. Shpak, BSc, MEng, PhD, PEng	Engineering
Lecturer – Captain B.P. Mulders, BSc, MSc	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.

COMPUTER SCIENCE 102: An Introduction to Computer Programming (1/2) **(1,0,1)**

For First Year Arts or Administration students.

An introduction to algorithm design and structured programming. The BASIC language is used, in a structured dialect on the Honeywell-Bull mainframe. File handling is covered, with both sequential and direct access. An introduction to word processing, using the Honeywell-Bull TEXT processor, may be included if time permits.

Bent and Sethares, *Business BASIC (2nd Ed.)*

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.

Dale and Weems, *Introduction to Pascal and Structured Design (2nd Ed.)*

COMPUTER SCIENCE 201: Computer Applications I (1) **(2,0,2)**

For Second Year Science or Engineering students.

This course is intended to develop the student's ability to use the computer for practical problem solving. The students will write their own programs as well as use library programs. Proper documentation, critical examination and interpretation of program results will be emphasized.

Students will be introduced to FORTRAN programming, its syntax and use. Applications will be programmed in this language.

Topics covered include number and data representation, computational pitfalls, numerical integration, modelling of measured data by curve fitting, simulation of dynamic systems and solution of systems described by linear simultaneous equations.

Selected applications from engineering, physics, and chemistry will be used to illustrate the use of the computer.

Davis & Hoffman, *FORTRAN 77: A Structured Discipline Style (2nd Ed.)*
Al-Khafaji & Tooley, *Numerical Methods in Engineering Practice*
Honeywell-Bull, *CP-6 Pocket Guide*

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

An elective course for Second Year Science students.

This course may be elected with CH203 in lieu of Chemistry 243. The contents will introduce students to a diversity of topics in our Computer Science program, chosen from hardware, software, and operating systems.

COMPUTER SCIENCE 301: 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 201.

Tanenbaum, *Structured Computer Organization*
Zarrella, *Systems Architecture*
Zarrella, *Operating Systems - Concepts and Principles*
Leventhal, *8080A-8085 Assembly Language Programming*
Zaks, *CP/M Handbook with MP/M*

COMPUTER SCIENCE 311: Interactive Computer Graphics (1-1/2) **(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.

Newman & Sproull, *Principles of Interactive Computer Graphics (2nd Ed.)*
Foley & van Dam, *Fundamentals of Interactive Computer Graphics (1982)*

COMPUTER SCIENCE 312: Numerical Analysis (1-1/2) **(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 201.

Burden, Farres & Reynolds, *Numerical Analysis (3rd Ed.)*
Meissner & Organick, *FORTRAN 77: Featuring Structured Programming*

COMPUTER SCIENCE 322: Microcomputer Architecture (1-1/2) **(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 301.

Coffron, *Practical Hardware Details for Microprocessor Systems*
Osborne, *An Introduction to Microcomputers Vol 1 Basic Concepts (2nd Ed.)*
Leventhal & Walsh, *Microcomputer Experimentation with the INT SDK-85*

COMPUTER SCIENCE 332: Organization of Programming Languages (1-1/2) **(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 301 and 341 or consent of the Department

Pratt, *Programming Languages, Design and Implementation (2nd Ed.)*
Kerrighan & Ritchie, *The C Programming Language*

COMPUTER SCIENCE 341: Advanced Programming Techniques (1-1/2) **(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.

Dale & Orshalick, *Introduction to Pascal & Structured Design*
Dale & Lily, *Pascal Plus Data Structures*

COMPUTER SCIENCE 401: Digital Design (1-1/2) **(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 322.

Winkel & Prosser, *The Art of Digital Design*

COMPUTER SCIENCE 411: Operating Systems (1-1/2) **(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 301 or consent of the Department.

Calingaert, *Operating System Elements - A User Perspective*
Peterson & Silberschatz, *Operating System Concepts*
Kerrighan & Ritchie, *The C Programming Language*

COMPUTER SCIENCE 422: Topics in Computer Science (1-1/2) **(3,0,0)**

In 1989-90, 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.

Fu, K.S., et. al., *Robotics: Control, Sensing, Vision and Intelligence*, McGraw Hill, 580 pp., New York, 1987.

Prerequisite: Physics 451 Intermediate Mechanics

COMPUTER SCIENCE 432: Solid State Device Technology (1-1/2) **(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, 421.

Bar-Lev, *Semi-Conductors and Electronic Devices*

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

Fourth Year cadets 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 cadet 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.

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 – E.R. Chappell, rmc, BSc, MASc, MEIC, MCSCE, MCASI, PEng

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

Associate Professor – M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc, AdeC

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.

Popov, *Mechanics of Materials (2nd Ed.) - SI Version*
Beer & Johnston, *Vector Mechanics for Engineers - Statics, (4th Ed.)*

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).

Giesecke, Mitchell, Spencer, Hill, Loving & Dygdon, *Engineering Graphics (4th Ed.)*

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 RR261 and the following additional topics: oblique and perspective drawings; auxiliary views; intersections; screw threads and fasteners; limit dimensioning; assembly drawings; revolutions; developments; empirical equations; graphical solution of vectors; computer aided drafting; simple determinate truss analysis and an introduction to the design process with cadet 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).

Giesecke, Mitchell, Spencer, Hill, Loving & Dygdon, *Engineering Graphics (4th Ed.)*

ENGINEERING 311: Applied Fluid Mechanics (2) **(4,0,2)**

For Third Year Physics and Oceanography students; optional for General Science students.

Newtonian and non-Newtonian fluid properties, fluid statics, ship stability; Euler equation, Bernoulli equation, the steady-state energy equation, applications of the linear-momentum equation; Buckingham Pi Theorem and principals of modelling; Navier-Stokes equations, laminar and turbulent flow, boundary layer concepts, lift and drag on immersed bodies; hydraulic jumps and steady, uniform flow in open channels; Mach number and compressible flow; cavitation; and methods of fluid measurement.

The laboratory course amplifies topics discussed in the lectures. Experiments include ship stability, jet impact, flow measurements, boundary layer flows, pipe system friction losses, vortex flows and demonstrations of flow phenomena.

