Royal Roads Military College

Calendar 1992-93

Victoria, B.C.

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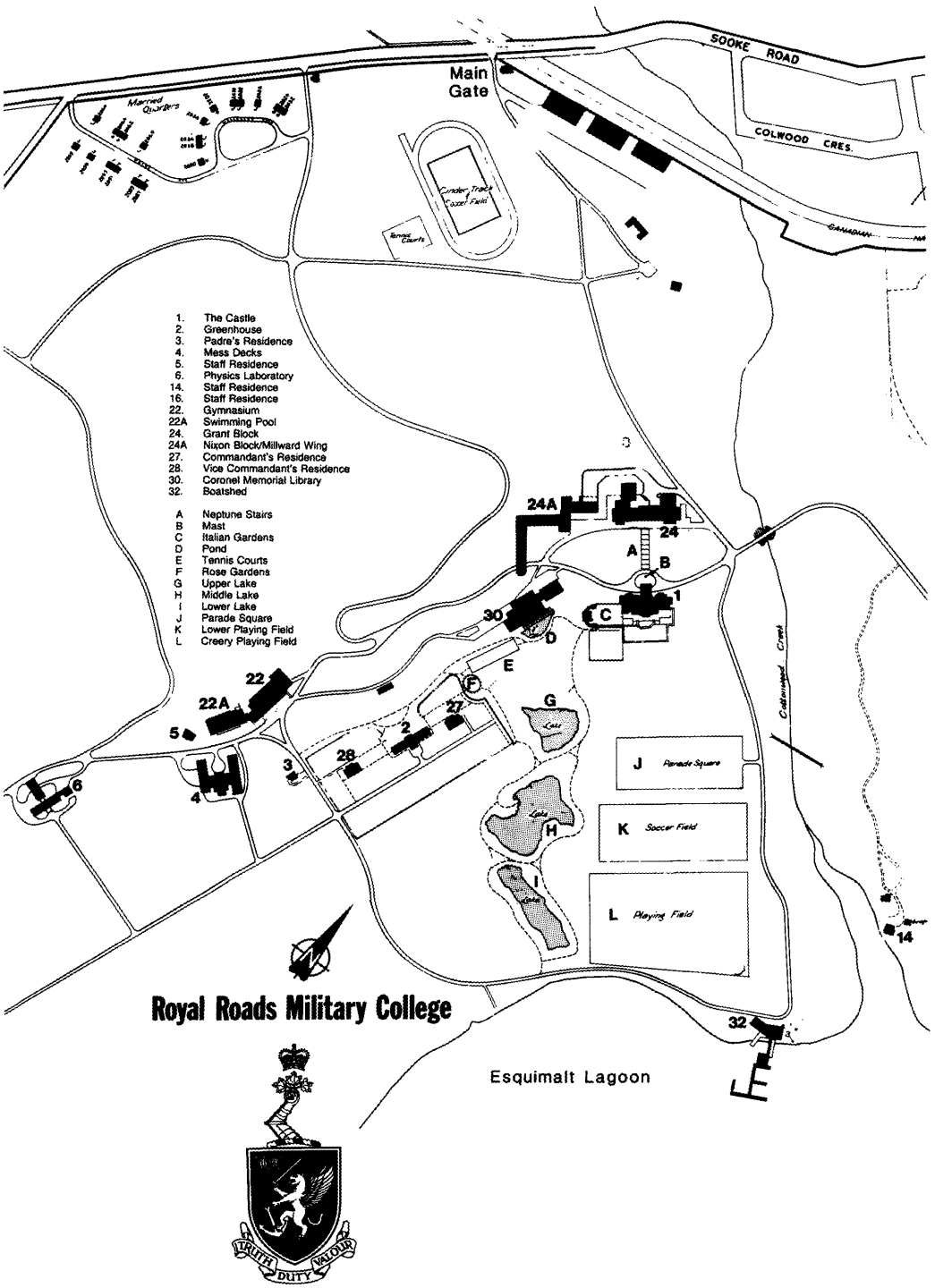
SOOKE ROAD
Main Gate
COLWOOD CRES.
Married Quarters
Cinder Track
Soccer Field
Tennis Courts
1. The Castle
2. Greenhouse
3. Padre's Residence
4. Mess Decks
5. Staff Residence
6. Physics Laboratory
14. Staff Residence
16. Staff Residence
22. Gymnasium
22A Swimming Pool
24. Grant Block
24A Nixon Block/Millward Wing
27. Commandant's Residence
28. Vice Commandant's Residence
30. Coronel Memorial Library
32. Boatshed
A Neptune Stairs
B Mast
C Italian Gardens
D Pond
E Tennis Courts
F Rose Gardens
G Upper Lake
H Middle Lake
I Lower Lake
J Parade Square
K Lower Playing Field
L Creery Playing Field
Colquitz Creek
J Parade Square
K Soccer Field
L Playing Field
Esquimalt Lagoon
Royal Roads Military College
TRUTH DUTY VALOUR

1992

JANUARY

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ACADEMIC YEAR
CALENDAR OF EVENTS 1992-93

Fall Semester 1992/93

Aug 17	Cadet Officers return
Aug 21	Recruits arrive and Recruit Term commences
Sep 4	Recruit Term ends
Sep 8	Classes start
Sep 15	Reports due from Departments on Graduates
Sep 29	Last date for Voluntary course changes
Sep 29	Last date for Extension Student Registration
Oct 10-12	Thanksgiving Stand-down (no classes)
Oct 23	Fall Convocation
Oct 25	Last day for registration changes
Nov 11	Remembrance Day (no classes)
Dec 4	Classes end
Dec 7-18	Fall semester examinations
Dec 19	Christmas Ball
Dec 20-Jan 3	Christmas Leave

Winter Semester 1992/93

Jan 4	All cadets return
Jan 7-9	Supplemental Examinations
Jan 11	Classes begin
Jan 29	Last date for voluntary course changes
Feb 19	Last date for dropping course without penalty
Feb 27-28	Ex Cadet Weekend
Mar 6-14	Reading Break (no classes)
Apr 9-12	Easter Break
Apr 16	Classes end
Apr 19-30	Winter semester examinations
May 3	Marks due to Registrar
May 4	Faculty Board/Faculty Council
May 7-9	Supplemental Examinations
May 14	Spring Convocation and Sunset Ceremony
May 15	Graduation Parade and Graduation Ball
May 16	Successful cadets to summer duties

CANADIAN MILITARY COLLEGES

ADVISORY BOARD

CHAIRMAN

T. P. Adams, BA, BComm

VICE-CHAIRMAN

L. J. Régimbal, BA, BScA

PAST CHAIRMAN

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

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K. M. Morris, BEd, MEd
J. L. Bolduc, BEng, MBA, PEng, rmc

MEMBERS

L. A. Bergeron
R. W. Boadway, BEng, BA, BPhil, PhD, rmc
D. M. Deacon, CM, MC, BA
J. H. Farrell, BA, rmc
G. Fournier, Ing, BASc
R. G. Glassford, BPE, MPE, PhD
Brigadier-General (Retired) B. A. Howard, CD, BASc, PEng
P. S. Jackson, BEd, MA, MEd
P. H. Newcombe, BSc, rmc
B. J. Nicholson, BA, BEd, MA
The Honourable R. G. Rogers, O.C., K.St.J., LL.D., D.Sc.M., CD
N. A. Ross, MSc, PEng
G. R.Skanes, BSc, BA, MA, PhD
K. A. Smee, BSc, MSc, MBA, rmc
Major-General (Retired) J.A. Stewart, CD, BSc, MSc, rmc, psc, ndc
R. Vanier, Ing, BEng

EX-OFFICIO MEMBERS

Deputy Minister of National Defence
Chief of the Defence Staff
Vice Chief of the Defence Staff
Assistant Deputy Minister (Personnel)
Chief Research and Development

SECRETARY

Major P. D.Wardley, CD, BA, rmc, psc, plsc

OFFICERS OF ADMINISTRATION

CHANCELLOR AND PRESIDENT - The Minister of National Defence, The Honourable M. Masse, PC, MP

COMMANDANT AND VICE-CHANCELLOR - Colonel V. M. Caines, CD, rmc, pcsc, BComm (RMC), AdeC

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

ACADEMIC WING

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

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

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

REGISTRAR - Lieutenant-Colonel (ret'd) J. C. Parker, CD, rmc, pcsc, awc, BEng (RMC), MPA (Auburn)

ASSISTANT REGISTRAR - SCHEDULING AND SERVICES - Captain J.S.P.M. Paquin, BComm (Concordia)

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

MILITARY COLLEGE CAREER COUNSELLOR - Captain P. Madore, CD, rmc, BA (RMC)

MILITARY WING

DIRECTOR OF CADETS - Commander D.B. Bindernagel, CD, rmc, BA (RMC), MA (RMC)

STAFF OFFICER CADETS AND MILITARY TRAINING - Major W. A. March, CD, rmc, BA (RMC)

DEPUTY STAFF OFFICER CADETS AND MILITARY TRAINING - Captain P. Mailloux

SQUADRON COMMANDERS -
Lieutenant (N) G. Fedderly, rrmc, BSc (RRMC)
Captain B. A. Billings, BSc Hons (Queen's)
Captain D. T. Martin, rrmc, BA (RRMC)
Major W. A. March, CD, rmc, BA (RMC)

DIRECTOR OF ATHLETICS - Captain J.C.D. Jobin, BA (Sherbrooke)

ATHLETIC ADMINISTRATION OFFICER - Lieutenant (N) M.P. Nimeck, CD, BPE (Calgary)

ADMINISTRATION WING

DIRECTOR OF ADMINISTRATION - Major P. D. Bryan, CD

PERSONNEL ADMINISTRATIVE OFFICER - Captain P. McGuire, CD, rmc, BA (RMC)

COMPTROLLER AND LOGISTICS OFFICER - Lieutenant (N) J. Palle, CD

CHAPLAINS -

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

Chaplain (RC) - To be announced

EMERITI

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Group Captain (ret'd) M.D. Thom, CD, rmc, pfsc, pcsc, aws, BASc (Brit Col), Emeritus Registrar

ACADEMIC STAFF

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

Captain R. Backlund, CD, rmc, BEng (RMC), MEng (RMC), Lecturer in Mathematics

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 of Political Science and Head of the Department of History and Political Economy

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

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

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

J.S. Collins, BSc (Dalhousie), BEng, MEng (NSTechColl), PhD (Washington), PEng, Associate Professor and Head of the Department of Engineering (Sabbatical 1992-93)

Lieutenant-Commander D.S. Crooks, CD, BA (Queen's), BA (Hons)(York), MBA (York), MA (York), Assistant Professor in Military Leadership and Applied Psychology

C.J. Damaren, Assistant Professor, BSc (Toronto), MSc (Toronto), PhD (Toronto)

P.G. Donnelly, BA (Ottawa), BPEd (Montreal), Teach Cert (EN J. Cartier), Senior Teacher and Head of Second Language Training

P.J.S. Dunnett, BSc (Bradford), MA, PhD, (S.Fraser), Professor of Economics (Sabbatical 1992-93)

M. Erlic, BASc (Hons) (Queen's), MASc in ECE (UVic), Lecturer in Engineering

C. E. Fertile, BA (Alberta), MA (Alberta), PhD (Alberta), Assistant Professor of Literature and Philosophy

Lieutenant Commander G.H. Fleming, CD, rrmc, BSc (RRMC), MSc (USNPS), 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

D. Goulet, BPEd (Montreal), Manpower Mgmt Cert. (Montreal), Senior Language Teacher

S.L. Grundy, BSc (Sheffield), PhD. (Sheffield), Assistant Professor of Chemistry

A. Hadley, BA (Brit Col), DipEd (Victoria), MEd (Victoria), Language Teacher D. Hamel, BEd (Edmonton), Language Teacher

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

D.L. Kowalik, BSW (McMaster), MA (Western), PhD (Western), Lecturer in Military Leadership and Applied Psychology

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

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

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

G. Lanteigne, BA (Moncton), L. ès-L. (Aix-Marseille), MA (France), Language Teacher

D. Lavoie, BAC Language (Montreal), DEC (St-Jerome), Language Teacher

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

Lieutenant (N) C. Lyon, CD, BSc, BEd, MSc, Lecturer in Military Leadership and Applied Psychology.

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

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

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

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

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

G.A. May, BSc (Toronto), MA (Western), PhD (WBC), Assistant Professor of Physics and Computer Science

Lieutenant-Commander D. McLean, CD, rmc, BA (RMC), MA (RMC), Lecturer in History and Political Science

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

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

Major G.W. Nicks, CD, rmc, BEng (RMC), MEng (Brit Col), AssistantProfessor of Engineering and Mathematics

P.G. Nixon, BA (Carleton), BEd, MA, PhD (Western), Associate Professor of Political Science

Lieutenant-Colonel (ret'd) J. C. Parker, rmc, pcsc, awc, BEng (RMC), MPA (Auburn), Associate Professor and Registrar

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, Head of the Department of Literature and Philosophy

K.J. Reimer, BSc, MSc (Calgary), PhD (Western), Professor of Chemistry

S. Robert, BA (French Studies) (Montréal), Teach Cert. (Montréal) Language Teacher

M.G. Robinson, BSc, PhD (Durham), Professor of Chemistry

P.J. Schurer, BSc, MSc, PhD (Groningen), Professor of Physics (Sabbatical 1992-93)

D.J. Shpak, BSc, MEng (Calgary), PhD (Victoria), Assistant Professor of Engineering and Acting Head of Department of Engineering

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), Associate Professor of Physics

R.C. St. John, BA (Waterloo), MA, PhD (Western), Associate Professor and Head of Department of Military Leadership and Applied Psychology

H. Sugimoto, CD, rmc, pfsc, BEng (RMC), MEng (Hons) (Willamette), Lecturer in History and Economics

A. Tétreault, BA (Montreal), Language Teacher

D.R. Toyonaga, BA (Ottawa), Language Teacher

S.R. Waddell, BSc (Mount Allison) MSc, PhD (Dalhousie), Assistant Professor of Physics

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

W.W. Wolfe, BSc (Brandon), MSc, PhD (Queen's), Associate Professor of Mathematics

CORONEL MEMORIAL LIBRARY STAFF

CHIEF LIBRARIAN - S.E. Day, BA (Queen's), MLS (Toronto)

HEAD, USER SERVICES - J.C. Inkster, BA (Brit Col), BA (Hons) (Carleton), BLS, MLS (Toronto)

HEAD, TECHNICAL SERVICES - L.B. Jensen, BA, MLS (Brit Col),

AUTOMATED DATA PROCESSING ORGANIZATION

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

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

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

NETWORK MANAGER/ANALYST - W. Baskett

SYSTEMS PROGRAMMER/ANALYST - D.M. Pettyjohn

BULL HN INFORMATION SYSTEMS STAFF - Operators/Programmers
M. Lee, BSc (Victoria)
M. Chan, BSc (Victoria)
C. Lambe

SENATE OF THE ROYAL ROADS MILITARY COLLEGE

CHANCELLOR AND PRESIDENT

The Minister of National Defence,
The Honourable M. Masse, PC, MP

COMMANDANT AND VICE-CHANCELLOR

Colonel V. M. Caines, CD, pcsc, rmc, BComm (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

Lieutenant-Colonel (ret'd) J. C. Parker, CD, rmc,
pcsc, awc, BEng (RMC), MPA (Auburn)

ELECTED MEMBERS

F. Milinazzo, BSc, PhD (Brit Col) (to 1993)
R.F. Marsden, rmc, BSc (RMC), PhD (UBC) (to 1994)
R. C. St. John, BA (Waterloo), MA, PhD (Western) (to 1995)

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. It 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 Director of Cadets, and other members of the Senior Staff designated by the Chairman. Its functions are: to determine all matters of an educational character including programs of study, course offerings, and the conduct of examinations; to recommend to the Senate 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 Director of Cadets, the Director of Administration, the Officers of the Military Wing, and other members of the Senior Staff designated by the Chairman. The functions of the Faculty Board are to make recommendations to the Faculty Council on matters of an educational nature and to grant final grades in course for all courses, subject to confirmation by Faculty Council.

THE FACULTY COUNCIL

CHAIRMAN

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

MEMBERS

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

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

Commander D.B. Bindernagel, CD, rmc, BA (RMC), MA (RMC), Director of Cadets

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

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

J. G. Donnelly, BA (Ottawa), BPEd (Montreal), Teach Cert (EN J Cartier), Senior Teacher and Head of Department of Second Language Training

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

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

Major W. A. March, Staff Officer Cadets and Military Training, rmc, BA (RMC)

Lieutenant-Colonel (ret'd) J. C. Parker, CD, rmc, pcsc, awc, BEng (RMC), MPA (Auburn), Registrar, Secretary of the Faculty Council

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 and Head of the Department of Literature and Philosophy

R. C. St. John, BA (Waterloo), MA, PhD (Western), Associate Professor and Head of the Department of Military Leadership and Applied Psychology

D. J.Shpak, BSc, MEng (Calgary), PhD (Victoria), Assistant Professor of Engineering and Acting Head of Department of Engineering

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

COMMITTEES

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AUDIO VISUAL SERVICES

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COMMITTEE ON RESEARCH INVOLVING HUMAN SUBJECTS

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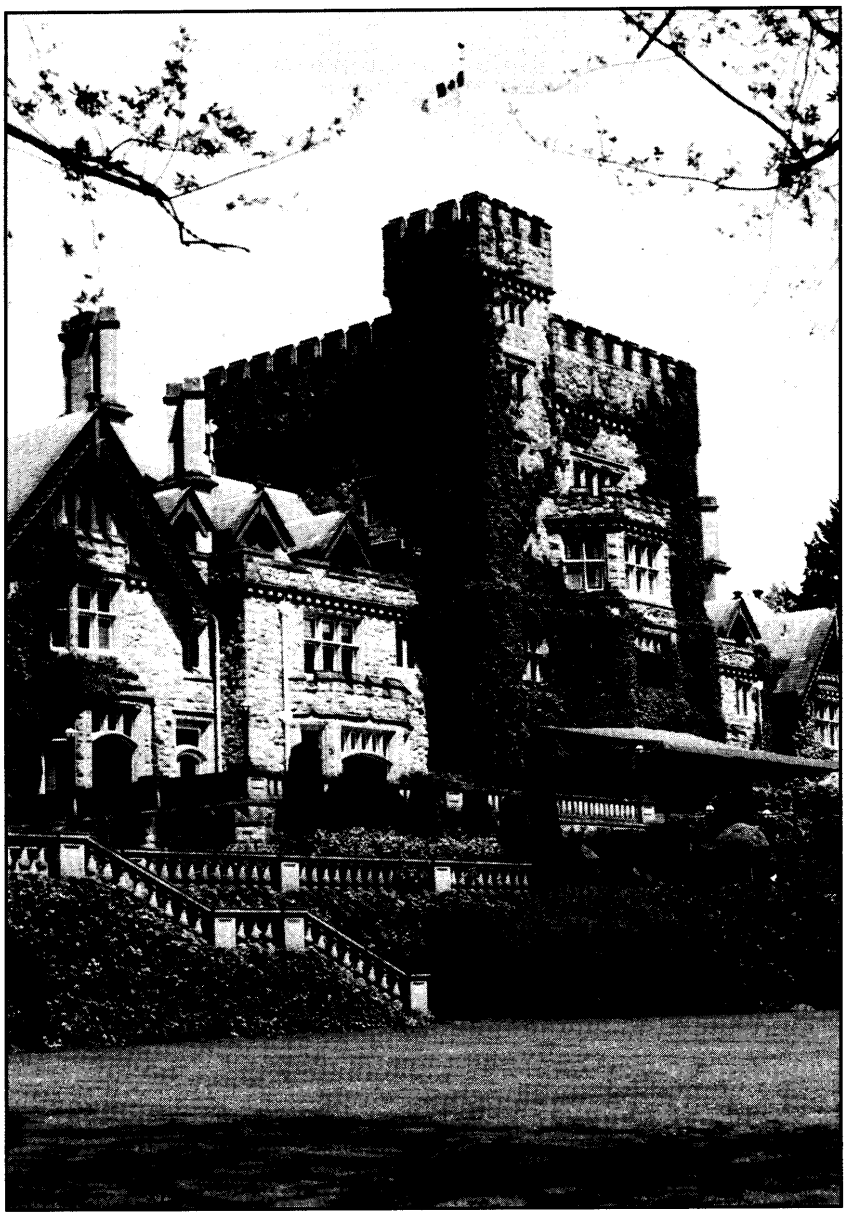


HATLEY CASTLE

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; and
   (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; and

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 known as the Canadian Services College Royal Roads. In 1968, the name of the College was changed to Royal Roads Military College.