Streeter & Wylie, *Fluid Mechanics (1st SI Metric Ed.)*

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

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

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

Professor – A.G. Martel, BA, MA, PhD, FRHistS

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

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

Lecturer – Lieutenant (N) W.R. Glover, CD, BA, MA

Special Lecturer – W.T. Mann, BComm, FCGA

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

Special Lecturer – R.B.J. Walker, BA, MA, PhD

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. Two 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% at the end of the Second Year. Honours students are required to maintain an overall average of 66% 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.

BA GENERAL, MILITARY AND STRATEGIC STUDIES

(Joint Concentration in History and International Politics)

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
History 302
Political Science 322, and
one 300 or 400 level course in
English or Military Leadership 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 361
Economics 421
History 471
Political Science 401

One of the following:

Economics 332
Economics 412
Economics 422
Economics 432
History 302
Political Science 402, and
one 300 or 400 level course in
English or Military Leadership or
Applied Psychology or Science in
the first semester.

NOTE: Political Science 213 must be taken in the Third Year in lieu of three units of credit in elective courses if it or its equivalent was not completed in Second Year.

BA GENERAL, MILITARY AND STRATEGIC STUDIES

(Joint Concentration in Politics and Economics)

Third Year

Major

Political Science 361
Political Science 322
Economics 341
Economics 352

Fourth Year

Major

Political Science 401
Political Science 402
Economics 412
Economics 421

Other Courses	**Other Courses**
Military Leadership 311	Military Leadership 402
Elective Courses*	**Elective Courses***
One of the following:	*One* of the following:
Economics 311 Economics 321 Economics 331	Economics 311 Economics 321 Economics 331
One of the following:	*One* of the following:
Political Science 321 Political Science 441	Political Science 441 Political Science 321
One of the following:	*One* of the following:
Economics 332 Economics 422 Economics 432	Economics 332 Economics 422 Economics 432
One of the following:	*One* of the following:
Political Science 302 Political Science 312 Political Science 342, and	Political Science 342 Political Science 432, and
one 300 or 400 level course in English or History or Military Leadership or Applied Psychology or Science in the second semester.	one 300 or 400 level course in English or History or Military Leadership or Applied Psychology or Science in the first semester.

NOTE: Political Science 213 must be taken in the Third Year in lieu of three units of credit in elective courses if it or its equivalent was not completed in Second Year.

BA HONOURS, MILITARY AND STRATEGIC STUDIES

(Both Joint Concentrations)

In addition to the courses listed above for the Major program, candidates for the honours degree must present six additional units of credit in elective courses. In the Fourth Year honours candidates are required to complete the course Military Studies 483 or to complete an additional three units of credit in elective courses.

COMMERCE 203: Accounting (3) **(3,0,0/3,0,0)**

For Second Year Arts students intending to pursue a degree in Administration at le Collège militaire royal de Saint-Jean.

With Faculty Council permission, also available as an Arts option to other cadets.

Basic elements of accounting method. Analysis of financial transactions. The recognition of revenue and expense. Financial statement preparation. Recognition of profit. Introduction to analysis of funds flow, cost control and identification of costs, budgetary planning and control systems and accounting for corporations and partnerships.

Pyle, White, Larson & Zin, *Fundamental Accounting Principles (5th Cdn. Ed.)*

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 RR201 and includes research projects calculated to enrich a principles course.

Lipsey, Purvis, Sparks & Steiner, *Economics (5th Ed.)*

ECONOMICS 301: Economics for Scientists (1-1/2) **(3,0,0)**

For Third and Fourth Year Science students. (Replaces Economics 201, and offered initially in 1990/91).

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.

Lipsey, Purvis, Sparks & Steiner, *Economics (6th Ed.)*

ECONOMICS 304: Directed Reading and Research (1-1/2) **(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 (1-1/2) **(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.

Kennedy & Dorosh, *Dateline Canada (2nd Ed.)*
Officer & Smith, *Issues in Canadian Economics*

ECONOMICS 314: Selected Topics in Economics (1-1/2) **(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 (1-1/2) **(3,0,0)**

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

ECONOMICS 331: Quantitative Methods (1-1/2) **(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 (1-1/2) **(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 (1-1/2) **(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.

Call & Hollahan, *Microeconomics (2nd Ed.)*

ECONOMICS 352: Intermediate Macroeconomic Theory (1-1/2) **(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.

Chernoff, *Macroeconomics: Theory and Policy*

ECONOMICS 361: Applied Business Finance (1-1/2) **(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 (1-1/2) **(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.

Green, *Canadian Industrial Organization and Policy*

ECONOMICS 421: The Economics of Defence (1-1/2) **(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.

Hitch & McKean, *Economics of Defence in the Nuclear Age*

ECONOMICS 422: Money and Banking (1-1/2) **(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.

Offered on demand. Prerequisite: consent of the instructor.

Binhammer, *Money, Banking and the Canadian Financial System*

ECONOMICS 432: International Trade and Finance (1-1/2) **(3,0,0)**

An analysis of the pure theory of international trade and topics in 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, the theory of exchange rates, and an analysis of postwar international monetary problems.

Prerequisite: Consent of the instructor

HISTORY 121: European History to 1500 (1-1/2) **(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.

Chambers, Grew et al., *The Western Experience*

HISTORY 122: The Founding of New Societies, 1500-1763 (1-1/2) **(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.

Bennett & Jaenen, *Emerging Identities*
Chambers, Grew et al., *The Western Experience*
Morton, *The Kingdom of Canada (2nd Ed.)*

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.

Bennett & Jaenen, *Emerging Identities*
Chambers, Grew et al., *The Western Experience*
Morton, *The Kingdom of Canada (2nd Ed.)*

HISTORY 221: Canadian History for Engineers (1-1/2) **(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 211: Europe and the Wider World, 1763-1870 (1-1/2) **(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, and the emergence of the "nation state."

Bennett & Jaenen, *Emerging Identities*
Chambers, *The Western Experience, III, (The Modern Era)*

HISTORY 212: World History, 1870-1970 (1-1/2) **(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.

Morton, *The Kingdom of Canada (2nd Ed.)*
Bennett & Jeanen, *Emerging Identities*
Chambers, *The Western Experience, III, (The Modern Era)*

HISTORY 302: Technology and War, 1914 to Present (1-1/2) **(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 (1-1/2) **(0,3,0)**

Open to Third and Fourth Year students enroled 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.

HISTORY 311: The Evolution of Modern Strategy (1-1/2) **(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.

Paret, *Makers of Modern Strategy*
Ropp, *War in the Modern World*

HISTORY 312: Armies and Society (1-1/2) **(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 what 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.

Cassels, *Fascism*
Payne, *Fascism: A Comparative Approach*

HISTORY 314: Selected Topics in History (1-1/2) **(0,3,0)**

Open to Third and Fourth Year students enroled 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 (1-1/2) **(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.

Winks, *The Historian as Detective*
Davidson & Lytle, *After the Fact: The Art of Historical Detection*
Barker, *The Superhistorians*

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.

Martel, *The Origins of the First World War*
Martel, *The Origins of the Second World War Reconsidered*
Taylor, *The Origins of the Second World War*

HISTORY 411: America as a World Power (1-1/2) **(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 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.

Paterson, *Major Problems in American Foreign Policy Vol. 1 & 2*
Schulzinger, *American Diplomacy in the Twentieth Century*
Williams, *The Tragedy of American Diplomacy (2nd Revised Ed.)*

HISTORY 421: Naval History in the Twentieth Century (1-1/2) (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.

Potter, *Sea Power: A Naval History (2nd Ed.)*

HISTORY 432: China and Japan in the Twentieth Century (1-1/2) (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 rapproachment between China and the Western powers; and the new economic, political, and military balance in East Asia.

Reischauer, *The Japanese*
Fairbank, Reischauer & Craig, *East Asia: Tradition and Transformation*

HISTORY 452: Russia in the Twentieth Century (1-1/2) (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.

McLellan, *Russia: A History of the Soviet Period*
Treadgold, *20th Century Russia (5th Ed.)*

HISTORY 471: The Pacific Rim and East Asia to 1905 (1-1/2) (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.

Dodge, *Islands and Empires: Western Impact on the Pacific*
Lower, *Ocean of Destiny*

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 page 151.

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

POLITICAL SCIENCE 102: Introduction to Political Science (1-1/2) (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.

Kahn, McNiven, MacKown, *An Introduction to Political Science*
MacPherson, *The Real World of Democracy*
Marx, *The Communist Manifesto*

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.

LaFeber, America, *Russia & The Cold War, 1945-1980 (4th Ed.)*
Stoessinger, *Crusaders & Pragmatists: Movers of Modern American Foreign Policy*
Nogee & Donaldson, *Soviet Foreign Policy Since W.W. II*
Holsti, *International Politics (4th Ed.)*
Matthews, Rubinoff & Stein, *International Conflict and Conflict Management*

POLITICAL SCIENCE 302: Crisis and War in International Relations (1-1/2) (3,0,0)

A study of factors determining the nature, extent and control of international conflict through discussion of selected problems and issues in international politics.

Prerequisite: Political Science 213 or consent of the Department

POLITICAL SCIENCE 304: (1-1/2) (0,3,0)

Open to Third and Fourth Year students enroled 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 (1-1/2) (3,0,0)

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

Freedman, *The Evolution of Nuclear Strategy*
Paret, *Makers of Modern Strategy*

POLITICAL SCIENCE 314: Selected Topics in Political Science (1-1/2) (0,3,0)

Open to Third and Fourth Year students enroled in the Military and Strategic Studies program. A selected topic of intrerst 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.

POLITICAL SCIENCE 321: Irregular Warfare (1-1/2) (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 (1-1/2) (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.

Whittington & Williams, *Canadian Politics in The 1980's. (Revised Edition)*
Gibbins, *Conflict and Unity: An Introduction to Canadian Political Life*

POLITICAL SCIENCE 342: Asia-Pacific Defence and Security Issues (1-1/2) (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 (1-1/2) (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.

Berki, *The History of Political Thought*
Bondanella (Ed), *The Prince*
Crocker, *Social Contract and Discourse on the Origin of Inequality*
Gamble, *An Introduction to Modern Social and Political Thought*

POLITICAL SCIENCE 401: Canadian Public Administration (1-1/2) **(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 (1-1/2) **(3,0,0)**

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

Prerequisite: Political Science 102

POLITICAL SCIENCE 432: Arms Control (1-1/2) **(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.

Blacker & Duff, *International Arms Control: Issues and Agreements (2nd Ed.)*
National Academy of Science, *Nuclear Arms Control: Background & Issues*
International Institute of Strategic Studies, *Strategic Survey 1985-86*

POLITICAL SCIENCE 441: Canadian Foreign Policy (1-1/2) **(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.

Stacey, *Canada & The Age of Conflict, Vol. 1 & 2*
Holmes, *Canada: A Middle-Aged Power*
Hillmer & Stevenson, *Foremost Nation: Canadian Foreign Policy and A Changing World*
Nossal, *The Politics of Canadian Foreign Policy*

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

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

Assistant Professor – P.A. Black, BA, MA, PhD

Assistant Professor – G.W.S. Brodsky, CD, BA, MA, PhD

ENGLISH 103: Composition, Logic, 14-16th Century Literature, Utopian Literature (3) **(3,1,0/3,1,0)**

For First Year Science and Engineering students. Students considered weak in English composition will receive additional instruction.

Part I: Logic and Linguistics: Chaucer and Marlowe (First Semester).

This part of the course includes a review of the principles of clear and accurate expression and a study of works by Chaucer and Marlowe.

Two essays and other exercises are required from each student.

Part II: Utopian Literature (Second Semester).

In this part of the course, the student analyzes various literary forms of social criticism and examines the effect of ideas of social organizations on the individual citizen. Beginning with Plato and More, the student proceeds to other examples of Utopian thought, including the satire of Swift and several modern anti-Utopias (e.g., Zamiatin, Burgess).

Two essays are required from each student.

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 (1-1/2) **(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 (1-1/2) **(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 (1-1/2) **(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 (1-1/2) **(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 form'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 312: Literature of War in the Modern Age (1-1/2) **(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 321: Literary Criticism (1-1/2) **(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 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.