The College continued as a two year feeder College for the Royal Military College and Collège militaire royal de Saint-Jean until 1975. On 25 June 1975 the Royal Roads Military College Degree Act was passed allowing the granting of degrees. The first class graduated from Royal Roads in May of 1977. The first class of post-graduate students graduated in the Fall of 1989.

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, Director of Cadets, Registrar and staff, Director of Administration, Comptroller and Logistics Officer, Personnel Administrative Officer, Staff Officer Cadets, and several professors.

Coronel Memorial Library

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

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

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

Grant Block

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

This building houses a large general chemistry laboratory, capable of accommodating 48 students, and smaller laboratories used for advanced chemistry and chemical or biological oceanography experiments. The computer systems, a Coastal Marine Science Laboratory, an Applied Fluid Dynamics Laboratory, a Dental Clinic, a Medical Inspection and Treatment Area, and the cadets' dining facilities are also located in this building.

Computer Facilities

The primary computer facilities that are available for the use of the students at the College are PC compatibles with 80386 processors and Apollo DN3500 workstations. There are two Micro-computer Labs in the Grant Block that contain 12 and 30 PCs respectively for the general use of the student body. As well, most third and fourth year students are issued with PCs for their own personal use. The PCs in the Micro-computer Labs are on a local area network (lan) that is served by two VAX3100 file servers with a combined disk capacity of 1 gigabyte. There are also laser printers and a coloured 8 pen plotter on the lan for the use of the students. Standard PC software such as word processors, database management systems, spreadsheets and language compilers are all available to the students along with a variety of other PC software packages.

Apollo DN3500 workstations are situated in a common room in the Grant Block and are available for the use of all students. There are 23 workstations available and they are interconnected over a local area network. They each have 19 inch coloured monitors and they have a combined disk capacity of 4 gigabytes. A variety of software packages is available on the workstations, including a Computer Aided Drafting (CAD) package and a desk top publishing package.

The computer facilities at Royal Roads also include a Hewlett Packard 835 and Vax based image analysis system, both of which are used primarily by fourth year science students and graduate students for research and other related projects. As well, there is a Honeywell DPS8/52C mainframe that is used mainly for academic administration and the automated library system.

Each student may be required to purchase and maintain a personal computer, associated peripherals, and software which satisfy the specifications established for the program in which the student is enrolled.

Physics Facilities

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

in projects in the research laboratories located in the Physics Building and Grant Block.

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

Oceanography Research Vessel

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

Nixon Block

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

This accommodation 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.

Millward Wing

Millward Wing is an extension of the main accommodation building. Opened in May 1991, it contains 103 bedrooms, several common rooms and offices.

This extension was named after Group Captain J. B. Millward, the first Air Force Commandant commanded the College from 1949 to 1952.

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 the completion of Grant Block.

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

Gymnasium

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

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, one ball diamond, a 400 metre track, and various cross country trails throughout the 650 acre campus. A proper orienteering map has been done of the entire grounds.

Ranges

In addition to the indoor rifle range in the Mess Decks, there is an outdoor pistol range and an archery range on the College grounds.

Boat Houses

The two boat houses and jetties are situated on campus on Esquimalt Lagoon, and are the centre of most of the rowing, sailing, kayak and canoeing activities. RRMC has 14 albacores, two FJs, two lasers, one 24 foot keel boat and access to a 36 foot keel boat. The rowing boathouse was constructed in 1989 to house the eight rowing shells used by the RRMC rowing team, and the specialized dock was completed the following year.

Other Facilities

RRMC rents the local rink for hockey, broomball and curling, PE classes and intramural sports. Both are approximately one km from the campus. Adjacent to the grounds is the Royal Colwood Golf Course which ranks among the ten best courses in Canada. Cadets have use of this facility for PE classes, representative golf team and recreational use.

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.

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

VARSITY TEAMS AND RECREATION CLUBS

Physical education and athletics are compulsory for all cadets. There are three levels of sports opportunities, namely varsity, intramural and recreational club teams. Cadets must participate in either of the first two levels and may, if they so choose, be involved in the latter level.

RRMC contests several sports against other colleges and universities at the varsity level. They are rugby and soccer, rowing and sailing, running and golf. All take advantage of the unique geographical and climatic features of the campus which allow cadets to participate year round outdoors. RRMC is a member of the British Columbia Colleges Athletic Association (BCCAA) which currently has thirteen institutions throughout the province (from Prince George to Kelowna and to the Fraser Valley/Vancouver and Nanaimo).

Attempts will be made to accommodate cadets who have achieved provincial, national or international class standards in individual sports, subject to their academic and military standings and commitments. Recently, a national calibre sprinter/international class bobsledder and provincial junior champion cyclist have been able to pursue their quest for athletic excellence. There is an academic standard which cadets must achieve and maintain in order to have the privilege of participating in a representative sport.

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 Director of Athletics through the Athletic Administrative Officer. College recreational clubs vary with student interest but have recently included:

Archery
Auto
Camera
Choir
Golf
Judo/Karate
Kayak
Windsurfing
Mountaineering
Pistol & Rifle Shooting
Powered Flight
Scuba
Skiing
Sky Diving
Stage Band

Recreational Sports clubs have included:

Badminton
Basketball
Curling
Fencing
Hockey
Squash
Triathlon
Volleyball (M & W)
Waterpolo
Wrestling

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 PIPES, DRUM AND STAGE BANDS

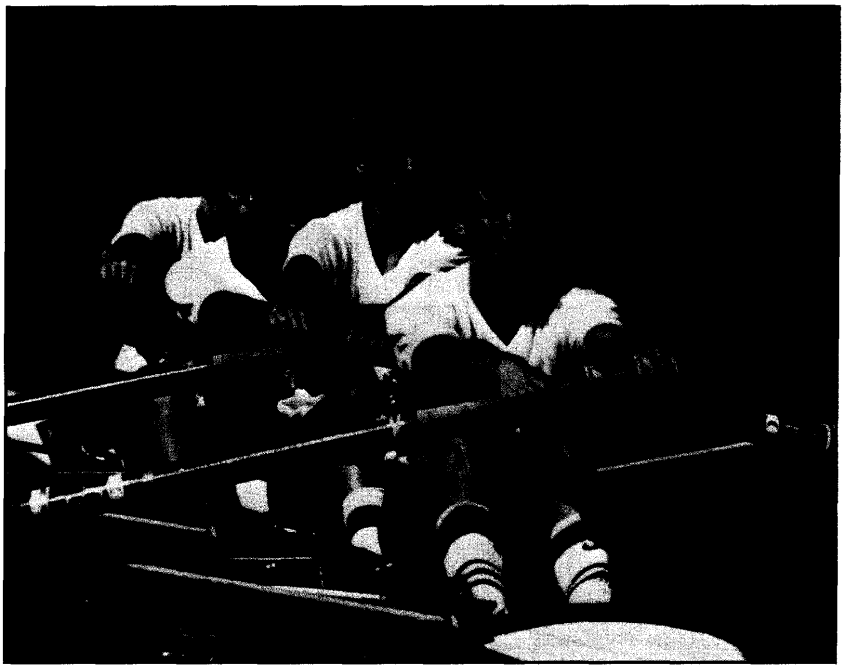
The Royal Roads bands serve two purposes. They serve as a recreational outlet for the musically inclined cadets and also lend themselves to performance of a military parade function. Under the direction of a professional musician from the Canadian Forces, the bands provide an excellent opportunity for 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. An off-shoot of the pipes and drums band is the stage band. Any cadet with musical training is strongly encouraged to join this group.

CANADIAN FORCES COUNSELLING

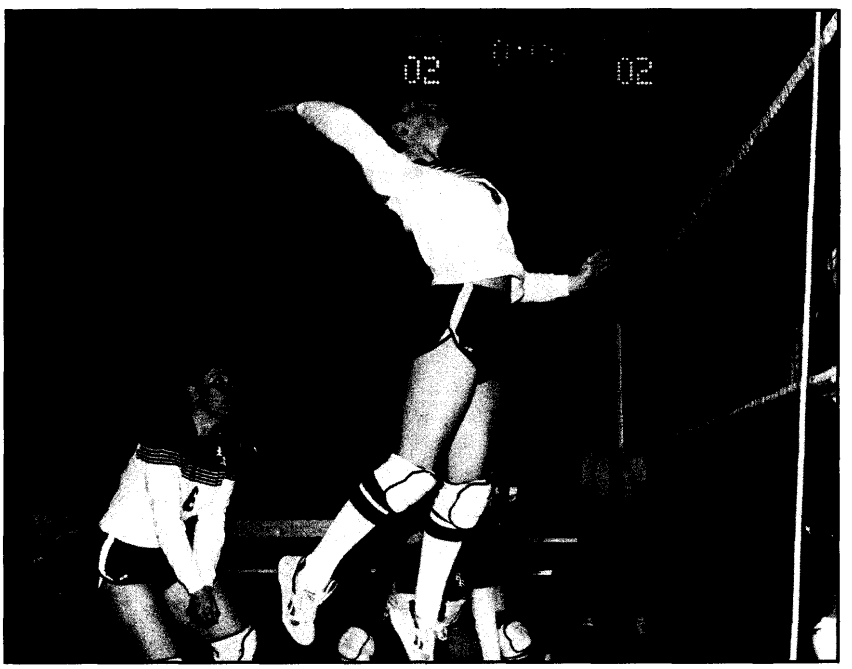
The staff of the College includes officers from the Canadian Forces who are responsible for career counselling and arranging for military training programs for all officer cadets. These officers are available to the cadets at all times to answer inquiries on military matters and to offer advice on military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

SUMMER TRAINING

A major part of an RRMC cadet's military development takes place during the non-academic portion of the year. 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.

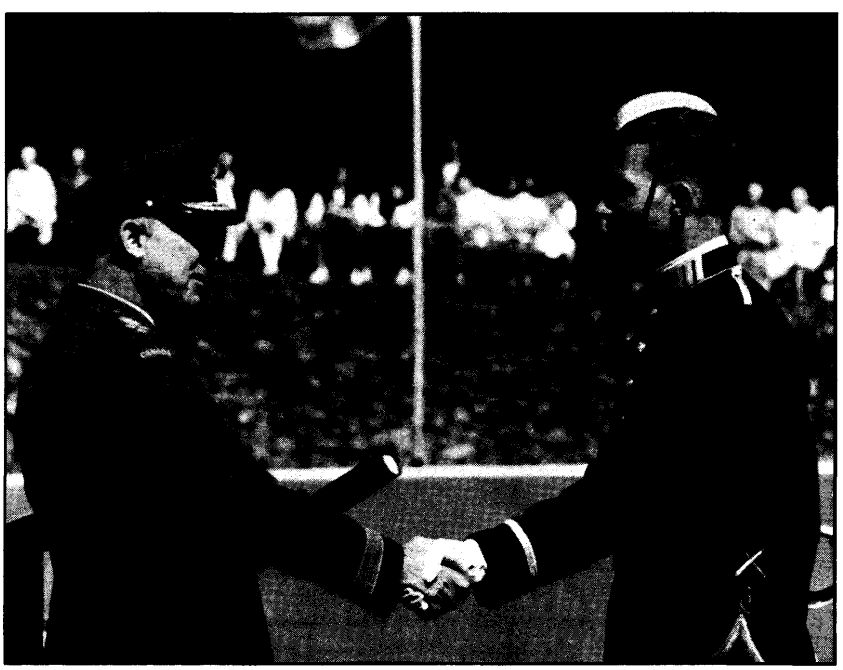


WOMEN'S ROWING



WOMEN'S VOLLEYBALL

UNIVERSITY DEGREE



QUEEN'S COMMISSION

ADMISSIONS TO ROYAL ROADS MILITARY COLLEGE

MEDICAL REQUIREMENTS

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

ADMISSIONS PLANS

THE REGULAR OFFICER TRAINING PLAN (ROTP)

The Regular Officer Training Plan, which was introduced in 1951, gives young Canadians the opportunity of gaining a university education and a permanent commission in the Canadian Forces. Applicants who have been accepted for entry at the Canadian Military Colleges under the ROTP enrol in the Regular component of the Canadian Forces. In limited programs of study not offered at the CMCs, 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 the ROTP 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, second language proficiency, 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 (currently five years) in the 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 unable to pay the costs prior to release, he or she 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 normally 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 military career in the Regular Component of the Canadian Forces at the time of entry. Since 1961, provision has been made to have up to 15 percent of the annual ROTP intake at the Canadian Military Colleges accepted as Reserve Entry cadets. Reserve Entry officer cadets receive the same education and training as ROTP officer cadets, but they are required to pay fees to defray the cost of tuition, clothing, books, instruments, laundry, dry cleaning, meals and accommodation during the academic year, according to the scale of fees set out in the section on Fees and Allowances. Reserve Entry cadets may transfer to the ROTP at any time during their College course, in which event they would pay no further fees and would receive the same financial benefits as ROTP cadets. Reserve Entry cadets are committed to serve in a component of the Active Reserve Force upon graduation and commissioning. RETP cadets are required to take summer training with their assigned occupation for which they receive pay and allowances at the same rate as a Second Lieutenant on Class "B" Service (refer to any Canadian Forces Recruiting Centre for the current rate).

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

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

THE UNIVERSITY TRAINING PLAN - NON-COMMISSIONED MEMBERS (UTPNCM)

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

THE UNIVERSITY TRAINING PLAN OFFICERS (UTPO)

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

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

SPECIAL STUDENTS

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

FIRST YEAR ADMISSION REQUIREMENTS

GENERAL REQUIREMENTS

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

a. be Canadian citizens;

b. meet the minimum medical standards required for enrolment;

c. obtain a passing standard in pre-enrolment tests;

d. be single;

e. have reached their sixteenth, but preferably not exceeded their twenty-first birthday by 1 January of the year of admission;

f. normally, obtain a passing standard in the Basic Officer Training Course which is completed prior to the commencement of the academic year; and

g. possess the necessary academic qualifications as set forth below.

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

a . Canadian citizens;

b. serving members of the Canadian Forces;

c. selected by the appropriate DND selection board; and

d. accepted by the RRMC Admissions Committee.

ACADEMIC QUALIFICATIONS

Two **entry programs** are offered to successful applicants in the First Year at the Royal Roads Military College:

a. the **ARTS program** - a degree in ARTS may be obtained through admission to the Arts program; and

b. the **SCIENCE/ENGINEERING program** - a degree in ARTS, SCIENCE or in ENGINEERING may be obtained through the admission to the Science/Engineering program.

NOTE:

Degree programs in Arts, Administration and Science offered at Collège militaire royal de Saint-Jean and in Arts, Science and Engineering at Royal Military College of Canada may be accessed through one of the above options. Refer to "Academic Programs at the Canadian Military Colleges" for details.

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 CMR 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 be completing or have completed high school (Grade 12) at a pre-university level satisfactory to the College, with credits acceptable and sufficient for regular admission to a University in the province in which the student is completing his secondary education.

Quebec students enrolled in a Quebec College of General and Vocational Education (CEGEP) must be completing or have completed the first year of a two-year pre-university program, and will normally be expected to offer fourteen credit courses.

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.

REQUIRED ACADEMIC SUBJECTS

	ARTS	**(SCIENCE/ENGINEERING)**
Nfld	English 3101 and either 3201 or 3202 Maths 3201	English - level 3 course Maths 3201 Chem 3202 Physics 3204
NS	English 441 or 541 Maths 441 or 541 Chem 441 or 541	English 441 or 541 Maths 441 or 541 Physics 441 or 541
PEI	English 621 Maths 621 Chem 621 or 611	English 621 Maths 621 Physics 621
NB	English 121 or 122 Maths 121 or 122 Maths 120 recommended Chem 121 or 122	English 121 or 122 Maths 121 or 122 Maths 120 recommended Physics 121 or 122
Quebec	English, two core (CEGEP 1) courses Maths 101, 103 or 105	English, two core courses Maths: two of 101, 103, 105, 203 Physics 101 Chem 101
Quebec (Grade 12)	One course in each of English and Math	One course in English, two courses in Maths and one course in each of Chem and Physics
Ontario	English OAC 1 OAC Algebra/Geometry or OAC Calculus .21(Calculus is pre- ferred. Finite Maths may be considered if good standing has also been obtained in Grade 12 Maths)	English OAC 1 OAC Algebra/Geometry OAC Calculus OAC Chem OAC Physics
Manitoba	English 300 Maths 300 Physics 300 Maths 305 (Calculus) (desirable)	English 300 Maths 300 Chem 300
Saskatchewan	English A 30 English B 30 Algebra 30 Geo/Trig 30 Physics 30	English A English B 30 Algebra 30 Geo/Trig 30 Chem 30
Alberta/NWT	English 30 Maths 30 Maths 31 (desirable)	English 30 Maths 30 Maths 31 Physics 30 Chem 30

BC/Yukon	English 12	English 12
	Algebra 12 or Maths 12	Algebra 12 or Maths 12
	Physics 12	Chem 12

NOTES:

1. Applicants intending to pursue their studies in French should offer secondary school courses in French equivalent to and in lieu of the courses in English required above.
2. Applicants who have been unable to satisfy all the prerequisite course requirements but have high academic standing may be considered for admission.
3. Electives studied to complete a secondary school program should be chosen carefully to strengthen academic preparation.
4. In addition to specific course requirements, applicants for an arts program must present at least two other senior level academic courses.
5. *Applicants completing a secondary school program outside of Canada must offer as a minimum a secondary school mathematics course that is a prerequisite for studying calculus.*

TRANSFER CREDIT AND ADVANCED STANDING POLICIES

Transfer credits for university level courses equivalent to those of RRMC may be accepted from all students. A student must have achieved a minimum of 60 percent standing in each course, have that course accepted for transfer credit by the Department Head concerned, and must register in a normal course load for the semester. A minimum weighted average or GPA may eliminate transfer credit considerations for weaker students.