LITERATURE 422: Introduction to French Canadian Literature (1-1/2) **(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 (1-1/2) **(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 (1-1/2) **(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 RR311 or consent of the instructor.

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

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 – Capt. B.P. Mulders, BSc, MSc

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.

Ayres, *Mathematics of Finance*
Bittinger, *Calculus, A Modelling Approach (3rd Ed.)*

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.

Leithold, *The Calculus with Analytic Geometry, Part 1, 2 & 3 (5th Ed.)*

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.

Bittinger & Crown, *Finite Mathematics, A Modelling Approach (2nd Ed.)*
Walpole, *Introduction to Statistics (3rd Ed.)*

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.

Leithold, *The Calculus with Analytic Geometry (5th Ed.)*
Zill, *A First Course in Differential Equations with Applications (2nd Ed.)*

MATHEMATICS 233: 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.

This course will include all of the topics of Mathematics RR223 but with more rigorous treatment.

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

Leithold, *The Calculus with Analytic Geometry (5th Ed.)*
Zill, *A First Course in Differential Equations with Applications (3rd Ed.)*

MATHEMATICS 241: Probability and Statistics (1-1/2) **(3,0,0)**

For Second Year Engineering students and General Science students; required for Third Year Physics and Oceanography and Physics and Computer Science students, and the Applied Military Psychology program.

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.

Walpole, *Introduction to Statistics (3rd Ed.)*

MATHEMATICS 252: Linear Algebra (1-1/2) **(3,0,0)**

For Second Year Engineering students; optional for General Science students; and recommended for Third Year Physics and Oceanography students.

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

Anton, *Elementary Linear Algebra (4th Ed.)*

MATHEMATICS 301: Differential Equations (1-1/2) **(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.

Spiegel, *Fourier Analysis*
O'Neil, *Advanced Engineering Mathematics*

MATHEMATICS 401: Complex Analysis (1-1/2) **(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.

O'Neil, *Advanced Engineering Mathematics*

MATHEMATICS 411: Signal Processing I (1-1/2) **(3,0,0)**

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

Recommended as an elective for Physics and Oceanography students involved in Anti-Submarine Warfare.

Prerequisite: Mathematics 301, or consent of the Department.

Stanley, *Digital Signal Processing*

MATHEMATICS 422: Signal Processing II (1-1/2) **(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.

Burdic, *Underwater Acoustics System Analysis*

MATHEMATICS 432: Advanced Applied Mathematics (1-1/2) **(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 enroled in this course have taken Mathematics 401.

Prerequisite: Mathematics 301 and consent of the Department.

Burkov, *Mathematical Physics*

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

DEPARTMENT OF MILITARY LEADERSHIP AND APPLIED PSYCHOLOGY

Assistant Professor and Head of Department – Squadron Leader (retired) A.T. Malcolm, CD, pcsc, asc, BA, MA, PhD

Assistant Professor – Major L.P.K. LeGras, CD, pcsc, BA, MAS

Assistant Professor – R.C. St. John, BA, MA, PhD

Lecturer – Captain H.P.R. Smith, CD, BSc, MA, MSc

Special Lecturer – G.D. Resch, OMM, 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

Military Leadership and Applied Psychology

Third Year

Major

Applied Psychology 361
Applied Psychology 381
Applied Psychology 322
Applied Psychology 362
Applied Psychology 372

Other Courses

Military Leadership 311

Elective Courses

Six units of credit in Arts or Science courses at the 300 or 400 level. Applied Psychology 221 may be taken in lieu of an elective if not completed in Second Year.

Fourth Year

Major

Applied Psychology 411
Applied Psychology 431
Applied Psychology 462
Applied Psychology 422
Applied Psychology 432

Other Courses

Military Leadership 402

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

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 403, Thesis Project, must be completed.

BSc Major, Applied Military Psychology

Third Year

Major

Applied Psychology 361
Applied Psychology 381
Applied Psychology 322
Applied Psychology 362
Applied Psychology 372

Other Courses

Military Leadership 311
Mathematics 301

Elective Courses

Six units of credit in Arts or Science courses at the 300 or 400 level.

Fourth Year

Major

Applied Psychology 411
Applied Psychology 431
Applied Psychology 462
Applied Psychology 422
Applied Psychology 432
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.

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:

Physics 371	Computer Science 332
Computer Science 301	Computer Science 322
Computer Science 411	Computer Science 422

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

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 403, Thesis Project.

COURSE DESCRIPTIONS

MILITARY LEADERSHIP 111: Psychology of the Individual – Part 1 (1-1/2) (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 (1-1/2) (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 (1-1/2) (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 and Applied Psychology 111 or consent of the Department.

MILITARY LEADERSHIP 292: Social Psychology (1-1/2) (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: Leadership and Management Theories and Techniques (1-1/2) **(3,0,0)**

This course is designed to familiarize students with leadership theories and techniques as well as the basic management skills required of military leaders. It also aims at developing elementary skills in interviewing and in the analysis of group phenomena. Exercises deal with group dynamics, the leadership process, human relations, supervisory skills, communication and non-directive interviewing, problem analysis, conflict management and decision making.

Prerequisite: Military Leadership and Applied Psychology 111 or consent of the Department.

Whetten & Cameron, *Developing Management Skills*
West Point Military Academy, *Leadership in Organizations*

MILITARY LEADERSHIP 402: Professional and Ethical Issues (1-1/2) **(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 and Applied Psychology 111 or consent of the Department.

Taylor & Rosenbach, *Military Leadership: In Pursuit of Excellence*
Wakin, *War, Morality and the Military Profession*
Rosenbach & Taylor, *Contemporary Issues in Leadership*

APPLIED PSYCHOLOGY 221: Psychology of the Individual – Part 2 (1-1/2) (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 (1-1/2) **(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.

Henderson, *Cohesion: The Human Element in Combat*
Kellet, *Combat Motivation: The Behaviour of Soldiers in Battle*

APPLIED PSYCHOLOGY 331: Abnormal Psychology (1-1/2) **(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 (MLAP 321) 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 332: Psychological Foundations of Sport (1-1/2) **(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 (1-1/2) **(3,0,0)**

The study of theory and research on the principles affecting personality development and structure.

Prerequisite: ML 111 or equivalent.

APPLIED PSYCHOLOGY 352: Selected Topics in Military Psychology (1-1/2) **(3,0,0)**

Prerequisite: ML 111 or equivalent and ML 332.

APPLIED PSYCHOLOGY 361: Elements of Physiological Psychology (1-1/2) **(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.

Thompson, *The Brain: An Introduction to Neuroscience*
Carlson, *Physiology of Behaviour*

APPLIED PSYCHOLOGY 362: Introduction to Research Methods (1-1/2) (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, MATH 203 or 241.

APPLIED PSYCHOLOGY 372: Sensation/Perception (1-1/2) (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 and AP 321.

Coren, *Sensation & Perception (2nd Ed.)*

APPLIED PSYCHOLOGY 381: Statistics for the Behavioural Sciences (1-1/2) (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 403: Psychology Thesis Project (3) (0,3,0/0,3,0)

Fourth Year students in the Honours program will work on an experimental project in the area of applied military psychology. The thesis must be defended in accordance with thesis regulations.

APPLIED PSYCHOLOGY 411: Cognitive Processes (1-1/2) (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 422: Military Psychology – Part 2 (1-1/2) **(3,0,0)**

Continuation of AP 322 an examination of military relevant topics.

Prerequisites: ML111, 212, and AP 322.

APPLIED PSYCHOLOGY 431: Organizational Behaviour (1-1/2) **(3,0,0)**

The application of psychological principles to the understanding of organizational behaviour including selection, training and development, motivation and job satisfaction.

APPLIED PSYCHOLOGY 432: Counselling Psychology (1-1/2) **(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.

Corsini, R., *Current Psychotherapies (4th Ed.)*

APPLIED PSYCHOLOGY 442: Forensic Psychology (1-1/2) **(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.

Bartle and Bartle, *Criminal Behaviour: A Psycho-Social Analysis*

APPLIED PSYCHOLOGY 452: Psychological Tests and Measurement (1-1/2) **(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 462: Human Factors in Engineering (1-1/2) **(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.

APPLIED PSYCHOLOGY 472: Human Physiology (1-1/2) **(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 (1-1/2) **(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 (1-1/2) **(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.

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 – G.H. Fleming, CD, BSc, MA, PhD	Physics
Assistant Professor – J.R. Buckley, BSc, PhD	Physics
Assistant Professor – M.W. Stacey, BSc, PhD	Physics
Assistant Professor – S.R. Waddell, BSc, MSc, PhD	Physics

The descriptions of named Oeanography 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, Acoustics, Signal Processing, Applied Fluid Mechanics, etc.

OCEANOGRAPHY 301: Descriptive Oceanography (1-1/2) **(3,0,0)**

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.

Pickard & Emery, *Descriptive Physical Oceanography: An Introduction (4th SI Ed.)*
Knauss, *Introduction to Physical Oceanography*
Beer, *Environmental Oceanography*

OCEANOGRAPHY 321: Biological Oceanography (1) **(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.

Russell & Hunter, *Aquatic Productivity (1st Ed.)*
Sumich, *Introduction to the Biology of Marine Life (2nd Ed.)*
Chemical Rubber Publishing Company, *Handbook of Chemistry and Physics*

OCEANOGRAPHY 331: Chemical Oceanography (2) **(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.

Riley & Chester, *Introduction to Marine Chemistry*
Horne, *Marine Chemistry*
Strickland & Parsons, *A Practical Handbook of Seawater Analysis (2nd Ed.)*
Broecker & Peng, *Tracers in the Sea*

OCEANOGRAPHY 352: Oceanographic Methods (1-1/2) (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

Harris, *Quantitative Chemical Analysis*
Strickland & Parsons, *A Practical Handbook of Seawater Analysis (2nd Ed.)*
Thomson, *Oceanography of the B.C. Coast*

OCEANOGRAPHY 401: Geophysical and Geological Oceanography (1-1/2) (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; geodosy; geomagnetism and paleomagnetism; geothermal studies; marine geophysics and geophysical prospecting.

Prerequisite: Physics 332, Mathematics 301*

Garland, *Introduction to Geophysics - Mantle, Core & Crust (2nd Ed.)*
Dobrin, *Introduction to Geophysical Prospecting (3rd Ed.)*

(*May be taken concurrently.)

OCEANOGRAPHY 412: Aeronomy ((1-1/2) (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.

Wallace & Hobbs, *Atmospheric Science*
Iribarne & Cho, *Atmospheric Physics (1980)*

OCEANOGRAPHY 422: Geochemistry of Marine Sediments (1) (2,0,0)

A review of the chemical and mineralogical composition of marine sediments; the interaction of sediments and the water column; adsorption and desorption processes; recent developments in sediment research including the behaviour of hydrothermal vents; ocean mining.

Offered on demand. Prerequisite: Oceanography 331 or consent of the Department.

OCEANOGRAPHY 442: Practical Marine Oceanography (1/2) (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 (1-1/2) (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.

Pond & Pickard, *Introductory Dynamical Oceanography (2nd Ed.)*
LeMehaute, *An Introduction to Hydrodynamics & Water Waves*
Gill, *Atmosphere - Ocean Dynamics*

OCEANOGRAPHY 462: Advanced Dynamic Oceanography (1-1/2) (3,0,0)

Selected topics in turbulence, turbulent diffusion, waves, design of experiments, and analysis of data.

Prerequisites: Oceanography 451, Mathematics 301.

Pond & Pickard, *Introductory Dynamical Oceanography (2nd Ed.)*
LeMehaute, *An Introduction to Hydrodynamics & Water Waves*
Gill, *Atmosphere-Ocean Dynamics*

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 (3) **(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.

OCEANOGRAPHY 492: Oceanography Seminar (0) **(0,2,0)**

A series of lectures on various topics in oceanography, presented by guest speakers, members of the college staff, and by students in the Honours program.

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, PhD
Assistant Professor – J.R. Buckley, BSc, PhD
Assistant Professor – G.H. Fleming, CD, BSc, MA, PhD
Assistant Professor – J.M. Gilliland, BSc, MA, PhD
Assistant Professor – J.L. LaCombe, BSc, MSc, PhD
Assistant Professor – M.W. Stacey, BSc, PhD
Assistant Professor – S.R. Waddell, BSc, MSc, 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. With the Physics specialization there are combined major programs that permit additional specialization in either Oceanography or Computer Science.