One year of advanced standing based on course to course equivalency may be granted to ROTP, RETP and UTPNCM applicants. A minimum standing of 60 percent on all university courses attempted is normally required, and minimum weighted averages of GPAs enter consideration for this privilege.

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

In all cases no credit will normally be transferred for courses in which the mark obtained is less than 60 percent (C), or for courses which constitute part of a failed year. At the discretion of the Admissions Committee, full or part credit may be granted for recognized courses offered under the auspices of DND (such 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.

Science applicants should, as far as possible, have completed mathematics, 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) and Statistics.

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

ADMISSION PROCEDURES

APPLICATION

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

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

Serving members interested in the UPTNCM or the UTPO should refer to CFAO 9-13 or 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 contacted by the College regarding their course selection.

SELECTION OF CANDIDATES

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

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

Special students will be selected by the 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, and the head of the department concerned.

JOINING INSTRUCTIONS

Most successful ROTP/RETP candidates 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.

ADMISSIONS RESTRICTION

The College reserves the right to reject applicants for admission on the basis of their overall academic record, even if they technically meet entrance requirements. Normally a student who has been required to withdraw for academic reasons from another university or college will not be considered for admission until a full academic year has elapsed.

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.

TRANSCRIPTS

Requests for transcripts should be made in writing to the Registrar. Telephone requests will not normally be accepted.

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 and Queen's Orders and Regulations (QR&Os) concerning pay matters.

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&Os). The current annual rates, which are subject to change, are the same as those listed for Reserve Entry Training Plan cadets.

Reserve Entry Training Plan

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

a. annual College fee of $1,524 to defray the costs of tuition, clothing, books, instruments, drawing materials, dry cleaning, laundry, and incidental expenses;

b. a fee of approximately $2,100 each year to defray the costs of meals and accommodation;

c. an annual Recreation Club fee of $90;

d. a book deposit of $100 (refunded at end of academic year); and

e. a messing assessment of $200.

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 $2,000 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 adjustment upward in August of every year.

University Training Plans UTPNCM and UTPO

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

Special Students

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

Mess Subscriptions

All officer cadets are required to pay an annual mess subscription, (approximately $200) 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 home on annual leave, once in each year, for the portion of the journey to home and return actually made in Canada or between Canadian points, is entitled to transportation allowances at public expense, in accordance with QR&Os.

SCHOLARSHIPS & LOANS

Canada Scholarships

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

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

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

Foundation Scholarships - Royal Military College Club of Canada

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

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

Application forms and further information may be obtained from:

The Secretary-Treasurer
RMC Club of Canada
Royal Military College of Canada
Kingston, Ontario
K7K 5L0

or from the representative of the Branch of the RMC Club of Canada in your area. Applications must be submitted by June 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 15th in the year of application. The presentation of the bursary to the winner will normally be made at the Fall Convocation ceremonies.

Terry Fox Humanitarian Award Program

When Terry Fox took his Marathon of Hope halfway across Canada in the summer of 1980, his courageous run, combining both outstanding athletic achievement and high humanitarian ideals, stirred the pride and compassion of Canadians everywhere. Although he was unable to complete his cross-country 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 $4000 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 $2500.

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. A 3% guarantee fee is applicable and payable to the Receiver General of Canada on all Canada Students Loans issued after August 1991.

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. There is a maximum amount which may be advanced under this plan to one student in one year.

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

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

Canadian Forces Personnel Assistance Fund
Educational Assistance Loan

The Board of Directors of the Canadian Forces Personnel Assistance Fund (CFPAF) approved the creation of an Educational Assistance Loan Program which commenced in 1987. This program provides low interest loans to defer the cost of education for dependent children attending accredited post secondary institutions. Loans of up to $2000.00 per dependent, at a low interest rate, are available to qualified applicants each year. Repayment is over a 12-month period, commencing September annually.

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

Application forms will be available from Base Financial Counsellors, offices of Veterans Affairs Canada, Royal Canadian Legion Branches, and university/college loan offices. Deadline for applications is 30 June. No late submissions or appeals will be considered. For further information, refer to CFAO 56-34.

MEDALS, AWARDS, PRIZES AND CERTIFICATES

Presentation Ceremonies

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

a. Spring Convocation, conducted in May, to confer degrees and present academic medals, awards, prizes and honours certificates to those officer cadets graduating or transferring to RMC or CMR.

b. Graduation Ceremonial Parade, conducted in May, to present military awards and commissions to deserving officer cadets of all years.

c. Fall Convocation conducted in October, to confer post graduate degrees and present academic awards, prizes or honours certificates to the First and Third Year officer cadets from the previous year.

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

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

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 or her Fourth Year.

The Lieutenant-Governor of British Columbia's Silver Medal, awarded to the officer cadet who obtains the highest academic standing in his or her 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 of any program of study containing physics as one of the combined majors or concentrations.

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. It is presented for the officer cadets of the Third and the Fourth Year class who achieve the highest standing in computer science courses in their respective years and whose programs of study include computer science as either a concentration or major.

The Armed Forces Communications and Electronics Association Education Fund of Canada Award, presented for the student entering a third year computer science degree program with the highest academic standing in the second year science or engineering program.

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 in memory of Professor Emeritus A.D. Wallis for the officer cadet of the fourth year who achieves the highest standing in the Military and Strategic Studies Honours program.

The W.M. Ogle Award, presented by Emeritus Dean of Science A.G. Bricknell for the naval officer cadet who achieves the highest standing in the Fourth Year of the Applied Military Psychology program.

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

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

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

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.

Canadian Aeronautical and Space Institute Medal, awarded to the fourth year student in an Earth Observational Science combined major program, who achieves the highest standing in the Earth Observational Science courses of fourth year.

Military Awards

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

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

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

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

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

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

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

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

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

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

The Naval Officers Association of Canada (Vancouver Island Branch) Award, presented to 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.

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 Award of Merit, presented by the Department of National Defence for a cadet of the graduating class of the fourth year who achieves the second highest standing in military and academic proficiency.

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

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

Additional prizes may also be awarded.

Departmental Prizes

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

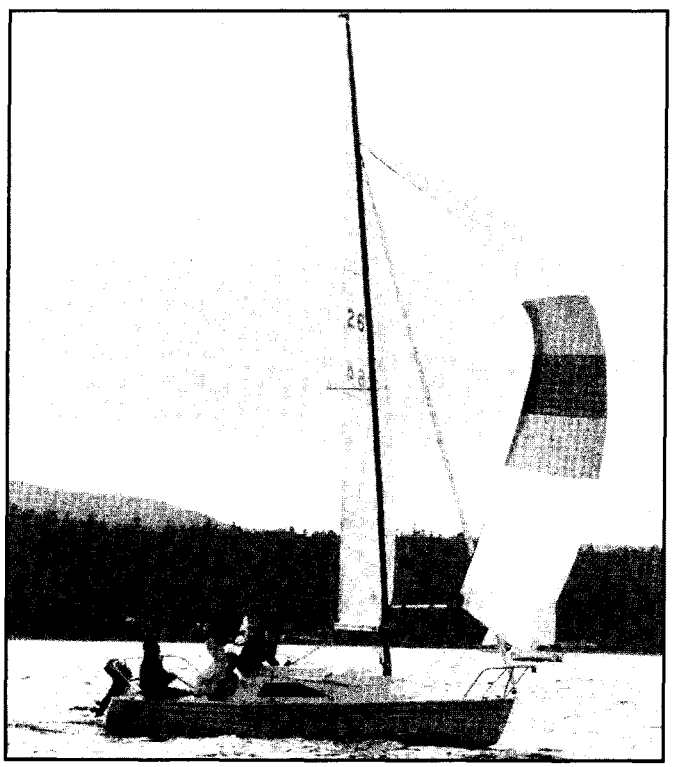
In addition, special book prizes may be awarded for work of unusual merit, when such prizes are recommended by an academic department and approved by Faculty Council.

Certificates

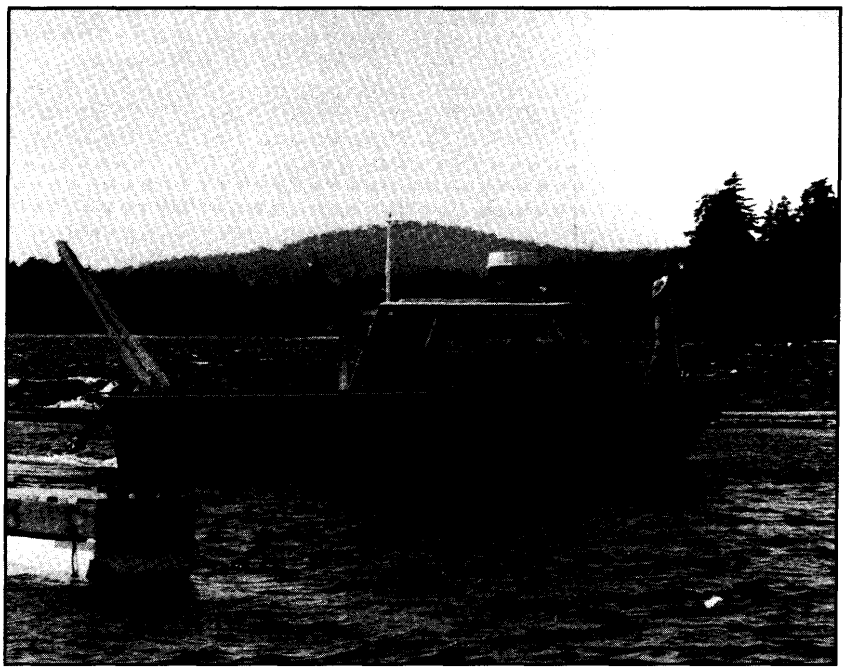
First Class Honours certificates are awarded to officer cadets of the First, Second, or Third Year who obtain an overall A average in their final examinations, with no failures. In addition, second class and pass certificates are awarded to Second

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

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



RRMC'S RACING BOAT



OCEANOGRAPHY RESEARCH VESSEL

COMPUTER SCIENCE LAB

CANADIAN MILITARY COLLEGE BACCALAUREATE DEGREE PROGRAMS

The three 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, Computer Science and Earth Observational Science programs.

b. Bachelor of Science (Honours or Major) in Applied Military Psychology.

c. Bachelor of Arts (Honours or General) with interdisciplinary concentrations in History, Literature and Philosophy, Political Science, and Economics.

d. 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'S DEGREE

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

Master of Science (Course or Thesis patterns) in Oceanography and Acoustics.

The duration of the program of study is normally two years.

DIPLOMA IN OCEANOGRAPHY

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 offers the following degrees to those considered worthy of the honour:

a. Doctor of Laws (L.L.D.), *honoris causa*;

b. Doctor of Science (D.Sc.), *honoris causa*; and

c. Doctor of Military Science (D.Mil.Sc.), *honoris causa.*

GENERAL REQUIREMENTS - BACCALAUREATE PROGRAMS

The academic subjects in the curriculum are selected for their value to potential officers of the Canadian Forces. Science and Engineering programs have a portion of time devoted to the Humanities and Social Sciences, and on the other hand, the Arts programs have a portion 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 Psychology and Applied Psychology courses for credit are required in all programs in all four years. These courses are:

MP111 - Psychology of the Individual - Part 1
MP212 - Social Psychology
MP311 - Organizational Leadership and Management
MP402 - 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 1.5 units of credit in the 13 week semester. Other courses may be assigned more or fewer credits based on the following guidelines:

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
0.5 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 students 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.

STUDENT COUNSELLING

Counselling is offered on a confidential basis to students throughout the year through the Student Personal Counselling Services. Students wishing to see a counsellor may arrange an appointment through the Office of the Registrar or Assistant Registrar for Scheduling and Student Services.

The purpose of Student Personal Counselling Services is to help students gain the maximum benefit in education, development and satisfaction from their university experience. This may involve exploring educational and career goals, developing better learning and studying skills, solving personal and interpersonal problems or developing greater self-confidence and a more balanced life style.

Individual counselling in a confidential atmosphere provides a student the opportunity to explore any topic or situation and discuss any concerns the student may have. Students are helped to solve their problems and to develop self-awareness.

ARTS DIVISION

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

Graduation Academic Requirements

Academic Requirements for graduation in the Arts Division include:

a. successful completion of the First and Second Years of the Arts or Science/Engineering programs at any CMC including Mathematics 203 or Mathematics 241 or an equivalent course in probability and statistics;

b. in the Third and Fourth Years in a General or Major program, 30 units must be completed of which 18 units must be in Arts courses at the 300 and 400 level;

c. in the Third and Fourth Years in an Honours program, an additional 6 units of Arts courses at the 300 and 400 level must be completed, including either a research project or a thesis; and

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

General Requirements

Students normally must complete a minimum of 7.5 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.

Students must select courses in consultation with Academic Advisors at the beginning of the Second Year and each subsequent year. Any exceptions to the listed courses in the Program descriptions may be made only with the prior written approval of the Head of Department and the Dean of Arts, which must be on file in the Office of the Registrar.

General Program

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

Major Program

Of the 18 units required in Arts courses, 15 units in one field at the 200, 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. 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 Departmental Sections of the Calendar for details of specific program requirements.

Graduation Academic Requirements

Academic requirements for graduation in the Science Division include:

a. successful completion of the First and Second Years of the Science/Engineering programs at any CMC including Mathematics 241 or its equivalent plus, for the combined major programs, a weighted average of at least 55 percent in mathematics, science and engineering courses. In addition, for completion of all Combined Major Science Programs, Mathematics 252 or its equivalent is required, and for programs with Oceanography, Engineering 232 or its equivalent is recommended;

b. in the Third and Fourth Years, in a General or Major program a minimum of 30 units must be completed of which a minimum of 22 units must be in science courses at the 300 and 400 level;

c. in the Third and Fourth Years, in a Combined Major program a minimum of 36 units must be completed of which 30 units must be in science courses at the 300 and 400 level;

d. in the Third and Fourth Years, in an Honours program, an additional 4 units of science courses at the 300 and 400 level must be completed, including either a research project or a thesis; and

e. in all programs, a minimum of 3 units must be completed in Military Psychology courses and a minimum of 3 units must be completed in other Arts courses at the 300 and 400 level.

General Requirements

Students normally must complete a minimum of 7.5 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.

Students must select courses in consultation with the Academic Advisors at the beginning of Second Year and each subsequent year. Any exceptions to the listed courses in the Program descriptions may be made only with the prior written approval of the Head of Department and the Dean of Science and Engineering, which must be on file in the Office of the Registrar.

General Program

Of the 22 units required in science courses, 9 units in each of two fields of concentration are normally required along with 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. Applied Military Psychology is the only Major program currently available at RRMC.

Combined Major Programs

Of the 30 units required in science courses, 12 units in each of the major fields are normally required. The additional 6 units required are normally in other than these two fields. With the written approval of the Dean of Science and Engineering, on file in the Office of the Registrar, a student may be permitted to present 1.5 units of these 6 units of credit from one of the major 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.

BSc Honours - Applied Military Psychology

Candidates for the honours degree must complete all the courses for the major program with the exception of Applied Psychology 471. They must also complete the advanced statistics course AP 481 and the psychology honours thesis course AP 483.

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 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. **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 through RMC, CMR or RRMC.

c. 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 course of study, and an overall average of 60 percent will also normally be required. The department concerned may refuse a student permission to enter Honours.

ENTRANCE REQUIREMENTS FOR RMC DEGREES IN SCIENCE (BSC)

A Second Year course of study in Engineering and Science is a prerequisite for admission to any of the following BSc degree programs which are to be offered. Students from engineering and/or science in Second Year at CMR or RRMC will be given admission consideration.

a. **Science (Applied)**
This program is designed for the future officer with interests in the military and civilian applications of science. A pass standing in Second Year is required for admission.

b. **General Science**
The program offers a general exposure to Science, and requires pass standing in Second Year for admission.

c. **Major and Minor Concentrations**

Major in Applied Mathematics
Major in Applied Mathematics (Physical Sciences)
Major in Applied Mathematics, Minor in Physics
Major in Applied Mathematics, Minor in Chemistry
Major in Physics
Major in Physics, Minor in Mathematics
Major in Physics, Minor in Chemistry
Major in Chemistry
Major in Chemistry, Minor in Physics
Major in Chemistry, Minor in Mathematics

Admission to a program with a Major Concentration, or a Major and a Minor Concentration, normally requires a 55 percent average in Second Year Engineering or Science.

d. **Honours Courses of Study**
In order to qualify for a BSc (Hons) a student must apply for admission to an Honours Program by the end of the Third Year and must sustain an average of 66 percent or better in particular courses prescribed by the Division of Science. An Honours degree will not be granted to any student who has not completed all the requirements of the Second Year Engineering and Science program.

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 the following minimum considerations:

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

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

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

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

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

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

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

LE COLLÈGE MILITAIRE ROYAL DE SAINT-JEAN ACADEMIC PROGRAM

Le Collège militaire royal de Saint-Jean offers degree programs in Administration, in Computing Science, in Physical Sciences, 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)**

Chemistry Option

The Chemistry option enables the student to understand the structure of matter and chemical transformations. Courses emphasize the molecular view of matter and the modern tools of chemistry.

General Option

The General program allows the student to acquire a modern scientific training without necessarily becoming a specialist. Each student may pursue his/her personal interests in science and those of his/her military classification by an appropriate choice of courses in science, humanities, and administration.
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.