PHYSICS 103: Mechanics (1-1/2) **(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.

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.

Kepes, *Introduction to Physics for Scientists & Engineers*
Baird, *Experimentation: An Introduction to Measurement Theory & Experimental Design*
Serway, *Physics for Scientists and Engineers (2nd Ed.)*

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.

Halliday & Resnick, *Physics - Part I & II (3rd Ed.)*
Baird, *Experimentation: An Introduction to Measurement Theory & Experimental Design*

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

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 CAF are used as illustrative examples. Topics covered in the classroom are supplemented by laboratory experiments in the second semester.

PHYSICS 203: AC Circuits and Electromagnetism (3) **(2-1/2,0,3/2-1/2,0,3)**

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, 113, Mathematics 113.

Lorrain & Corson, *Electromagnetism*
Edminster, *Electric Circuits (2nd Ed.) (Schaums Outline)*
Edminister, *Theory & Problems of Electromagnetics (Schaums Outline)*
Mix & Schmitt, *Circuit Analysis for Engineers*

PHYSICS 211: Vibrations and Waves (1) **(2-1/2,0,0)**

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, 113, Mathematics 113.

Baird, *Experimentation: An Introduction to Measurement Theory & Experimental Design*

PHYSICS 252: Modern Physics (1) **(2-1/2,0,0)**

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, 113, Mathematics 113.

Tipler, *Modern Physics*

PHYSICS 312: Solid State Physics (1-1/2) **(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.

Prerequisites: Physics 203, 211, 252, and Mathematics 301.

Kittel, *Introduction to the Solid State (5th Ed.)*
Rosenberg, *The Solid State (2nd Ed.)*

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.

Physics 302 must be taken in conjunction with this course.

Prerequisites: Physics 203, 211, and Mathematics 301.

Edminster, *Theory & Problems of Electromagnetics (Schaums Outline)*
Brown, Sharpe, Hughes & Post, *Lines, Waves & Antennas (2nd Ed.)*

PHYSICS 342: Applied Optics and Remote Sensing (1-1/2) **(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.

Offered on demand. Prerequisite: Physics 113 or 123.

Cralknell (ed), *Remote Sensing in Meteorology, Oceanography and Hydrology*
Castleman, *Digital Image Processing*
Hecht & Zajac, *Optics*
Robinson, *Satellite Oceanography*

PHYSICS 362: Acoustics (1-1/2) **(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.

Kinsler & Frey, *Fundamentals of Acoustics (3rd Ed.)*
Urick, *Principles of Underwater Sound (3rd Ed.)*
Seto, *Acoustics (Schaum's Outline)*

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, 252.

Diefenderfer, *Principles of Electronic Instrumentation (2nd Ed.)*
Leventhal & Walsh, *Microcomputer Experimentation with the Int. SDK-85*

PHYSICS 401: Experimental Physics (1/2) **(0,0,3)**

For all Fourth Year Physics and Computer Science and Physics and Oceanography students as well as for those General Science students who choose Physics 421 or Physics 451.

A course of experiments which illustrate and supplement the work discussed in the lecture courses.

PHYSICS 421: Quantum Mechanics (1-1/2) **(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 312.

Davies & Brown (eds). *The Ghost in the Atom*
Eisberg & Resnick, *Quantum Physics of Atoms, Molecules, Solids, Nuclei & Particles (2nd Ed.)*

PHYSICS 432: Applied Nuclear Physics (1-1/2) **(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.

Nero, *A Guidebook to Nuclear Reactors*
Tsoulfanidis, *Measurement and Detection of Radiation*
Eisberg & Resnick, *Quantum Physics of Atoms, Molecules, Solids, Nuclei & Particles (2nd Ed.)*

PHYSICS 451: Intermediate Mechanics (1-1/2) **(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.

Physics 401 must be taken in conjunction with this course.

Prerequisites: Physics 211, 252, Mathematics 301.

Fowels, *Analytical Mechanics (4th Ed.)*

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

DEPARTMENT OF SECOND LANGUAGE TRAINING

Senior Teacher and Head of Department – A. Hadley, BA, DipEd, MEd (Adm)

Language Teacher – A. Allard, BA, MA

Language Teacher – M. Connor, BA

Language Teacher – L. Hof, BA, BSc, MA, MEd

Language Teacher – B. Leclerc, BA, BEd

Language Teacher – F. Nantais, BA, BacEd

Language Teacher – J. Robichaud, BA, BAEd, Licence (théologie)

Language Teacher – M. Savard, BA, MA

Language Teacher – A. Tétreault, BA

Language Teacher – D.R. Toyonaga, BA

The objective of Second Language Training (SLT) in the Canadian Military Colleges is to eventually achieve a bilingual career officer corps. SLT and the development of proficiency in communicative skills is considered to be an integral part of the development of leadership qualities. To graduate from a Canadian Military College, an officer cadet shall be required to demonstrate, within the context of established standards of bilingualism, regular and adequate individual progress in communicative competence in his/her second official language.

Upon his/her arrival at the College and thereafter at the end of every year, each officer cadet shall be required to take a battery of tests in order to demonstrate his/her competence in the Second Language. Based upon the results, the SLT Department will create small, homogeneous classes in order to permit students to progress at their own pace.

During the academic year each student receives five periods of Second Language Training per week. In addition, students will attend an intensive ten week French course at the end of their First Year.

Students who obtain the "integral" level of bilingualism on the Language Knowledge Tests will have met the requirements of the Department of National Defence and will therefore be exempted from further Second Language Training.

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

DRILL

Officer in Charge of Drill – Captain M.F. McIntosh, BA (RMC)

Drill Sergeant Major – Master Warrant Officer V.J. Wooley, CD

Drill Instructor – Sergeant J.A. Aubin, CD

Drill Instructor – Petty Officer 2nd Class W.J. Rudolph, 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.

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

PHYSICAL EDUCATION, ATHLETICS AND RECREATION

Director of Athletics – Captain J.A. Kimick, CD, BA, BPE, MSc

Physical Education Officer – Second Lieutenant K. Fogalin, BA (PE)

Chief Instructor – Master Warrant Officer N.F. Graff, CD

Physical Education and Recreation Instructors: –

Sergeant J.J. Dufresne, CD
Sergeant M.L. Rousseau
Master Corporal J.G.L. Turcotte

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.

Anderson, *Stretching*
Stewart, *Everybody's Fitness Book*

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.

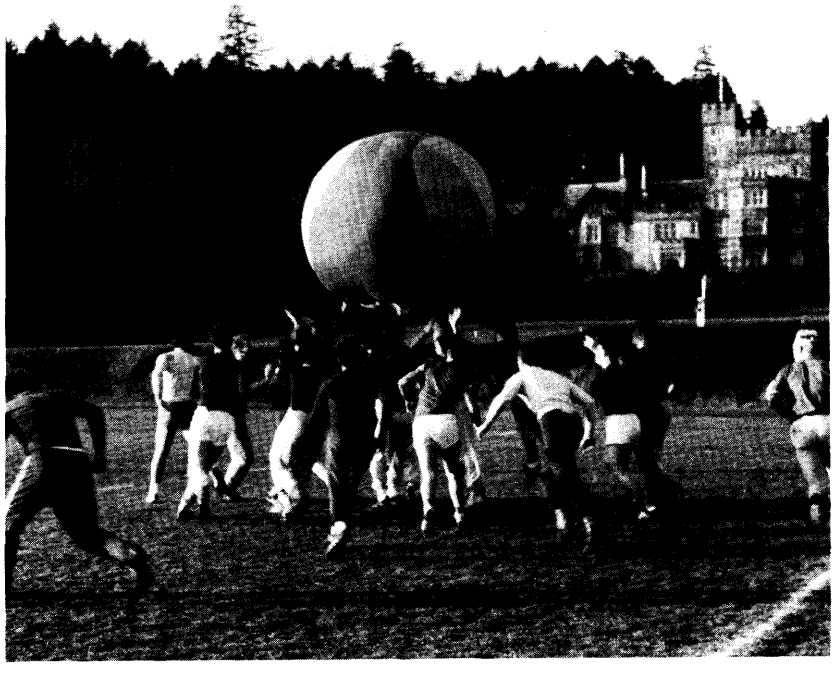
INTRAMURALS, INTERSQUADRON EVENTS AND REPRESENTATIVE TEAMS

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, triathalon, 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.


Royal Roads



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 – Member (UTPM).

b. **Officer:** a student attending RRMC under the University Training Plan – Officers (UTPO).

c. **Special Student:** other members of the Canadian Forces or civilian staff, or dependents, 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 RR103, Oceanography RR401, 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 Coll`ege 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 Coll`ege 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 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.

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 offered are Honours Military and Strategic Studies, General Military and Strategic Studies, Honours Applied Military Psychology, General Applied Military Psychology, General Science, Physics and Oceanography (Combined Major), Physics and Computer Science (Combined Major), Honours (Thesis) and Honours (Course) in Physics and Oceanography, and Honours (Course) in Physics and Computer Science. Details of courses are laid down in the current calendar.

11. Admission into the general, major and combined major degree programs completed at RRMC requires the satisfactory completion of Second Year at any CMC with the following prerequisites:

- **Arts General or Major Program**
  any CMC Arts, Administration, Science or Engineering program of study which includes a course in Mathematics 203 or Mathematics 241 or an equivalent course in probability and statistics.
- **Science General or Major Program**
  any CMC Science or Engineering program of study which includes a course in Mathematics 241, or its equivalent.
- **Science Combined Major Program, Physics and Oceanography**
  any CMC Science or Engineering program of study which includes a course in Mathematics 241 or its equivalent. Engineering 232 and Mathematics 252, or their equivalents, are recommended courses. A weighted grade average of at least 55 percent is required in mathematics, science, and engineering courses.
- **Science Combined Major Program, Physics and Computer Science**
  any CMC Science or Engineering program of study which includes a course in Mathematics 241 and Mathematics 252, or their equivalent. A weighted grade average of at least 55 percent is required in mathematics, science, and engineering courses.

12a. Candidates for a General Arts degree must normally take a semester course loading of 7-1/2 units of credits. A minimum of 30 units of credit in 300 and 400 level courses must be attained over four semesters of which 9 units in each of two fields must be completed. Three units of credit 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 offered for which the student has the prerequisite and timetabling permits. A minimum of three units of credit in elective courses must be completed from among offerings outside the Department of History and Political Economy.

12b. Candidates for a Major degree in Applied Military Psychology must generally take a semester course loading of 7-1/2 units of credit. A minimum of 30 units of credit in 300 and 400 level courses must be attained over four semesters of which 15 units must be in Military Leadership and Applied Psychology. Three units of credit 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 offered for which the student has the prerequisites and timetabling permits. At least nine units of credit in elective courses must be taken from outside the Military Leadership and Applied Psychology Department.

12c. Candidates for a General degree in Science must normally take a minimum semester course loading of 7-1/2 units of credit and pass a minimum semester load of 6 units of credit. A minimum of 30 units of credit in 300 and 400 level courses must be obtained in four semesters of which 22 units in Science courses must be completed. Three units of credit must be in Military Leadership 311 and 402. A minimum of 3 or a maximum of 6 units of credit must be in Arts electives and the remainder must be in Science courses.

12d. Candidates for a Combined Major degree in Physics and Oceanography must normally take a minimum semester load of 9 units of credit. A minimum of 36 units of credit in four semesters is required. A minimum of 30 units of credit in

Science courses at the 300 and 400 level, of which 12 units must be in Physics and 12 units must be in Oceanography, must be completed. Three units of credit must be in Military Leadership 311 and 402. A minimum of three units of credit in other Arts electives must be taken during the Third and Fourth Years.

12e. Candidates for a combined Major degree in Physics and Computer Science must normally take a minimum semester load of 9 units of credit. A minimum of 36 credits in four semesters is required. A minimum of 30 units in Science courses at the 300 and 400 level, of which 12 units must be Physics and 12 units must be in Computer Science, must be completed. Three units of credit must be in Military Leadership 331 and 402. A minimum of three units of credit in other Arts electives must be taken during the Third and Fourth Years.