4) **Bachelor of Science - Space Science**
The Space Science program enables the student to discover and comprehend the scientific, technical and human aspects related to the exploration and development of outer space. The program, based on a rigorous scientific method, provides a thorough grounding in natural sciences and mathematics. During the final two years of study, the student applies this basic knowledge in specialized courses on the development of space operations.

This course is offered in both French and English.

Candidates must have successfully completed the equivalent of Second Year in either Science or Engineering at one of the CMC's. In addition, candidates must have obtained a minimum combined average of 55 percent in Mathematics and Physics.

d. **Bachelor of Arts in Military and Strategic Studies - CMR**

The primary objective of this program is to prepare future officers to analyze 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 in-depth 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.

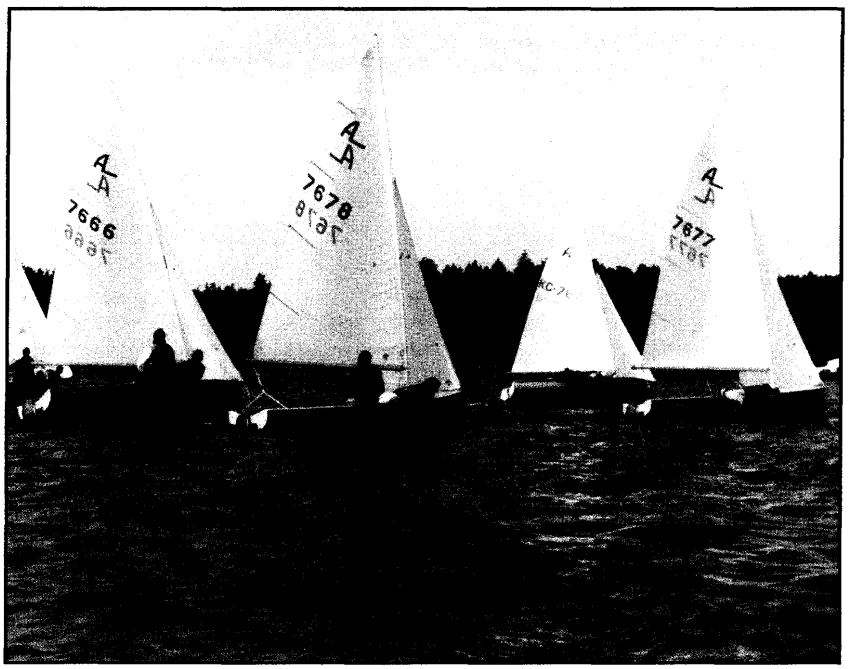
e. **Bachelor of Arts in Social Sciences - CMR**

This multidisciplinary program is offered in conjunction with five other departments to give the student a basic and comprehensive formation in Social Sciences. The program, based on the study of history, economics, political science, sociology, psychology and literature, has three distinct options:

B.A. (Major)	**(Minor)**
Social Sciences	**Pshychology**
(60 credits)	**(30 credits)**
B.A. (Major)	**(Minor)**
Social Sciences	**Administration**
(60 credits)	**(30 credits)**
B.A.	
Social Sciences	

Each option allows the student to concentrate or balance his/her program over one or more disciplines.

Entry into Social Sciences program is open to candidates from the three CMC's who have successfully completed either their First Year or their Second Year in Arts and Humanities. Candidates from other programs may be accepted subject to a review of their academic record.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COURSE DESCRIPTIONS

The different courses offered at RRMC are described in detail in the sections that follow (listed alphabetically by divisions). 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 223). A few courses have 4 as the third number, indicating it may be offered either semester. The course number is followed by a brief descriptive title of the course; this in turn is followed by numbers in parentheses that indicate respectively the number of credits [ ], and number of lectures, tutorials, and laboratory periods ( ) each week in whichever semester it is offered (6 numbers if course covers both semesters). A detailed course description would read as follows:

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

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

PHYSICS 411: Solid State Physics [1.5] **(3,0,0)**

This is a one semester course offered by the Department of Physics in the fall semester of the fourth year. The course meets three times each week for lectures, has no tutorial or laboratory periods, and carries 1.5 units of credit.

MATHEMATICS 223: Calculus, Vector Calculus and Differential Equations [3] **(3,1,0/3,1,0)**

This is a full year course offered by the Department of Mathematics in Second Year. The course extends over both the first and second semesters of the year, meets three times each week for lectures, once for tutorial, 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 the transcript will indicate a course numbering ending in a 1 or 2, instead of the usual 3.
2. A course ending in a 4 usually indicates an arts elective which may be offered in either semester depending on the instructional resources. It may also be used to designate "reading" courses offered by the various departments to indicate a specially designed curricula tocater to an individual student's needs.

ARTS DIVISION

The Arts Division offers a degree of Bachelor of Arts in General, Major, Joint Concentration or Honours patterns in the fields of History, Political Science, Economics, Applied Military Psychology, and Military and Strategic Studies, to a student who has successfully completed the requirements by the final year at Royal Roads Military College.

DEPARTMENT OF APPLIED PSYCHOLOGY

Department of Applied Psychology Professors

Associate Professor and Head of Department - R. C. St. John, BA, MA, PhD

Associate Professor - Squadron Leader (ret'd) A. T. Malcolm, CD, pcsc, asc, BA, MA, PhD

Assistant-Professor - Lieutenant-Commander D. S. Crooks, CD, BA, BA (Hons), MBA, MA

Lecturer - Lieutenant (N) C. Lyon, BSc, BEd, MSc

Lecturer - Captain A. T. MacIntyre, CD, BA, MA

Lecturer - D. L. Kowalik, BSW, MA, PhD

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 general degree requirements and academic regulations and designed 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.

BA HONOURS, APPLIED MILITARY PSYCHOLOGY

Candidates for the honours degree must complete all of the courses for the major program as well as one additional elective in both semesters of the third year. One of these additional electives must be a psychology elective course. Candidates must also complete AP 481, advanced statistics, AP 483, the psychology honours thesis course, and complete one additional psychology elective in the fourth year.

DEPARTMENT OF LITERATURE AND PHILOSOPHY

Department of Literature and Philosophy Professors

Associate Professor and Head of Department, C. N. Ramkeesoon, BA, MA, PhD

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

Assistant Professor - C. E. Fertile, BA, MA, PhD

PROGRAM OF STUDY

This Department, in conjunction with the Department of History and Political Economy, offers a Joint Concentration in History and Literature leading to either a General or an Honours BA in Military and Strategic Studies.

As a guide to students interested in the MSS degree with a Joint Concentration in History and Literature, the Department of Literature and Philosophy indicates its offerings in the first and second semesters for AY 1992-1993. While these are considered core courses for the above students, all may serve as electives for interested students. However, student choices need to be cleared with the Department Head and the Registrar.

Fall Semester	**Winter Semester**
LI 231: British & European Literature	LI 242: Canadian & American Literature
LI 341: Literature of War	LI 312: Tales of Mystery and Imagination
Pl 421: Philosophical Perspectives II	LI 432: Commonwealth Lit.
LI 431: French Canadian Literature	PL 312: Philosophical
LI 421: Literary Theory and Criticism Perspectives I	

DEPARTMENT OF HISTORY AND POLITICAL ECONOMY

Department of History and Political Economy Professors

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 (sabbatical 1992-93)

Professor - A. G. Martel, BA, MA, PhD, FR Hist S

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

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

Lecturer - Lieutenant-Commander D. McLean, CD, BA, MA

Lecturer - H. Sugimoto, BEng, MEng.

ENTRY AND QUALIFICATIONS

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

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

The selection of courses to make up a program of study in the Department must be guided by the outlines listed below, the general degree requirements and academic regulations, and designed 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. Copies of this approval 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 profession.

BA HONOURS, MILITARY AND STRATEGIC STUDIES

(All areas of joint concentration)

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

FIRST YEAR ARTS

The First Year Arts Program is common to all programs of study.

RRMC Arts Programs

First Year: Foundations

Fall Semester	Credits	Winter Semester	Credits
Political Science 101	(1.5)	History 102	(1.5)
Literature 123	(1.5)	Literature 123	(1.5)
Military Psychology 113	(1.5)	Military Psychology 113	(1.5)
Mathematics 123	(1.5)	Mathematics 123	(1.5)
Chemistry 123	(1.5)	Chemistry 123	(1.5)
	7.5	Computer Science 112	(0.5)
			8.0

SECOND YEAR: Concentrations

The program of study followed by cadets in the second year will depend upon the area in which they choose to specialize. However, second year Arts students may be able, through the use of elective choices, to keep their options open and alter their specialization in third year. Four different programs will be available, three of them as options within the Military and Strategic Studies Program.

Military and Strategic Studies
Joint Concentration in Politics and Economics

SECOND YEAR

Fall Semester	Credits
Economics 213: Principles of Economics	(1.5)
Political Science 213: Introduction to International Politics	(1.5)
Political Science 223: Comparative Government	(1.5)
Physics 123: Introductory Physics	(1.5)
Mathematics 211: Probability and Statistics	(1.5) 7.5

Winter Semester	Credits
Economics 213: Principles of Economics	(1.5)
Political Science 213: Introduction to International Politics	(1.5)
Political Science 223: Comparative Government	(1.5)
Physics 123: Introductory Physics	(1.5)
Military Psychology 212: Social Psychology	(1.5)
Elective [Arts or Science, other than Economics or Political Science	(1.5) 9.0

THIRD YEAR

Fall Semester	Credits
Economics 341: Intermediate Microeconomic Theory	(1.5)
Economics Elective: [one of 311, 331, 361, 431]	(1.5)
Political Science 322: Issues in Canadian Politics **OR** Political Science 401: Canadian Public Administration	(1.5)
Political Science Elective: [one of 321, 441]	(1.5)
Military Psychology 311: Organizational Leadership and Management	(1.5) 7.5

Winter Semester	Credits
Economics 352: Intermediate Macroeconomic Theory	(1.5)
Economics Elective: [one of 332, 322, 432, 442]	(1.5)
Political Science 361: Modern Political Thought **OR** Political Science 402: American Government & Politics	(1.5)
Political Science Elective: [one of 302, 342, 412, 432]	(1.5)
Elective [Arts or Science, other than Economics or Political Science]	(1.5) 7.5

FOURTH YEAR

Fall Semester	Credits
Economics 421: The Economics of Defence	(1.5)
Economics Elective: [one of 311, 331, 361, 431]	(1.5)
Political Science 402: American Government and Politics **OR**	
Political Science 361: Modern Political Thought	(1.5)
Political Science Elective: [one of 321, 441]	(1.5)
Elective [Arts or Science, other than Economics or Political Science]	(1.5) 7.5

Winter Semester	Credits
Economics 412: Industrial Organization	(1.5)
Economics Elective: [one of 332, 322, 432, 442]	(1.5)
Political Science 322: Issues in Canadian Politics OR	
Political 401: Canadian Public Administration	(1.5)
Political Science Elective: [one of 302, 342, 412, 432]	(1.5)
Military Psychology 402: Professional and Ethical Issues	(1.5) 7.5

Available Electives: Economics

Economics 311: The Canadian Economy	(1.5)
Economics 322: Mathematical Economics	(1.5)
Economics 331: Quantitative Methods	(1.5)
Economics 332: Canadian Economic History	(1.5)
Economics 361: Applied Business Finance	(1.5)
Economics 431: Money and Banking	(1.5)
Economics 432: International Trade and Finance	(1.5)
Economics 442: Natural Resource Economics	(1.5)

Available Electives: Political Science	Credits
Political Science 302: Conflict Resolution	(1.5)
Political Science 321: Irregular Warfare	(1.5)
Political Science 342: Asia-Pacific Defence & Security	(1.5)
Political Science 412: Political Economy of Canadian Arctic	(1.5)
Political Science 432: Arms Control	(1.5)
Political Science 441: Canadian Foreign Policy	(1.5)

Military and Strategic Studies
Joint Concentration in History and Literature

SECOND YEAR

Fall Semester	Credits
History 211: Europe & the Wider World, 1763-1870	(1.5)
History 231: The Evolution of Modern Strategy	(1.5)
Literature 231: British & European Literature	(1.5)
Physics 123: Introductory Physics	(1.5)
Elective: [Arts or Science, other than History or Literature]	(1.5) 7.5

Winter Semester	Credits
History 212: World History, 1870-1970	(1.5)
Literature 242: Canadian & American Literature	(1.5)
Military Psychology 212: Social Psychology	(1.5)
Physics 123: Introductory Physics	(1.5)
Elective: [Arts or Science, other than History or Literature]	(1.5) 7.5

THIRD YEAR

Fall Semester	Credits
History 343: War & Diplomacy in Europe, 1848-1960	(1.5)
Literature 341: Literature of War in the Modern Age **OR** Literature 421: Literary Theory and Cricitism	(1.5)
Philosophy 421: Philosophical Perspectives II OR Elective	(1.5)
Military Psychology 311: Organizational Leadership & Management	(1.5)
Elective: [Arts or Science, other than History or Literature] **OR** Literature 431: French Canadian Literature	(1.5) 7.5

Winter Semester	Credits
History 343: War & Diplomacy in Europe, 1848-1960	(1.5)
History 302: Technology & War in the Twentieth Century	(1.5)
Philosophy 312: Philosophical Perspectives I OR Elective	(1.5)
Literature 312: The Tales of Mystery and Imagination OR Literature 432: Commonwealth Literature	(1.5)
Elective: [Arts or Science, other than History or Literature]	(1.5) 7.5

NOTE: In AY 92/93, third year Arts students in this program must complete History 231, The Evolution of Modern Strategy.

FOURTH YEAR

Fall Semester	Credits
History 411: America as a World Power	(1.5)
History 421: Naval History in the Twentieth Century	(1.5)
Literature 431: French Canadian Literature OR Elective	(1.5)
Literature 421: Literary Theory and Criticism OR	
Literature 341: Literature of War in the Modern Age	(1.5)
Elective: [Arts or Science, other than History	
or Literature] OR	
Philosophy 421: Philosophical Perspectives II	(1.5) 7.5

Winter Semester	Credits
History 432: China & Japan in the Twentieth Century	(1.5)
History 442: Studies in Modern Culture	(1.5)
Literature 432: Commonwealth Literature OR	
Literature 312: The Tales of Mystery and Imagination	(1.5)
Military Psychology 402: Professional & Ethical Issues	(1.5)
Elective: [Arts or Science, other than History or Literature] **OR**	
Philosophy 312: Philosophical Perspectives I	(1.5) 7.5

Military and Strategic Studies
Joint Concentration in History and International Politics

SECOND YEAR

Fall Semester	Credits
History 211: Europe & the Wider World, 1763-1870	(1.5)
History 231: The Evolution of Modern Strategy	(1.5)
Political Science 213: Introduction to International Politics	(1.5)
Physics 123: Introductory Physics	(1.5)
one of: Economics 213: Principles of Economics	(1.5)
Political Science 223: Comparative Government	(1.5)
Literature 231: British & European Literature	(1.5)
Mathematics 211: Probability & Statistics	(1.5) 7.5

Winter Semester	Credits
History 212: World History, 1870-1970	(1.5)
Political Science 213: Introduction to International Politics	(1.5)
Political Science 232: Contemporary Strategic Thought	(1.5)
Physics 123: Introductory Physics	(1.5)
Military Psychology 212: Social Psychology	(1.5)
one of: Economics 213: Principles of Economics	(1.5)
Political Science 223: Comparative Government	(1.5)
Literature 242: Canadian and American Literature	(1.5) 9.0

THIRD YEAR

Fall Semester	Credits
History 343: War & Diplomacy in Europe, 1848-1960	(1.5)
Political Science 321: Irregular Warfare	(1.5)
Military Psychology 311: Organizational Leadership & Management	(1.5)
H&PE Elective: one of the following—	
Economics 311: The Canadian Economy	
Economics 331: Quantitative Methods	
Economics 341: Intermediate Microeconomic Theory	
Economics 361: Applied Business Finance	
Economics 421: The Economics of Defence	
Economics 431: Money and Banking	
History 471: The Pacific Rim and East Asia to 1905	
Political Science 322: Issues in Canadian Politics	
Political Science 401: Canadian Public Administration	(1.5)
Elective: [Arts or Science, other than History or Political Science]	(1.5) 7.5

Winter Semester	Credits
History 343: War & Diplomacy in Europe, 1848-1960	(1.5)
Political Science 342: Asia-Pacific Defence & Security	(1.5)
Political Science 302: Conflict Resolution	(1.5)
H&PE Elective: one of the following—	
Economics 332: Canadian Economic History	
Economics 322: Mathematical Economics	
Economics 352: Intermediate Macroeconomic Theory	
Economics 412: Industrial Organization	
Economics 432: International Trade & Finance	
Economics 442: Natural Resource Economics	
History 302: Technology & War, 1914 to Present	
Political Science 361: Modern Political Thought	
Political Science 402: American Government	
Political Science 412: Political Economy of the Canadian Arctic	(1.5)
Elective: [Arts or Science, other than History or Political Science]	(1.5) 7.5

FOURTH YEAR

Fall Semester	Credits
History 411: America as a World Power	(1.5)
History 421: Naval History in the Twentieth Century	(1.5)
Political Science 441: Canadian Foreign Policy	(1.5)
H&PE Elective: one of the following—	
Economics 311: The Canadian Economy	
Economics 331: Quantitative Methods	
Economics 341: Intermediate Microeconomic Theory	
Economics 361: Applied Business Finance	
Economics 421: The Economics of Defence	
Economics 431: Money and Banking	
History 471: Pacific Rim & East Asia to 1905	
Political Science 322: Issues in Canadian Politics	
Political Science 401: Canadian Public Administration	(1.5)
Elective: [Arts or Science, other than History or Political Science]	(1.5) 7.5

Winter Semester	Credits
History 432: China & Japan in the Twentieth Century	(1.5)
History 452: Russia in the Twentieth Century	(1.5)
Political Science 432: Arms Control	(1.5)
Military Psychology 402: Professional & Ethical Issues	(1.5)
H&PE Elective: one of the following—	
Economics 332: Canadian Economic History	
Economics 322: Mathematical Economics	
Economics 412: Industrial Organization	
Economics 432: International Trade & Finance	
Economics 442: Natural Resource Economics	
History 302: Technology & War, 1914 to Present	
History 442: Studies in Modern Culture	
Political Science 361: Modern Political Thought	
Political Science 402: American Government	
Political Science 412: Political Economy of the Canadian Arctic	(1.5) 7.5

Applied Military Psychology

SECOND YEAR

Fall Semester	Credits
Physics 123: Introductory Physics	(1.5)
Mathematics 211: Probability and Statistics	(1.5)
Applied Psychology 361: Elements of Physiological Psychology	(1.5)
Arts Elective	(1.5)
Elective: [Arts or Science, other than Psychology]	(1.5) 7.5

Winter Semester	Credits
Physics 123: Introductory Physics	(1.5)
Military Psychology 212: Social Psychology	(1.5)
Applied Psychology 372: Sensation and Perception	(1.5)
Arts Elective	(1.5)
Elective: [Arts or Science, other than Psychology]	(1.5) 7.5

Arts Electives available:

- Economics 213
- Political Science 223
- Political Science 213
- History 211 & 212
- Literature 231 & 242

THIRD YEAR

Fall Semester	Credits
Military Psychology 311: Organizational Leadership and Management	(1.5)
Applied Psychology 351: Counselling Psychology	(1.5)
Applied Psychology 381: Introductory Statistics for Behavioural Sciences	(1.5)
Arts Elective	(1.5)
Elective [Arts or Science, other than Psychology]	(1.5) 7.5

Winter Semester	Credits
Applied Psychology 322: Military Psychology, Part One	(1.5)
Applied Psychology 362: Introduction to Research Methods	(1.5)
Psychology Elective*	(1.5)
Arts Elective	(1.5)
Elective [Arts or Science, other than Psychology]	(1.5) 7.5

Arts Electives available:

- Economics 341 & 352
- Political Science 361 & 322
- Political Science 321 & 302
- History 343
- Literature 341

Psychology Electives available:

- Applied Psychology 342: Abnormal Psychology

Applied Psychology 332: Psychological Foundations of Sport
Applied Psychology 442: Forensic Psychology
Applied Psychology 452: Psychological Tests & Measurement
Applied Psychology 472: Human Physiology
Applied Psychology 482: Advanced Topics in Sensory Neurobiology

*1.5 credits of Psychology electives is required in third year.

FOURTH YEAR

Fall Semester	Credits
Applied Psychology 441: Personnel Psychology	
Applied Psychology 461: Cognitive Processes	(1.5)
Arts Elective	(1.5)
Arts Elective	(1.5)
Elective [Arts or Science, other than Psychology]	(1.5) 7.5

Winter Semester	Credits
Military Psychology 402: Professional and Ethical Issues	(1.5)
Applied Psychology 422: Military Psychology, Part Two	(1.5)
Applied Psychology 462: Human Factors in Engineering	(1.5)
Psychology Elective*	(1.5)
Arts Elective	(1.5) 7.5

Arts Electives available:
Economics 421 & 412
Political Science 401 & 402
Political Science 441 & 432
History 411 & 452
Literature 421 & 432
Psychology Electives available:

Applied Psychology 332: Psychological Foundations of Sport
Applied Psychology 342: Abnormal Psychology
Applied Psychology 442: Forensic Psychology
Applied Psychology 452: Psychological Tests & Measurement
Applied Psychology 472: Human Physiology
Applied Psychology 482: Advanced Sensory Neurobiology

*1.5 credits of Psychology electives is required in fourth year.

COURSE DESCRIPTIONS

APPLIED PSYCHOLOGY 304: Selected Topics in Military Psychology I [1.5] **(0,3,0)**

This course provides the opportunity for students in third and fourth year to undertake independent yet supervised studies in topics in military psychology. 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.

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

NOTE: A student may take this course not more that twice. The course content must be different each time.

Prerequisite: MP 113 or equivalent and MP 212.

APPLIED PSYCHOLOGY 311: Personality Theory [1.5] **(3,0,0)**

An elective course.

Students will study principles concerning the development of personality structure. This will include an examination of the major personality theories, and an evaluation of relevant research in the field of personality. In addition, an understanding of the methods of assessing personality by structured and unstructured measures will be provided. This course is designed to inform students about normal and abnormal personality structures and their assessment and treatment.

Prerequisite: MP 113 and MP 212.

APPLIED PSYCHOLOGY 322: Military Psychology, Part One [1.5] **(3,0,0)**

A required course for students electing the BA major program.

This course is intended to provide leaders with a better understanding of the human factor in both combat and pre-combat situations 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.

APPLIED PSYCHOLOGY 332: Psychological Foundations of Sport [1.5] **(3,0,0)**

An elective course.

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 342: Abnormal Psychology [1.5] **(3,0,0)**

An elective course.

Students will study the nature and history of abnormal behaviour from the perspectives of the biomedical, psychodynamic, behavioural, cognitive, and humanistic approaches. They will, in part, apply their knowledge of physiology (AP 361) to an examination of anxiety disorders, major depressive disorders, social and interpersonal problems including drug abuse, the psychoses, and disorders of the nervous system. Emphasis will be placed on the biomedical and behavioural/ cognitive approaches.

Prerequisite: AP 361, or consent of the instructor.

APPLIED PSYCHOLOGY 351: Counselling Psychology [1.5] **(3,0,0)**

A required course for students electing the BA major program.

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.

APPLIED PSYCHOLOGY 361: Elements of Physiological Psychology [1.5] **(3,0,0)**

A required course, normally offered in second year, for students electing a major in applied military psychology.

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.

APPLIED PSYCHOLOGY 362: Introduction to Research Methods [1.5] **(3,0,0)**

A required course for students electing the BA major program.

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.

APPLIED PSYCHOLOGY 371: Developmental Psychology [1.5] **(3,0,0)**

An elective course.

Students will be introduced to the psychology of human development covering the span from neonate to the young adult. A balanced approach will include the influences of heredity, the environment, and prenatal development. Various perspectives on the developmental stages in childhood (e.g., Freud, Erikson, Piaget, Kohlberg) will be examined in detail. The major areas of focus will be physical, cognitive, emotional, and social development. The approach will be chronological rather than topical, beginning with the neonate and progressing through the stages of development.

APPLIED PSYCHOLOGY 372: Sensation and Perception [1.5] **(3,0,0)**

A required course, normally offered in second year, for students electing a major in applied military psychology.

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.

APPLIED PSYCHOLOGY 381: Statistics for the Behavioural Sciences [1.5] **(3,0,0)**

A required course for students electing the BA major program.

This course applies statistical concepts to the behavioural sciences. Students will peruse and understand such concepts as measures of central tendency, measures of dispersion, and the normal distribution. They will determine relationships between data and apply models related to prediction. Hypothesis testing involving dependent and independent data will be introduced and will lead to simple two-way analysis of variance. The course will conclude with an introduction to non-parametric statistics.

APPLIED PSYCHOLOGY 422: Military Psychology, Part Two [1.5] **(3,0,0)**

A required course for students electing the BA major program.

This course is a continuation of AP 322 and consists of a comprehensive examination of several militarily relevant topics.

APPLIED PSYCHOLOGY 441: Personnel Psychology [1.5] **(3,0,0)**

A required course for students electing the BA major program.

This course consists of a comprehensive review of essential personnel psychology concepts and techniques; recruitment and placement; training and development; compensation and motivation; appraisal and career management; and the legal environment.

APPLIED PSYCHOLOGY 442: Forensic Psychology [1.5] **(3,0,0)**

An elective course.

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 defined as "criminal" by statute. The course starts with basic biological issues such as a simple review of genetic XYY research and possible physiological influences in the development of psychopathy. This is followed by social learning theory and other non-biological explanations of deviant and criminal behaviour. Once this groundwork is completed the course turns to specific behaviours such as violence/aggression (e.g., sexual assault, terrorism and hostage taking). These specific behaviours are then dissected for their possible biological and non-biological influences which of course range from alcohol to cultural factors. Considerable time is spent on social psychological variables influencing behaviour such as riot and general crowd control situations which have potential for disaster (e.g., panic in fire). The course finishes with a review of intervention and treatment strategies aimed at specific and general criminal/deviant behaviours.

APPLIED PSYCHOLOGY 452: Psychological Tests and Measurement [1.5] **(3,0,0)**

An elective course for students electing the BA major program. A required course for students admitted to the honours BA major program.

A study of the basic concepts of measurement in psychology and the application of these concepts in selected areas of psychology. The principal topics of the course will be historical foundations, basic concepts such as reliability, validity, and invariance, the use of different tests and instruments, scaling, and the unique aspects of measurement encountered in different areas of psychology.

APPLIED PSYCHOLOGY 461: Cognitive Processes [1.5] **(3,0,0)**

A required course for students electing the BA or BSc major programs.

This course provides the student with an introduction into mental processes and information processing. The topics include human memory, attention, and thought processes. Both visual and auditory cognition will be discussed, as well as the cognitive approach to higher mental processes. The methods used in measuring mental processes will be examined with examples provided by various in-class experiments and demonstrations. In addition, the topic of artificial intelligence and the problems facing the design of "thinking machines" will be discussed in the course.

APPLIED PSYCHOLOGY 462: Human Factors in Engineering [1.5] **(3,0,0)**

A required course for students electing the BA major program.

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)**

A required course for students electing the Bsc major program.

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 [1.5] **(3,0,0)**

An alternate course to AP 452 for students admitted to the honours BA or BSc major programs.

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 [1.5] **(3,0,0)**

A required course for students admitted to the honours BA or BSc major programs.

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.

Prerequisite: AP 381, or consent of the instructor.

APPLIED PSYCHOLOGY 482: Advanced Topics in Sensory Neurobiology [1.5] **(3,0,0)**

An elective course.

This course provides students with the opportunity to complete 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.

APPLIED PSYCHOLOGY 483: Psychology Honours Thesis [2.5] (0,3,0/0,3,0)

A required course for students admitted to the honours BA or BSc major programs.

Fourth Year students in the Honours program will complete research in an area related to Applied Military Psychology. The thesis must be defended in accordance with thesis regulations. Students should familiarize themselves with the regulations of this Calendar which pertain to RRMC Honours programs.

CHEMISTRY 123: Introductory Chemistry [3] (1,0,2/1,0,2)

A required Science course for all first year Arts students.

Chemistry 123 is a hands-on course in practical chemistry. Students are introduced to fundamental chemical principles by a comprehensive set of 22 experiments. With Arts students in mind every effort has been made to include in these experiments substances and reactions which illustrate the importance of chemistry to everyday life. Experiments include: geological prospecting for metals, chemistry of fireworks, photochemical printing, electrochemical cells and synthesis of polymers. A full laboratory report will be required for at least 50% of these experiments. While formal lectures are not given the relevant chemical theory is presented in pre-laboratory lectures. These are complemented by lecture demonstrations. Some laboratory time is allocated for review and, from time to time, assignments and pre-laboratory tests are given.

COMPUTER SCIENCE 112: Computer Science Concepts and Applications [0.5] (1,0,1)

For first year Arts or Administration students.

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

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

A required course in second year for students electing the economics and politics concentrations in third year.

This course is an introduction to the methods of economics. The first part of the course covers the essentials of microeconomics: the principles of consumption,

production and exchange. Topics covered include the theory of the household, the theory of the firm, the theory of competitive markets and monopoly. The second part of the course covers the essentials of macroeconomics: the determination of national income, the monetary and banking system and fiscal and monetary policy. Topics covered include unemployment, the rate of interest, inflation, and the role of government, the theory of business cycles, economic growth and the international economy.

ECONOMICS 211: Principles of Microeconomics [1.5] **(3,0,0)**

This course deals with the principles of consumption, production and exchange. Topics covered include the theory of the household, the theory of the firm, the theory of competitive markets and monopoly.

ECONOMICS 212: Principles of Macroeconomics [1.5] **(3,0,0)**

This course deals with the determination of national income, the monetary and banking system and fiscal and monetary policy. Topics covered include unemployment, the rate of interest, inflation, and the role of government, the theory of business cycles, economic growth, and the international economy.

ECONOMICS 304: Directed Reading and Research [1.5] **(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.

ECONOMICS 311: The Canadian Economy [1.5] **(3,0,0)**

An elective course.

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.

ECONOMICS 314: Selected Topics in Economics [1.5] **(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. Examples of recent studies include: Economics of Developing Countries; Comparative Economic Systems; Economics of the USSR and East European Countries.

Offered on demand.

Prerequisite: consent of the instructor, approval of program by Head of Department and Faculty Council.

ECONOMICS 322: Mathematical Economics [1.5] **(3,0,0)**

An elective course.

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

ECONOMICS 331: Quantitative Methods [1.5] **(3,0,0)**

An elective course.

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

ECONOMICS 332: Canadian Economic History [1.5] **(3,0,0)**

An elective course.

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.

ECONOMICS 341: Intermediate Microeconomic Theory [1.5] **(3,0,0)**

A required course for the economics concentration.

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.

ECONOMICS 352: Intermediate Macroeconomic Theory [1.5] **(3,0,0)**

A required course for the economics concentration.

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.

ECONOMICS 361: Applied Business Finance [1.5] **(3,0,0)**

An elective course.

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.

ECONOMICS 412: Industrial Organization [1.5] **(3,0,0)**

A required course for the economics concentration.

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.

ECONOMICS 421: The Economics of Defence [1.5] **(3,0,0)**

A required course for the economics concentration.

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

ECONOMICS 431: Money and Banking [1.5] **(3,0,0)**

An elective course.

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

ECONOMICS 432: International Trade and Finance [1.5] **(3,0,0)**

An elective course.

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

ECONOMICS 442: Natural Resource Economics [1.5] **(3,0,0)**

An elective course.

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

HISTORY 102: An Introduction to History [1.5] **(3,0,0)**

A required course in first year Arts.

An introduction to history through an examination of fundamental historical concepts and the process by which they emerged in the culture of western civilization.

HISTORY 211: Europe & the Wider World, 1763-1870 [1.5] **(3,0,0)**

A required course in second year for students electing an history concentration in third year.

This course examines the inter-relationship between European and North American history in the period between the Seven Years and Franco-Prussian Wars. Attention is paid to the revolutionary process, the development of ideologies in Nineteenth Century Europe, colonization and decolonization in Asia and the Americas, and emergence of the "nation state".

HISTORY 212: World History, 1870-1970 [1.5] **(3,0,0)**

A required course in second year for students electing an history concentration in third year.

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

HISTORY 231: The Evolution of Modern Strategy [1.5] **(3,0,0)**

A required course in second year for students electing an history concentration in third year.

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

HISTORY 302: Technology and War in the Twentieth Century [1.5] **(3,0,0)**

A required course in third year for students electing the history and literature concentrations.

An examination of technological innovation in this century and its importance on defence. Themes to be considered are: the difficulties of adopting new technology in war and in peace, the relationship between politics and military technology, between military technology and morality, and the economic significance of military technology. Finally, the course examines historical trends in technological innovation and what predictions can be made for the future.

HISTORY 304: Directed Reading and Research [1.5] **(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 312: Armies and Society [1.5] **(3,0,0)**

An elective course.

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 semester a particular culture or ideology is selected for investigation: communist, fascist, liberal-democratic or third-world.

HISTORY 314: Selected Topics in History [1.5] **(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, approval of program by Head of Department and Faculty Council.

HISTORY 343: War & Diplomacy in Europe, 1848-1960 [3] **(3,0,0/3,0,0)**

A required course in third year for students electing an history concentration.

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

HISTORY 411: America as a World Power [1.5] **(3,0,0)**

A required course in fourth year for students electing an history concentration.

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.

HISTORY 421: Naval History in the Twentieth Century [1.5] **(3,0,0)**

A required course in the fourth year for students electing an history elective.

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

HISTORY 432: China & Japan in the Twentieth Century [1.5] **(3,0,0)**

A required course in the fourth year for students electing an history elective.

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

HISTORY 442: Studies in Modern Culture [1.5] **(3,0,0)**

A required course in the fourth year for students electing the history and literature concentrations.

An examination of the predominant aspects of twentieth-century culture and of the forces that shaped it. Particular attention will be paid to such distinctive phenomena as impressionism, expressionism and surrealism, and the inter-relationship between these movements and popular culture through the medium of modern technology.

HISTORY 452: Russia in the Twentieth Century [1.5] **(3,0,0)**

A required course in the fourth year for students electing the history and international politics concentrations.

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

HISTORY 471: The Pacific Rim and East Asia to 1905 [1.5] **(3,0,0)**

An elective course in the third or fourth years.

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.

LITERATURE 123: English Literature, and Composition [3] **(3,0,0/3,0,0)**

This is a required course for first year Arts students.

This course focuses upon developing the student's ability to organize his or her ideas coherently and to express them clearly in speech and writing.

However, the greater emphasis of this course is placed on the study of literature. During the first semester, there is a concentration on works by Chaucer, Marlowe and Shakespeare. The second semester is devoted to Milton, the Metaphysical and the Romantic poets.

Integrated with the study of literature in both semesters is the study of the evolution of the English language from its origins to the present day.

LITERATURE 231: British and European Literature [1.5] **(3,0,0)**

This is a required course in the second year for students electing the literature concentration.

This course undertakes a survey of British and European literature, including its origins and connections, during the nineteenth and twentieth centuries. It also conducts comparative studies of short fiction, poetry and the drama.

LITERATURE 242: Canadian and American Literature [1.5] **(3,0,0)**

This is a required course in the second year for students electing the literature concentration.

This course challenges students to practice and develop the ability to analyze, comprehend and interpret more accurately, the texts of Canadian and American writers of the nineteenth and twentieth centuries which have been chosen for critical reading and appraisal.

LI 242 lays special emphasis on the use of simple and precise expression of ideas as an encouragement for students to think and write clearly and logically, in the presentation of their literary interpretation of the works studied.

LITERATURE 304: Directed Reading Studies in Literature [1.5] **(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.

Variations of the course include the Novel, the Classics, Drama, Poetry or a combination of these areas.

The course is offered on demand only in exceptional circumstances and according to availability of instructor. The approval of the Head of the Department and Faculty Council must be obtained.

LITERATURE 312: The Tales of Mystery and Imagination [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

This course examines the themes, methods and settings of one of the most diverse and widespread literary forms of the nineteenth and twentieth centuries: the detective story.

Students are introduced to several excellent works by Poe, Doyle, Sayers, Hammett, Chandler, Simenon and others, and they are encouraged to discuss the authors' techniques.

The course allows students to explore such related forms as the mystery and the espionage story and to view films made from detective novels. The course also involves philosophical investigations of the ethics and epistemology of detective fiction.

LITERATURE 341: Literature of War in the Modern Age [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

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

LITERATURE 421: Literary Theory and Criticism [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

This course examines the major literary theories from Plato to the present. It explores the strengths and weaknesses of the most important schools of literary criticism. At the instructor's discretion, the course may include various examples of practical criticism and encourage students to sharpen their analytical and synthetic powers.