12f. A minimum weighted average of 55 percent in Science courses must normally be maintained in each semester to remain in the combined major programs.

12g. Elective courses selected by students must be approved by the departments concerned and the Registrar.

Honours Degree Programs

13a. Admission into the Honours Arts Degree programs in Military and Strategic Studies 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 the Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Military and Strategic Studies program, a candidate for an Honours Degree must complete an additional six units of credit in courses offered by the Department of History and Political Economy. In the Fourth Year, a candidate may elect to take the Honours Arts Research Seminar in lieu of three credits of work (see Rules Governing Honours Arts Research Seminars, page 151).

13b. Admission into the Honours Degree program in Applied Military Psychology requires completion of Second Year Arts with a minimum of second class honours. Students who have achieved less than the required average may be admitted to the Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Applied Military Psychology program, a candidate for an Honours Degree must complete an additional six units of credit including a Psychology thesis project and a minimum of three units of credit in courses external to the Department.

13c. Admission into the Honours Degree program in Physics and Oceanography requires completion of "Third Year - Combined Major in Physics and Oceanography" with a weighted average of at least 66 percent in Third Year science and engineering subjects. Students who have achieved less than the required average may be admitted to the Honours program on a probationary basis with Faculty Council approval.

13d. Admission into the Honours Degree program in Physics and Computer Science requires completion of "Third Year - Combined Major in Physics and Computer Science" with a weighted average of at least 66 percent in Third Year science and engineering subjects. Students who have achieved less than the required average may be admitted to the Honours program on a probationary basis with Faculty Council approval.

13e. A student wishing to enter any Honours program must apply in writing to the Dean concerned, no later than the first week of May in the Second Year for Arts

students and in the Third Year for Science students. A candidate accepted into a thesis Honour 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.

13f. To be graduated with an Honours Degree a candidate must normally maintain an overall weighted average of 66 percent or better 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 students in all years.

SECOND LANGUAGE TRAINING

17. Courses in second language training must be taken by all students 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
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:

i) a minimum overall weighted grade average of 50 percent in an approved program of study; and

ii) 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:

i) an overall final weighted grade average over the year's work of at least 50 percent;

ii) 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;

iii) a satisfactory standard in Second Language Training;

iv) a satisfactory standard in Physical Training and Drill; and

v) 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;
    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 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 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 RRMC. The minimum penalty for a student found to have plagiarized by a member of Faculty will be a zero for the plagiarized submission. An officer cadet accused of cheating or plagiarism may be charged under the Code of College Conduct or the National Defence Act. An officer cadet 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 the Physics and Oceanography or the Physics and Computer Science programs.

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 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 RRMC 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 RRMC 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 the additional 8 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 disciplines of History, Political Science, or Economics, and Arts, provided that the topic is considered appropriate to the Military and Strategic Studies program, from the disciplines of English or Military Leadership and Applied Psychology.
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, 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 Department of History and Political Economy 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.
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 Department of History and Political Economy.
9. The Coordinator of the Honours program will organize the Committee of Examiners upon receipt of the completed research paper and two copies. The 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 STUDY
GENERAL REQUIREMENTS

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 RRMC 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.

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 16 credits each semester. (See Table 13 page 000).

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 as letter grades by the Registrar.

No grades, whether numerical or letter, 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.

OCEANOGRAPHY AND ACOUSTICS

General

Candidates for the degree of Master of Science will be admitted under the Graduate Study General Requirements. 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 3 full year graduate courses plus a thesis)

b. Course pattern (minimum of 5 full year 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.

Specialization in Oceanography leads to a general understanding of the behaviour of both gases and liquids, together with acoustics. It is particularly applicable in problems of anti-submarine warfare faced by aircraft and ships. Attention is paid to the characteristics of the environments in which all military forces operate. The student studies the structure of the earth, the ocean bed, the air-sea interface including ice, the atmosphere and space, and especially the water column. Both chemical and biological oceanography are studied, but there is more emphasis upon physical oceanography because it is more closely related to military problems in anti-submarine warfare.

COURSES OF INSTRUCTION

PHYSICS 502: Acoustic Propagation and Modelling **(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.

Brekhovskikh & Lysanov, *Fundamentals of Ocean Acoustics*
Urick, *Sound Propagation in the Sea*

PHYSICS 511: Acoustic System Analysis **(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 wavenumber 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.

Burdic, *Underwater Acoustic System Analysis (1st Ed.)*
Urick, *Principles of Underwater Sound for Engineers (3rd Ed.)*
Kinsler, Frey, Coppens & Sanders, *Fundamentals of Acoustics (3rd Ed.)*

OCEANOGRAPHY 522: Time Domain Analysis of Marine Data **(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.

Kanasewich, *Time Series Analysis in Geophysics (3rd Ed.)*

OCEANOGRAPHY 551: Frequency Domain Analysis of Marine Data **(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, aperiodic, 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 522 or permission of the Department.

Kanasewich, *Time Series Analysis in Geophysics (3rd Ed.)*

OCEANOGRAPHY 531: Synoptic/Mesoscale Oceanography (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.

Robinson (ed.), *Eddies in Marine Science*
Kamenkovich, Koshlyakov & Monin, *Synoptic Eddies in the Ocean*

OCEANOGRAPHY 512: Ocean Dynamics (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 phenonema 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, Poincaré and Kelvin waves.

Gill, *Atmosphere – Ocean Dynamics (1st Ed.)*
Pond & Pickard, *Introductory Dynamical Oceanography (2nd Ed.)*

OCEANOGRAPHY 541: Dynamical Oceanography (3,0,0)

Long waves such as shelf, Rossby, Poincaré 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 512 or permission of the Department.

Gill, *Atmosphere – Ocean Dynamics (1st Ed.)*
Pond & Pickard, *Intorductory Dynamical Oceanography (2nd Ed.)*

OCEANOGRAPHY 502: Ocean Phyics **(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 geophyics such as gravity and magenetism 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-range forecasts of the marine environmental parameters based on the analysis of their climatology and essential dynamics will be undertaken.

Pickard & Emery, *Descriptive Physical Oceanography*
Tchernia, *Descriptive Regional Oceanography*
Robinson (ed.), *Eddies in Marine Science*

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