LITERATURE 431: French Canadian Literature [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

The first section of this course aims to introduce the student to those singular elements which combine to fashion the unique temperament,character and sense of values 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 of fiction, poetry and the drama by gifted 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 be helpful for a fuller appreciation of the readings. For those in need, help with translation is available.

LITERATURE 432: Commonwealth Literature [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

This course examines modern literary works selected from Africa, India and the West Indies in the context of the conditions that impinge upon the artist's imagination: the stresses of economic underdevelopment, the throes of revolution, the waning of colonialism and the problems of racial and cultural differences, the replacement of tribal or village cultures, and the struggle for human rights.

MATHEMATICS 123: Calculus and Analytic Geometry [3] **(3,2,0/3,2,0)**

A required course for first year Arts students.

Analytic geometry with vectors. An introduction to the calculus of one and two variables, Linear Algebra including echelon method, matrix algebra, Linear independence and dependence, Linear programming.

MATHEMATICS 211: Finite Mathematics, Probability and Statistics [1.5] **(3,2,0)**

A required course in second year for students electing a major in applied military psychology or a concentration in economics.

An introduction to Probability and Statistics. Basic laws of probability, discrete and continuous random variables. Functions of random variables, sampling distributions. Estimation and hypothesis testing of means and proportions.

MILITARY PSYCHOLOGY 113: The Psychology of the Individual [1.5] **(3,0,0)**

A required course for first year Arts students.

The first half of this course consists of an introduction of those areas of human development and behaviour that are relevant to future leaders' needs and interests. The course provides an exposure to the fundamental topics and elementary psychological vocabulary necessary for understanding individual behaviour. Topics include perception, learning, motivation, intelligence, personality, adjustment, and maturation.

The second half of the course proceeds with 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. As a supplement to lectures and discussions, microcomputer interactive psychological experiments will give students hands-on experience in the research experiment process.

MILITARY PSYCHOLOGY 212: Social Psychology [1.5] **(3,0,0)**

A required course for all students.

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.

MILITARY PSYCHOLOGY 311: Organizational Leadership and Management [1.5] **(3,0,0)**

A required course for all students.

The purpose of this course is to study human behaviour in organizations at the individual and group level, including the effect of organization structure on behaviour. Specific attention will be given to concepts for developing and improving interpersonal skills. Topics include self awareness, leadership, group dynamics, work stress, problem solving, conflict resolution and interviewing/counselling.

MILITARY PSYCHOLOGY 402: Professional and Ethical Issues [1.5] **(3,0,0)**

A required course for all students.

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 dilemmas 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.

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.

There are specific Academic Rules governing Honours Arts Research Seminars (See Academic Regulations).

Prerequisite: Second class honours in Second and Third Years, consent of the Head of the Department and the Faculty Council.

PHILOSOPHY 312: Philosophical Perspectives I [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

This course examines various philosophical problems and questions from the ancient to the modern times. At the instructor's discretion, the course may include works from the sciences as well as the humanities, the East as well as the West, in order to encourage students to develop a wide-ranging international outlook.

PHILOSOPHY 421: Philosophical Perspectives II [1.5] **(3,0,0)**

This is a required course for students electing the literature concentration.

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

PHYSICS 123: Introductory Physics [3] **(2.5,0,1/2.5,0,1)**

For Second Year students taking the Arts or Administration program of study.

This course introduces the concepts of elementary physics for students without a background in physics. In the first semester the concepts of force, velocity, acceleration, Newton's Laws of Motion, the gravitation field, work, power, energy, momentum, rotational motion and the conservation laws of energy and momentum are discussed. In the second semester the topics covered include the structure of matter, electric fields, electrical potential, potential differences, capacitance, resistance, current flow, simple AC and DC circuits, magnetic fields and the electromagnetic properties of materials. Topics of particular interest to the Armed Forces are used as illustrative examples. Topics covered in the classroom are supplemented by laboratory experiments on alternate weeks in the both semesters.

POLITICAL SCIENCE 101: An Introduction to Political Science [1.5] **(3,0,0)**

A required course for the First Year Arts program of studies.

An introduction to the study of politics through an examination of the basic questions informing political debate within the western tradition and the methodological approaches that have been employed to study political phenomena.

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

A required course in second year for students electing a concentration in political science.

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

POLITICAL SCIENCE 223: Comparative Government [1.5] (3,0,0/3,0,0)

A required course in second year for students electing the economics and political science concentrations in third year.

An introduction to the study of government through a comparative examination of the constitutions, institutions and processes of governance. Particular attention will be paid to Canada and the United States.

POLITICAL SCIENCE 232: Contemporary Strategic Thought [1.5] (3,0,0)

A required course in second year for students electing the history and international politics concentrations in third year.

This course examines the post-1945 evolution of strategic doctrine in the United States, France, Great Britain and the Soviet Union. It includes an analysis of concepts such as deterrence, crisis management and escalation control. It also includes an examination of doctrines such as massive retaliation, extended-deterrence, flexible response, and counter-force.

POLITICAL SCIENCE 302: Conflict Resolution [1.5] (3,0,0)

A required course in third year for students electing the history and international politics concentration.

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

POLITICAL SCIENCE 304: Directed Reading and Research [1.5] (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 314: Selected Topics in Political Science [1.5] (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: International Politics in the Arab World; Politics and Government in Southeast Asia; East European Communist Systems.

Offered on demand.

Prerequisite: consent of the instructor, approval of program by Head of Department and Faculty Council.

POLITICAL SCIENCE 321: Irregular Warfare [1.5] (3,0,0)

A required course for students electing the history and international politics concentrations.

This course examines the use of irregular warfare as a means to disrupt the security of the modern nation-state. Techniques examined include guerrilla warfare, terrorism, subversion, propaganda, economic coercion and coup d'état.

POLITICAL SCIENCE 322: Issues in Canadian Politics [1.5] (3,0,0)

(Offered in first semester in 1992/93.)

A required course for students electing the economics and political science concentrations.

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.

POLITICAL SCIENCE 342: Asia-Pacific Defence & Security [1.5] (3,0,0)

A required course for students electing the history and international politics concentrations.

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 [1.5] **(3,0,0)**

(Offered in second semester in 1992/93.)

A required course for students electing the economics and political science concentrations.

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

POLITICAL SCIENCE 401: Canadian Public Administration [1.5] **(3,0,0)**

A required course for students electing the economics and political science concentrations.

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

POLITICAL SCIENCE 402: American Government and Politics [1.5] **(3,0,0)**

A required course for students electing the economics and political science concentrations.

Students in this course will study the American constitution, institutions of government and political process.

POLITICAL SCIENCE 412: The Political Economy of the Canadian Arctic [1.5] **(3,0,0)**

An elective course.

This course, which is open to Arts and Science students in the third and fourth years, offers an interdisciplinary overview of major political, economic, defence and environmental issues related to the Canadian Arctic. Particular attention will be paid to those issues likely to be encountered by Canadian Forces personnel serving in the Arctic.

POLITICAL SCIENCE 432: Arms Control [1.5] **(3,0,0)**

A required course for students electing the history and international politics concentrations.

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, the control of chemical and bacteriological warfare, conventional arms control and naval arms control.

POLITICAL SCIENCE 441: Canadian Foreign Policy [1.5] **(3,0,0)**

A required course for students electing the history and international politics concentrations.

An examination of contemporary issues in Canadian foreign and defence policy. Topics covered are related to NATO, NORAD, peacekeeping, arms control, and Arctic sovereignty, as well as to Canada's relations with Europe, the United States, Latin America and Asia.

POLITICAL SCIENCE 461: Space; Law and Politics [1.5] **(3,0,0)**

(also listed under Science Division as EO 491)

This course examines the legal and political dimensions of space exploration. A general introduction to international law - including the relationship of law to politics - will be followed by an examination of the conventions governing the law of the sea and airspace. An understanding of the legal foundations of these subjects is preparatory to an appreciation of the nature and limits of the existing laws regulating activities in outer space. Topics to be discussed include the general regulation and administration of space activity, geostationary and sunsynchronous orbits, direct broadcasting satellites, problems of space debris, remote sensing, the boundaries of space, the status of weapons systems in space, private activities and responsibilities in space exploration and exploitation, and projections for future developments.

PSYCHOLOGY 111: The Psychology of the Individual [1.5] **(3,0,0)**

An introduction to some 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.

SCIENCE DIVISION

The Science Division offers degrees in the following areas:

(I) Combined Major Programs
- (i) Physics and Oceanography
- (ii) Physics and Computer Science
- (iii) Physics and Earth Observational Science
- (iv) Oceanography and Earth Observational Science
- (v) Computer Science and Earth Observational Science
- (vi) Psychology and Earth Observational Science

(II) Major Programs
- (i) Applied Psychology

(III) Joint Concentration Programs
- (i) BSc General program with specialization in two areas of concentration.

NOTE: For this academic year (1992/93) students in the fourth year of a Combined Major program will be completing their program of studies in Space Science instead of Earth Observational Science. This is the last year that the Space Science Major is offered at RRMC.

DEPARTMENTAL PROFESSORS

Department of Chemistry

Associate Professor and Head of Department - M.R. Barr, BSc,MSc,PhD
Professor - M.G. Robinson, BSc, PhD
Professor - K.J. Reimer, BSc, MSc, PhD
Assistant Professor - S.L. Grundy, BSc, PhD

Department of Engineering

Associate Professor and Head of Department - J.S. Collins, BSc, BEng, MEng, PhD, PEng (on sabbatical 1992-93)
Assistant Professor and Acting Head of Department - D.J. Shpak, BSc, MEng, PhD, PEng
Assistant Professor - C.J. Damaren, BASc, MASc, PhD
Assistant Professor - Major G.W. Nicks, CD, rmc, BEng, MEng
Lecturer - M. Erlic, BASc, MASc in ECE

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
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 - Captain R. Backlund, CD, rmc, BEng, MEng

Computer Science	**Department**
Professor and Professor in Charge (PIC) -	
A.G. Buckley, BSc, MSc, PhD	Mathematics
Professor - F. Milinazzo, BSc, PhD	Mathematics
Associate Professor - J.S. Collins, BSc, BEng,	
MEng, PhD, PEng (on sabbatical 1992/93)	Engineering
Associate Professor - J.L. LaCombe, BSc, MSc, PhD	Physics
Associate Professor - M.J. Press, BSc, MSc, PhD	Physics
Associate Professor - R.C. Snell, BSc, MSc, PhD	Mathematics
Associate Professor - W.W. Wolfe, BSc, MSc, PhD	Mathematics
Assistant Professor - J.R. Buckley, BSc, PhD	Physics
Assistant Professor - D.J. Shpak, BSc,MEng,PhD,PEng	Engineering
Lecturer - M. Erlic, BASc, MASc in ECE	Engineering

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

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.

Oceanography	**Department**
Professor and Dean of Science and Engineering -	
G.M. Lancaster, BSc, PhD	Mathematics
Professor - M.G. Robinson, BSc, PhD	Chemistry
Professor - K.J. Reimer, BSc, MSc, PhD	
Chemistry Associate Professor and Dean of Graduate Studies -	
D.P. Krauel, ndc, BSc, MSc, PhD	Physics
Associate Professor - W.T. MacFarlane, BA, MSc, PhD	Physics
Associate Professor - R.F. Marsden, rmc, BSc, MA, PhD	Physics
Associate Professor - M.W. Stacey, BSc, PhD	Physics
Assistant Professor - J.R. Buckley, BSc, PhD	Physics
Assistant Professor - Lieutenant-Commander G.H. Fleming	
CD, rrmc, BSc,MSc, PhD	Physics
Assistant Professor - S.R. Waddell, BSc, MSc, PhD	Physics

The undergraduate degrees in Physics and Oceanography, Earth Observational Science and Oceanography, Computer Science and Oceanography, and the postgraduate diploma and MSc in Oceanography and Acoustics are all interdisciplinary. As there is no department of Oceanography, the curricula for Oceanography are under the guidance of the Oceanography Curriculum Committee, chaired by the Dean of Science and Engineering.

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 (on sabbatical 1992-93)
Associate Professor - W.T. MacFarlane, BA, MSc, PhD
Associate Professor - R.F. Marsden, rmc, BSc, MA, PhD
Associate Professor - J.L. LaCombe, BSc, MSc, PhD
Associate Professor - M.W. Stacey, BSc, MSc, PhD
Assistant Professor - J.M. Gilliland, BSc, MA, PhD
Assistant Professor - S.R. Waddell, BSc, MSc, PhD
Assistant Professor - J.R. Buckley, BSc, PhD
Assistant Professor - Lieutenant-Commander G.H. Fleming, CD, rrmc, BSc, MSc, PhD
Assistant Professor - G. May, BSc, MA, PhD

The purpose of specialization in Physics, with a sound background in Mathematics, Chemistry and Engineering, is to provide the student with the ability to apply physical laws and to use the equipment and techniques of the exact sciences to solve problems. The interests of the Canadian Forces are reflected in the choice of topics studied. With the Physics specialization there are combined major programs that permit additional specialization in Oceanography, Computer Science, or Earth Observational Science.

Earth Observational Science	**Department**
Professor and Dean of Science and Engineering - G. M. Lancaster, BSc, PhD	Mathematics
Associate Professor - J.S. Collins, BSc, BEng, MEng, PhD (on sabbatical 1992/93)	Engineering
Associate Professor - M.J. Press, BSc, MSc, PhD	
Physics Assistant Professor - Lieutenant-Commander G.H.Fleming CD, rrmc, BSc, Msc, PhD	Physics
Assistant Professor - J.M. Gilliland, BSc, MA, PhD	Physics
Assistant Professor - C. J. Damaren, BASc, MASc, PhD	Engineering

The undergraduate degrees in Earth Observational Science and one of: Physics, Oceanography, Computer Science, or Applied Psychology are all interdisciplinary. As there is no department of Earth Observational Science, the curricula are under the guidance of the Earth Observational Science Curriculum Committee, chaired by the Dean of Science and Engineering.

BSc COMBINED MAJOR HONOURS PROGRAMS

Honours Combined major programs are available in most combinations of Computer Science, Earth Observational Science, Physics, Oceanography or Applied Psychology. Honours students are required to take, in addition to the regular course load, Mathematics 432 and 1.5 units of credit of 300 or 400 level Science elective courses. Honours students are also required to complete an appropriate honours project, or research project (AP471) in the case of the Applied Psychology Major.

BSc HONOURS - APPLIED MILITARY PSYCHOLOGY

Candidates for the honours degree must complete all the courses for the major program with the exception of Applied Psychology 471. They must also complete the advanced statistics course AP 481 and the psychology honours thesis course AP 483.

FIRST YEAR - DEGREES IN SCIENCE OR ENGINEERING

	First Semester				Second Semester			
Course Description	**Credits**	**Lect**	**Tut**	**Lab**	**Lect**	**Tut**	**Lab**	**Notes**
Language Training I Conversational French	0	0	3	2	0	3	2	1
Literature 113 English Literature of Science and Society	3	3	0	0	3	0	0	
Military Psychology 111 Psychology of the Individual - Part I	1.5	3	0	0	-	-	-	
Mathematics 113 Calculus and Linear Algebra	5	5	3	0	5	2	0	
Computer Science 122 Introduction to Computing	1.5	-	-	-	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.

SECOND YEAR - DEGREES IN SCIENCE (9)

Course Description	First Semester Credits	Lect	Tut	Lab	Second Semester Lect	Tut	Lab	Notes
Language Training II Conversational French	0	0	3	2	0	3	2	1
History 221 Canadian History for Engineers	1.5	3	0	0	-	-	-	
Military Psychology 212 Social Psychology	1.5	-	-	-	3	0	0	
Mathematics 223 Calculus, Vector calculus, Differential equations	3	3	1	0	3	1	0	
Mathematics 241 Probability and Statistics	1.5	3	0	0	-	-	-	2
Physics 202 Electro-magnetism	1.5	2.5	0	3				
Physics 211 Vibrations and Waves	1	2.5	0	0	-	-	-	
Physics 252 Modern Physics	1	-	-	-	2.5	0	0	
Chemistry 243 Thermodynamics	3	2	0	0	3	0	3	
Computer Science 211 Computer Applications I	1.5	2	0	2	-	-	-	
PE 203	0	0	0	2	0	0	2	
Drill 203	0	0	0	1	0	0	1	
Total	**15.5**	**15.5**	**4**	**7**	**14**	**4**	**11**	
Optional Courses:								
Chemistry 203 Thermodynamics	3	2	0	0	3	0	0	7
Computer Science 202 Computer Applications II	1	-	-	-	2	0	1	7
Engineering 232 Mechanics of Materials	2	- - -			3	0	2	5
Engineering 261 Engineering Graphics	1	- - -			2	0	1	8
Mathematics 233 Calculus, Vector calculus, Differential equations	4	4	1	0	4	1	0	6
Mathematics 252 Linear Algebra	1.5	-	-	-	3	0	0	3,4,5
Physics 201 AC circuits	1.5	2.5	0	3				

NOTES -

1. Second Language proficiency tests (LPTs) are administered at the end of the Academic Year. Results from these tests constitute a student's second language profile.
2. Required for students wishing to continue in all Science programs or the

Applied Military Psychology program in Third Year at RRMC.

3. Required for students wishing to continue in all Science programs in Third Year at RRMC.
4. Not required, but recommended for the Science (Applied) degree at RMC and the General Science degree at CMR. Required for other Science degree programs at RMC.
5. Recommended for students wishing to continue in Naval Architecture at MIT.
6. Recommended for students planning to continue in Electrical Engineering, Engineering Physics, or Honours Science, in lieu of Mathematics 223.
7. Students electing Computer Science 202 must take Chemistry 203 in lieu of Chemistry 243. Recommended for students planning to continue in programs with Computer Science in Third Year at RRMC.
8. Engineering 261 is strongly recommended for those Science students wishing to take Earth Observational Science as a Major or concentration in third year.
9. The Honours Science program is normally the entry level to the Honours Combined Major programs.

SECOND YEAR - DEGREES IN ENGINEERING

Course Description	First Semester Credits	Lect	Tut	Lab	Second Semester Lect	Tut	Lab	Notes
Language Training II Conversational French	0	0	3	2	0	3	2	1
History 221 Canadian History for Engineers	1.5	3	0	0	-	-	-	
Military Psychology 212 Social Psychology	1.5	-	-	-	3	0	0	
Mathematics 223 Calculus, Vector calculus, Differential equations	3	3	1	0	3	1	0	
Mathematics 241 Probability and Statistics	1.5	3	0	0	-	-	-	3
Mathematics 252 Linear Algebra	1.5	-	-	-	3	0	0	4,5
Physics 203 AC Circuits and Electromagnetism	3	2.5	0	3	2.5	0	3	
Physics 211 Vibrations and Waves	1	2.5	0	0	-	-	-	
Physics 252 Modern Physics	1	-	-	-	2.5	0	0	
Chemistry 203 Thermodynamics	3	2	0	0	3	0	0	
Computer Science 211 Computer Applications I	1	2	0	2	-	-	-	
Engineering 232 Mechanics of Materials	2	-	-	-	3	0	2	5
Engineering 263 Engineering Graphics and Descriptive Geometry	3	2	0	1	3	0	1	
PE 203	0	0	0	2	0	0	2	
Drill 203	0	0	0	1	0	0	1	
Total	**23**	**20**	**4**	**11**	**23**	**4**	**11**	
Optional Courses:								
Mathematics 233 Calculus, Vector calculus, Differential equations	4	4	1	0	4	1	0	2

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 for students planning to continue in Electrical Engineering, Engineering Physics, or Honours Science, in lieu of Mathematics 223.
3. Required for students wishing to continue in all Science programs or the Applied Military Psychology program in Third Year at RRMC.
4. Required for students wishing to continue in Science programs in Third Year at RRMC.
5. Recommended for students wishing to continue in Naval Architecture at MIT.

COMBINED MAJOR PROGRAMS

1. Combined Major degrees in Science are offered in six combinations as follows:

   PHYSICS AND OCEANOGRAPHY
   PHYSICS AND COMPUTER SCIENCE
   PHYSICS AND EARTH OBSERVATIONAL SCIENCE
   OCEANOGRAPHY AND EARTH OBSERVATIONAL SCIENCE
   COMPUTER SCIENCE AND EARTH OBSERVATIONAL SCIENCE
   PSYCHOLOGY AND EARTH OBSERVATIONAL SCIENCE

2. A total of 36 units of credit in 3rd and 4th year are required for the degrees.

3. A student must achieve a minimum of 12 units of credit in each of the two major disciplines, a further 6 units of credit in other Science subjects, and 6 units of credit in Arts sub-jects.

4. Wherever Science electives are called for to complete degree requirements under "Other Sciences", these must be selected from 3rd and 4th year courses offered by the Physics, Chemistry, Mathematics, or Engineering Departments.

5. The programs for each of the six degrees are outlined in the following pages.

6. The table of NOTES at the end of this section defines the various changes to existing courses, and the new or renumbered courses which are being introduced for the Earth Observational Science program.

PHYSICS and OCEANOGRAPHY
SEMESTER SUMMARY

3RD YEAR

1st Semester		**Credits**
PH371	Electronics and Microcomputers	2.0
OC301	Descriptive Oceanography	1.5
OC321	Biological Oceanography	1.5
OC331	Chemical Oceanography	1.5
MA301	Differential Equations	1.5
MP311	Organizational Leadership and Managment	1.5
		9.5

2nd Semester		**Credits**
PH322	Intermediate Mechanics	1.5
PH332	Electro-Magnetic Wave Propagation	2.0
PH342	Remote Sensing	1.5
OC362	Acoustics	1.5
OC352	Oceanographic Methods	1.5
Arts or Science Elective		1.5
		9.5

4TH YEAR

1st Semester		**Credits**
PH401	Experimental Physics	0.5
PH421	Quantum Mechanics	1.5
PH411	Solid State	1.5
OC401	Geophysical and Geological Oceanography	1.5
OC451	Dynamical Oceanography	1.5
MA401	Complex Analysis	1.5
MA451	Analogue Signal Processing	1.5
		9.5

2nd Semester		**Credits**
PH432	Nuclear Physics	1.5
OC442	Practical Oceanography	0.5
OC462	Advanced Dynnamic Oceanography	1.5
SC492	Seminar	0.0
Science or Arts Elective		1.5
Arts or Science Elective		1.5
MP402	Professional & Ethical Issues	1.5
		8.0

CREDIT SUMMARY

PHYSICS	12.0
OCEANOGRAPHY	12.5
OTHER SCIENCE (Including 1 Elective)	6.0
ARTS (Including 2 Electives)	6.0
TOTAL CREDITS	**36.5**

HONOURS - COURSE

MA432	Advanced Applied Mathematics	1.5
HP473	Honours Project	1.0
MA302	Numerical Analysis	1.5
		4.0

PHYSICS AND OCEANOGRAPHY
SUBJECT SUMMARY
COMBINED MAJOR

		Credits	
PHYSICS			
PH322	Intermediate Mechanics	1.5	(3,0,0)
PH332	Electro-Magnetic Wave Propagation	2.0	(3,0,3)
PH342	Remote Sensing	1.5	(3,0,0)
PH371	Electronics & Microcomputers	2.0	(3,0,3)
PH401	Experimental Physics	0.5	(0,0,3)
PH411	Solid State Physics	1.5	(3,0,0)
PH421	Quantum Mechanics	1.5	(3,0,0)
PH432	Nuclear Physics	1.5	(3,0,0)
		12.0	
OCEANOGRAPHY			
OC301	Descriptive Oceanography	1.5	(3,0,0)
OC321	Biological Oceanography	1.5	(2,0,2)
OC331	Chemical Oceanography	1.5	(3,0,1)
OC352	Oceanographic Methods	1.5	(2,0,4)
OC362	Acoustics	1.5	(3,0,0)
OC401	Geophysical & Geological Oceanography	1.5	(3,0,0)
OC442	Practical Oceanography	0.5	(0,0,3)
OC451	Dynamical Oceanography	1.5	(3,0,0)
OC462	Advanced Dynamical Oceanography	1.5	(3,0,0)
		12.5	
OTHER SCIENCES			
MA301	Differential Equations	1.5	(3,0,0)
MA401	Complex Analysis	1.5	(3,0,0)
MA451	Analogue Signal Processing	1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	
ARTS			
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
Elective		1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	
TOTAL CREDITS		**36.5**	

HONOURS

Courses as above with the addition of:

MA432	Advanced Applied Mathematics	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
HP473	Honours Project	1.0	(0,0,2/0,0,2)
		4.0	

PHYSICS AND COMPUTER SCIENCE SEMESTER SUMMARY

3RD YEAR

1st Semester		**Credits**
PH371	Electronics & Microcomputers	2.0
CS321	Theory of Computing	1.5
CS341	Data Structures	1.5
MA301	Differential Equations	1.5
MP311	Organizational Leadership and Management	1.5
Arts or Science Elective		1.5
		9.5

2nd Semester		**Credits**
PH322	Intermediate Mechanics	1.5
PH332	Electro-Magnetic Wave Propagation	2.0
CS302	Introduct ion to Computer Systems	2.0
CS332	Programming Languages	1.5
MA302	Numerical Analysis	1.5
		8.5

4TH YEAR

1st Semester		**Credits**
PH401	Experimental Physics	0.5
PH421	Quantum Mechanic	1.5
PH411	Solid State Physics	1.5
CS421	Micro Architecture	1.5
CS411	Operating Systems	1.5
Arts or Science Elective		1.5
Arts or Science Elective		1.5
		9.5

2nd Semester

PH432	Nuclear Physics	1.5
PH412	Solid State Devices	1.5
CS402	Data Base Management Systems	1.5
CS412	Digital Design	1.5
Arts or Science Elective		1.5
MP402	Professional & Ethical Issues	1.5
SC492	Seminar	0.0
		9.0

CREDIT SUMMARY

PHYSICS	12.0
COMPUTER SCIENCE	12.5
OTHER SCIENCE (Including 2 Electives)	6.0
ARTS (Including 2 Electives)	6.0
TOTAL CREDITS	**36.5**

HONOURS

MA432	Advanced Applied	1.5
HP473	Honours project	1.0
Science Elective		1.5
		4.0

PHYSICS AND COMPUTER SCIENCE
SUBJECT SUMMARY
COMBINED MAJOR

PHYSICS		**Credits**	
PH322	Intermediate Mechanics	1.5	(3,0,0)
PH332	Electro-Magnetic Wave Propagation	2.0	(3,0,3)
PH371	Electronics & Microcomputers	2.0	(3,0,3)
PH401	Experimental Physics	0.5	(0,0,3)
PH411	Solid State Physics	1.5	(3,0,0)
PH421	Quantum Mechanics	1.5	(3,0,0)
PH412	Solid State Devices	1.5	(3,0,0)
PH432	Nuclear Physics	1.5	(3,0,0)
		12.0	

COMPUTER SCIENCE			
CS302	Introduction to Computer Systems	2.0	(4,0,2)
CS321	Theory of Computing	1.5	(3,0,0)
CS332	Programming Languages	1.5	(3,0,1)
CS341	Data Structures	1.5	(3,0,0)
CS402	Data Base Management System	1.5	(3,0,0)
CS411	Operating Systems	1.5	(3,0,1)
CS412	Digital Design	1.5	(2,0,4)
CS421	Microcomputer Architecture	1.5	(2,0,4)
		12.5	

OTHER SCIENCES			
MA301	Differential Equations	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
Elective		1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	

ARTS			
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
Elective		1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	

TOTAL CREDITS	**36.5**

HONOURS

Courses as above with the addition of:		
MA432 Advanced Applied Mathematics	1.5	(3,0,0)
Science Elective	1.5	(3,0,0)
HP473 Honours Project	1.0	(0,0,2/0,0,2)
	4.0	

PHYSICS AND EARTH OBSERVATIONAL SCIENCE SEMESTER SUMMARY

3RD YEAR

1st Semester		**Credits**
EO311	Descriptive Oceanography	1.5
EO321	Space and Surveillance Systems	1.5
MA301	Differential Equations	1.5
PH371	Electronics & Microcomputers	2.0
MP311	Organizational Leadership and Management	1.5
Arts or Science Elective		1.5
		9.5

2nd Semester		**Credits**
EO332	Meteorology	1.5
EO342	Optics and Remote Sensing	1.5
MA302	Numerical Analysis	1.5
PH332	Electro-Magnetic Waves	2.0
PH362	Acoustics	1.5
PH322	Intermediate Mechanics	1.5
		9.5

4TH YEAR

1st Semester		**Credits**
EO411	Satellite Dynamics	1.5
EO431	Digital Image Processing	1.5
MA451	Analogue Signal Processing	1.5
EO491	Space; Law and Politics	1.5
PH401	Experimental Physics	0.5
PH411	Solid State Physics	1.5
PH421	Quantum Mechanics	1.5
		9.5

2nd Semester		**Credits**
EO452	Satellite and Aerial Surveillance	1.5
EO462	Satellite Communications	1.5
SC492	Seminar	0.0
PH432	Applied Nuclear Physics	1.5
MP402	Professional & Ethical Issues	1.5
Science or Arts Elective		1.5
		7.5

CREDIT SUMMARY

PHYSICS	12.0
EARTH OBSERVATIONAL SCIENCE	12.0
OTHER SCIENCE (Includes 1 Elective)	6.0
ARTS (Includes 1 Elective)	6.0
TOTAL CREDITS	**36.0**

HONOURS

MA432	Advanced Applied Mathematics	1.5
	Science Elective	1.5
HP473	Honours Project	1.0
		4.0

PHYSICS AND EARTH OBSERVATIONAL SCIENCE
SUBJECT SUMMARY

COMBINED MAJOR

PHYSICS		**Credits**	
PH322	Intermediate Mechanics	1.5	(3,0,0)
PH332	Electro-Magnetic Wave Propagation	2.0	(3,0,3)
PH371	Electronics & Microcomputers	2.0	(3,0,3)
PH362	Acoustics	1.5	(3,0,0)
PH401	Experimental Physics	0.5	(0,0,3)
PH411	Solid State Physics	1.5	(3,0,0)
PH421	Quantum Mechanics	1.5	(3,0,0)
PH432	Applied Nuclear Physics	1.5	(3,0,0)
		12.0	

EARTH OBSERVATIONAL SCIENCES			
EO311	Descriptive Oceanograpgy	1.5	(3,0,0)
EO321	Space & Surveillance Systems	1.5	(3,0,0)
EO332	Meteorology	1.5	(3,0,0)
EO342	Optics and Remote Sensing	1.5	(3,0,0)
EO411	Satellite Dynamics	1.5	(3,0,0)
EO431	Digital Image Processing	1.5	(3,0,0)
EO452	Satellite and Aerial Surveillance	1.5	(3,0,0)
EO462	Satellite Communications	1.5	(3,0,0)
SC492	Seminar	0.0	(0,2,0)
		12.0	

OTHER SCIENCES			
MA301	Differential Equations	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
MA451	Analogue Signal Processing	1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	

ARTS			
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
EO491	Space; Law and Politics	1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	
TOTAL CREDITS		**36.0**	

HONOURS

Courses as above with the addition of:			
MA432	Advanced Applied Mathematics	1.5	(3,0,0)
Science Elective		1.5	(3,0,0)
HP473	Honours Project	1.0	(0,0,2/0,0,2)
		4.0	

OCEANOGRAPHY AND EARTH OBSERVATIONAL SCIENCE SEMESTER SUMMARY

3RD YEAR

1st Semester		**Credits**
EO311	Descriptive Oceanography	1.5
EO321	Space and Surveillance Systems	1.5
MA301	Differential Equations	1.5
OC321	Biological Oceanography	1.5
OC331	Chemical Oceanography	1.5
MP311	Organizational Leadership and Management	1.5
		9.0

3RD YEAR

2nd Semester		**Credits**
EO332	Meteorology	1.5
EO342	Optics and Remote Sensing	1.5
MA302	Numerical Analysis	1.5
PH322	Intermediate Mechanics	1.5
OC352	Oceanographic Methods	1.5
OC362	Acoustics	1.5
		9.0

4TH YEAR

1st Semester		**Credits**
EO411	Satellite Dynamics	1.5
EO431	Digital Image Processing	1.5
EO491	Space; Law and Politics	1.5
MA451	Analogue Signal Processing	1.5
OC401	Geophysical Oceanography	1.5
OC451	Dynamic Oceanography	1.5
		9.0

4TH YEAR

2nd Semester		**Credits**
EO452	Satellite and Aerial Surveillance	1.5
EO462	Satellite Communications	1.5
SC492	Seminar	0.0
OC442	Practical Oceanography	0.5
OC462	Advanced Dynnamic Oceanography	1.5
OC402	Robotics and Applications	1.5
MP402	Professional & Ethical Issues	1.5
Arts Elective		1.5
		9.5

CREDIT SUMMARY

OCEANOGRAPHY	12.5
EARTH OBSERVATIONAL SCIENCE	12.0
OTHER SCIENCE	6.0
ARTS (Including 1 Elective)	6.0
TOTAL CREDITS	**36.5**

HONOURS

MA432	Avanced Applied Mathematics	1.5
Science Elective		1.5
HP473	Honours Project	1.0
		4.0

OCEANOGRAPHY AND EARTH OBSERVATIONAL SCIENCE
SUBJECT SUMMARY

COMBINED MAJOR

OCEANOGRAPHY		**Credits**	
OC321	Biological Oceanography	1.5	(2,0,2)
OC331	Chemical Oceanography	1.5	(3,0,1)
OC352	Oceanography Methods	1.5	(2,0,4)
OC362	Acoustics	1.5	(3,0,0)
OC401	Geophysical Oceanography	1.5	(3,0,0)
OC402	Robotics and Applications	1.5	(3,0,0)
OC442	Practical Oceanography	0.5	(0,0,3)
OC451	Intro Dynamical Oceanography	1.5	(3,0,0)
OC462	Advanced Dynamical Oceanog.	1.5	(3,0,0)
		12.5	
SPACE SCIENCES			
EO332	Meteorology	1.5	(3,0,0)
EO342	Optics and Remote Sensing	1.5	(3,0,0)
EO311	Descriptive Oceanography	1.5	(3,0,0)
EO431	Digital Image Processing	1.5	(3,0,0)
EO452	Satellite and Aerial Surveillance	1.5	(3,0,0)
EO321	Space & Surveillance Systems	1.5	(3,0,0)
EO411	Satellite Dynamics	1.5	(3,0,0)
EO462	Satellite Communications	1.5	(3,0,0)
SC492	Seminar	0.0	(0,2,0)
		12.0	
OTHER SCIENCES			
MA301	Differential Equations	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
MA451	Analogue Signal Processing	1.5	(3,0,0)
PH322	Intermediate Mechanics	1.5	(3,0,0)
		6.0	
ARTS			
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
EO491	Space; Law and Politics	1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	
TOTAL CREDITS		**36.5**	

HONOURS

Courses as above with the addition of:

MA432	Advanced Applied Mathematics	1.5	(3,0,0)
Science Elective		1.5	(3,0,0)
HP493	Honours Project	1.0	(0,0,2/0,0,2)
		4.0	

COMPUTER SCIENCE AND EARTH OBSERVATIONAL SCIENCE SEMESTER SUMMARY

3RD YEAR

1st Semester		**Credits**
EO311	Descriptive Oceanography	1.5
EO321	Space and Surveillance Systems	1.5
MA301	Differential Equations	1.5
CS321	Theory of Computing	1.5
CS341	Data Structures	1.5
MP311	Organizational Leadership and Management	1.5
		9.0

2nd Semester		**Credits**
EO342	Optics and Remote Sensing	1.5
EO332	Meteorology	1.5
PH322	Intermediate Mechanics	1.5
MA302	Numerical Analysis	1.5
CS302	Introduction to Computer Systems	2.0
CS332	Programming Languages	1.5
		9.5

4TH YEAR

1st Semester

EO411	Satellite Dynamics	1.5
EO431	Digital Image Processing	1.5
CS421	Micro Architecture	1.5
CS411	Operating Systems	1.5
MA451	Analogue Signal Proc.	1.5
EO491	Space; Law and Politics	1.5
		9.0

2nd Semester

EO452	Satellite and Aerial Surveillance	1.5
EO462	Satellite Communications	1.5
SC492	Seminar	0.0
CS412	Digital Design	1.5
CS402	Data Base Management Systems	1.5
MP402	Professional & Ethical Issues	1.5
Arts Elective		1.5
		9.0

CREDIT SUMMARY

COMPUTER SCIENCE	12.5
EARTH OBSERVATIONAL SCIENCE	12.0
OTHER SCIENCE	6.0
ARTS (Including 1 Elective)	6.0
TOTAL CREDITS	**36.5**

HONOURS

MA432	Advanced Applied Mathematics	1.5
Science Elective		1.5
HP473	Honours Project	1.0
		4.0

COMPUTER SCIENCE AND EARTH OBSERVATIONAL SCIENCE
SUBJECT SUMMARY

COMBINED MAJOR

COMPUTER SCIENCE		**Credits**	
CS302	Introduction to Computer Systems	2.0	(4,0,2)
CS321	Theory of Computing	1.5	(3,0,0)
CS332	Programming Languages	1.5	(3,0,1)
CS341	Data Structures	1.5	(3,0,0)
CS402	Data Base Management Systems	1.5	(3,0,0)
CS411	Operating Systems	1.5	(3,0,1)
CS412	Digital Design	1.5	(2,0,4)
CS421	Microcomputer Architecture	1.5	(2,0,4)
		12.5	

EARTH OBSERVATIONAL SCIENCES			
EO332	Meteorology	1.5	(3,0,0)
EO342	Optics and Remote Sensing	1.5	(3,0,0)
EO311	Descriptive Oceanography	1.5	(3,0,0)
EO431	Digital Image Processing	1.5	(3,0,0)
EO452	Satellite and Aerial Surveillance	1.5	(3,0,0)
EO321	Space and Surveillance Systems	1.5	(3,0,0)
EO411	Satellite Dynamics	1.5	(3,0,0)
EO462	Satellite Communications	1.5	(3,0,0)
SC492	Seminar	0.0	(0,2,0)
		12.0	

OTHER SCIENCES			
MA301	Differential Equations	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
MA451	Analogue Signal Processing	1.5	(3,0,0)
PH322	Intermediate Mechanics	1.5	(3,0,0)
		6.0	

ARTS			
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
EO491	Space; Law and Politics	1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	

TOTAL CREDITS	**36.5**

HONOURS		**Credits**	
Courses as above with the addition of:			
MA432	Advanced Applied Mathematics	1.5	(3,0,0)
Science elective		1.5	(3,0,0)
HP473	Honours Project	1.0	(0,0,2/0,0,2)

APPLIED PSYCHOLOGY AND EARTH OBSERVATIONAL SCIENCE SEMESTER SUMMARY

3RD YEAR

1st Semester

EO311	Descriptive Oceanography	1.5
EO321	Space and Surveillance Systems	1.5
MA301	Differential Equations	1.5
AP361	Physiological Psychology	1.5
AP381	Statistics	1.5
MP311	Organizational Leadership and Management	1.5
		9.0

2nd Semester

EO332	Meteorology	1.5
EO342	Optics and Remote Sensing	1.5
MA302	Numerical Analysis	1.5
AP322	Applied Military Psychology - I	1.5
AP362	Research Methods	1.5
PH322	Intermediate Mechanics	1.5
		9.0

4TH YEAR

1st Semester

EO411	Satellite Dynamics	1.5
EO431	Digital Image Processing	1.5
MA451	Analogue Signal Processing	1.5
EO491	Space; Law and Politics	1.5
AP461	Cognitive Processes	1.5
AP441	Personnel Psychology	1.5
		9.0

2nd Semester		**Credits**
EO452	Satellite and Aerial Surveillance	1.5
EO462	Satellite Communications	1.5
SC492	Seminar	0.0
AP372	Sensation & Perception	1.5
AP462	Human Factors in Engineering	1.5
MP402	Professional & Ethical Issues	1.5
Arts Elective		1.5
		9.0

CREDIT SUMMARY

PSYCHOLOGY	12.0
EARTH OBSERVATIONAL SCIENCE	12.0
OTHER SCIENCE	6.0
ARTS (Including 1 Elective)	6.0
TOTAL CREDITS	**36.0**

HONOURS

MA432	Advanced Applied Mathematics	1.5
Science Elective		1.5
HP473	Honours Project	1.0
		4.0

APPLIED PSYCHOLOGY AND EARTH OBSERVATIONAL SCIENCE
SUBJECT SUMMARY
COMBINED MAJOR

APPLIED PSYCHOLOGY

AP322	Applied Military Psychology - I	1.5	(3,0,0)
AP361	Physiological Psychology	1.5	(3,0,0)
AP362	Research Methods	1.5	(3,0,0)
AP372	Sensation & Perception	1.5	(3,0,0)
AP381	Statistics	1.5	(3,0,0)
AP441	Personnel Psychology	1.5	(3,0,0)
AP461	Cognitive Processes	1.5	(3,0,0)
AP462	Human Factors in Engineering	1.5	(3,0,0)
		12.0	

EARTH OBSERVATIONAL SCIENCES

		Credits	
EO311	Descriptive Oceanography	1.5	(3,0,0)
EO321	Space & Surveillance Systems	1.5	(3,0,0)
EO332	Meteorology	1.5	(3,0,0)
EO342	Optics and Remote Sensing	1.5	(3,0,0)
EO411	Satellite Dynamics	1.5	(3,0,0)
EO431	Digital Image Processing	1.5	(3,0,0)
EO452	Satellite and Aerial Surveillance	1.5	(3,0,0)
EO462	Satellite Communications	1.5	(3,0,0)
SC492	Seminar	0.0	(0,2,0)
		12.0	

OTHER SCIENCES

MA301	Differential Equations	1.5	(3,0,0)
MA302	Numerical Analysis	1.5	(3,0,0)
MA451	Analogue Signal Processing	1.5	(3,0,0)
PH322	Intermediate Mechanics	1.5	(3,0,0)
		6.0	

ARTS

MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
EO491	Space; Law and Politics	1.5	(3,0,0)
	Elective	1.5	(3,0,0)
		6.0	

TOTAL CREDITS **36.0**

HONOURS

Courses as above with the addition of:

MA432	Advanced Applied Mathematics	1.5	(3,0,0)
	Science Elective	1.5	(3,0,0)
HP473	Honours Project	1.0	(3,0,0)
		4.0	

THIRD AND FOURTH YEAR
MAJOR PROGRAMS IN SCIENCE

1. At the current time there is only one Major B.Sc. program in Science offered at RRMC:

APPLIED PSYCHOLOGY

2. A total of 30 units of credit in 3rd and 4th year are required to meet the degree requirements.
3. A student must achieve a minimum of 15 units of credit in the major field, a further minimum of 9 units of credit in other Science subjects, and 6 units of credit in Arts subjects, including 3 units of credit in Military Leadership courses. The "Other Science" credits must be drawn from courses outside of the field of Psychology.
4. The Psychology program is outlined in the following pages.

APPLIED PSYCHOLOGY

3RD YEAR

1st Semester		**Credits**
AP361	Physiological Psychology	1.5
AP381	Statistics	1.5
MP311	Organizational Leadership and Management	1.5
MA301	Differential Equations	1.5
Arts or Science Elective		1.5
		7.5

2nd Semester		
AP362	Research Methods	1.5
AP372	Sensation/Perception	1.5
AP322	Military Psychology - I	1.5
Arts or Science Elective		1.5
Arts or Science Elective		1.5
		7.5

4TH YEAR

1st Semester		
AP461	Cognitive Processes	1.5
AP441	Personnel Psychology	1.5
AP471	Research Project	1.0
Science Elective		1.5
Arts or Science Elective		1.5
Arts or Science Elective*		1.5
		8.5

2nd Semester		**Credits**
AP462	Human Factors in Engineering	1.5
AP422	Advanced Military Psychology	1.5
MP402	Professional Ethics	1.5
AP4—	Psychology Elective	1.5
Arts or Science Elective		1.5
		7.5

* MP112 (1.5) MUST be taken as an Arts Elective in 3rd Year, if not completed earlier.

CREDIT SUMMARY

PSYCHOLOGY	16.0
SCIENCE	9.0
ARTS	6.0
TOTAL CREDITS	**31.0**

HONOURS

AP481	Advanced Stats	1.5
AP483	Senior Thesis	2.5
		4.0
Drop AP471 Research Project		(1.0)
		34.0

* If necessary to meet the Science/Arts elective requirements.

APPLIED PSYCHOLOGY

AP322	Military Psychology	1.5	(3,0,0)
AP361	Physiological Psychology	1.5	(3,0,0)
AP362	Research Methods	1.5	(3,0,0)
AP372	Sensation & Perception	1.5	(3,0,0)
AP381	Statistics	1.5	(3,0,0)
AP422	Advanced Military Psychology	1.5	(3,0,0)
AP4—	Psychology Elective	1.5	(3,0,0)
AP441	Personnel Psychology	1.5	(3,0,0)
AP461	Cognitive Processes	1.5	(3,0,0)
AP462	Human Factors in Engineering	1.5	(3,0,0)
AP471	Research Project	1.0	(1,0,0)
		16.0	

OTHER SCIENCES

MA301	Differential Equations	1.5	(3,0,0)
Plus minimum 7.5 units of Science Electives		7.5	
		9.0	

ARTS		**Credits**	
MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
Elective		1.5	(3,0,0)
Arts Elective*		1.5	(3,0,0)
		6.0	
TOTAL CREDITS		**31.0**	

HONOURS

Courses as above with the addition of:			
AP481	Advanced Statistics	1.5	(3,0,0)
AP483	Senior Research Project	2.5	(3,0,0)
		4.0	
Drop AP 471 Research Project		(1.0)	
TOTAL CREDITS		**34.0**	

* If not already completed in second year.

THIRD AND FOURTH YEAR JOINT CONCENTRATION PROGRAMS

B.Sc. GENERAL PROGRAM, WITH SPECIALIZATION IN TWO AREAS OF CONCENTRATION

A TOTAL OF 30 UNITS OF CREDIT IN 3RD AND 4TH YEAR COURSES ARE REQUIRED FOR THE DEGREE.

1. The student chooses 9 units from each of two concentrations chosen from Earth Observational Science, Mathematics, Physics, Oceanography, Computer Science or Engineering Sciences. In addition, the concentration of Psychology may be taken jointly with Earth Observational Science. Care must be taken to ensure prerequisites are satisfied (e.g., MA301 is prerequisite to most Science courses).

2. The electives under "Other Sciences" must be drawn from courses taught by the Physics, Chemistry, Mathematics, or Engineering Departments.

NOTE: A small number of courses are double-listed, e.g., OC362 and PH362, both of which represent the same course in Acoustics. Such courses may be counted toward one concentration only.

The choices are as follows:

EARTH OBSERVATIONAL SCIENCES		**Credits**	**Prerequisites**	
EO311	Descriptive Oceanography	1.5	(3,0,0)	
EO321	Space and Surveillance Systems	1.5	(3,0,0)	
EO332	Meteorology	1.5	(3,0,0)	
EO342	Optics & Remote Sensing	1.5	(3,0,0)	
EO411	Satellite Dynamics	1.5	(3,0,0)	PH322
EO431	Digital Image Processing	1.5	(3,0,0)	MA301
EO442	Robotics	1.5	(3,0,0)	PH322
EO452	Satellite and Aerial Surveillance	1.5	(3,0,0)	PH322
EO462	Satellite Communications	1.5	(3,0,0)	
EO492	Seminar	0.0	(0,2,0)	
MATHEMATICS				
MA252	Linear Algebra	1.5	(3,0,0)	
MA301	Differential Equations	1.5	(3,0,0)	
MA401	Complex Analysis	1.5	(3,0,0)	MA301
And 6 units of credit selected from:				
MA302	Numerical Analysis	1.5	(3,0,0)	MA301,MA252
MA422	Digital Signal Processing	1.5	(3,0,0)	
MA451	Analogue Signal Processing	1.5	(3,0,0)	MA301
EO411	Satellite Dynamics	1.5	(3,0,0)	PH322
EO431	Digital Image Processing	1.5	(3,0,0)	MA451
PH322	Intermediate Mechanics	1.5	(3,0,0)	MA301
EG322	Applied Fluid Dynamics	1.5	(3,0,0)	MA301

PHYSICS		**Credits**	**Prerequisites**	
PH322	Intermediate Mechanics	1.5	(3,0,0)	MA301
PH332	Electro-Magnetic Wave Propagation	2.0	(3,0,3)	MA301
PH342	Applied Optics & Remote Sensing	1.5	(3,0,0)	
PH362	Acoustics	1.5	(3,0,0)	MA301
PH371	Electronics & Microcomputers	2.0	(3,0,3)	
PH411	Solid State Physics	1.5	(3,0,0)	MA301
PH412	Solid State Devices	1.5	(3,0,0)	PH411,PH421
PH421	Quantum Mechanics	1.5	(3,0,0)	
PH432	Applied Nuclear	1.5	(3,0,0)	MA301

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

CH401	Applied Thermodynamics	1.5	(3,0,0)	
OC401	Geophysical & Geological Oceanography	1.5	(3,0,0)	PH332,MA301
MA432	Advanced Applied Mathematics	1.5	(3,0,0)	MA301
EG322	Applied Fluid Mechanics	1.5	(3,0,1)	

OCEANOGRAPHY

OC301	Descriptive Oceanography	1.5	(3,0,0)	
OC321	Biological Oceanography	1.5	(2,0,2)	
OC331	Chemical Oceanography	1.5	(3,0,1)	

And 4.5 units of credit selected from:

OC352	Oceanographic Methods	1.5	(2,0,4)	OC301, OC321 OC331
OC362	Acoustics	1.5	(3,0,0)	MA301
OC401	Geophysical & Geological Oceanography	1.5	(3,0,0)	PH332, MA301
OC451	Introduction to Dynamic Oceanography	1.5	(3,0,0)	OC301
OC412	Meteorology	1.5	(3,0,0)	
OC432	Geochemistry of Marine Sediments	1.5	(3,0,0)	OC331
OC442	Practical Marine Oceanography	0.5	(0,0,3)	OC301
OC462	Advanced Dynamic Oceanography	1.5	(3,0,0)	OC301, MA301, OC451

With the written permission of the Dean of Science and Engineering the following course may be substituted for credit in the Oceanography concentration, if not applied to a second concentration:

PH342	Remote Sensing	1.5	(3,0,0)

COMPUTER SCIENCE

CS302	Intro to Computer Systems	2.0	(4,0,2)	CS211
CS341	Data Structures	1.5	(3,0,0)	CS211

And 6 units of credit selected from:

CS321	Theory of Computing	1.5	(3,0,0)	CS211
CS332	Programming Languages	1.5	(3,0,1)	CS341
CS402	Data Base Management Systems	1.5	(3,0,0)	CS341
CS411	Operating Systems	1.5	(3,0,1)	CS302,CS332
CS412	Digital Design	1.5	(2,0,4)	CS421
CS421	Microcomputer Architecture	1.5	(2,0,4)	CS302
CS431	Interactive Computer Graphics	1.5	(3,0,0)	CS211

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

MA302	Numerical Analysis	1.5	(3,0,0)	MA301,MA252
EG322	Applied Fluid Mechanics	1.5	(3,0,1)	
EG402	Robotics and Applications	1.5	(3,0,0)	PH322

ENGINEERING SCIENCE		**Credits**	**Prerequisites**	
EG322	Applied Fluid Mechanics	1.5	(3,0,1)	

And 7.5 units of credit selected from:

EG321	Space and Surveillance Systems	1.5	(3,0,0)	
EG402	Robotics and Applications	1.5	(3,0,0)	PH322
EG431	Interactive Computer Graphics	1.5	(3,0,3)	CS211
EG442	Satellite Communications	1.5	(3,0,0)	PH322
CS412	Digital Design	1.5	(2,0,4)	CS421
CS421	Microcomputer Architecture	1.5	(2,0,4)	CS302
CH401	Applied Thermodynamics	1.5	(3,0,0)	
MA451	Analogue Signal Processing	1.5	(3,0,0)	MA301
PH322	Intermediate Mechanics	1.5	(3,0,0)	MA301
PH371	Electronics & Microcomputers	2.0	(3,0,3)	

APPLIED PSYCHOLOGY

AP322	Military Psychology	1.5	(3,0,0)	
AP361	Physiological Psychology	1.5	(3,0,0)	
AP362	Research Methods	1.5	(3,0,0)	
AP372	Sensation & Perception	1.5	(3,0,0)	
AP381	Statistics	1.5	(3,0,0)	
AP422	Advanced Military Psychology	1.5	(3,0,0)	AP322
AP441	Personnel Psychology	1.5	(3,0,0)	
AP452	Tests and Measure	1.5	(3,0,0)	
AP461	Cognitive Processes	1.5	(3,0,0)	
AP462	Human Factors in Engineering	1.5	(3,0,0)	
AP471	Research Project	1.0	(1,0,0)	
AP472	Human Physiology	1.5	(3,0,0)	

The remaining 12 units of credit are selected as follows:

OTHER SCIENCES

Elective	1.5	(3,0,0)
Elective	1.5	(3,0,0)
Elective	1.5	(3,0,0)
Elective	1.5	(3,0,0)
	6.0	

ARTS

MP311	Organizational Leadership and Management	1.5	(3,0,0)
MP402	Professional & Ethical Issues	1.5	(3,0,0)
Elective*		1.5	(3,0,0)
Elective		1.5	(3,0,0)
		6.0	
TOTAL CREDITS		**30.0**	

* Students choosing the EARTH OBSERVATIONAL SCIENCE concentration must take the EO491 course. All others would take an Arts Elective of their choice, subject to availability and scheduling.

DOUBLE LISTED COURSES IN CALENDAR

1. OC362) Acoustics
   PH362)
2. OC412) Meteorology
   EO332)
3. PH342) Optics & Remote
   EO342) Sensing
4. EG321) Space & Surveil-
   EO321) lance Systems
5. EG411) Satellite Dynamics
   EO411)
6. EG402) Robotics and
   OC402) Applications
   EO442)
7. EG431) Interactive
   CS431) Computer Graphics
8. OC301) Descriptive
   EO311) Oceanography
9. EO491) Space; Law and
   PS461) Politics

COURSE DESCRIPTIONS

APPLIED PSYCHOLOGY 322: Military Psychology, Part One [1.5] (3,0,0)

A required course for students electing the BSc major program.

This course is intended to provide leaders with a better understanding of the human factor in both combat and pre-combat situations 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.

APPLIED PSYCHOLOGY 361: Elements of Physiological Psychology [1.5] (3,0,0)

A required course, normally offered in second year, for students electing a major in applied military psychology.

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.

APPLIED PSYCHOLOGY 362: Introduction to Research Methods [1.5] (3,0,0)

A required course for students electing the BSc major program.

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.

APPLIED PSYCHOLOGY 372: Sensation and Perception [1.5] (3,0,0)

A required course, normally offered in second year, for students electing a major in applied military psychology.

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.

APPLIED PSYCHOLOGY 381: Statistics for the Behavioural Sciences [1.5] **(3,0,0)**

A required course for students electing the BSc major program.

This course applies statistical concepts to the behavioural sciences. Students will peruse and understand such concepts as measures of central tendency, measures of dispersion, and the normal distribution. They will determine relationships between data and apply models related to prediction. Hypothesis testing involving dependent and independent data will be introduced and will lead to simple two-way analysis of variance. The course will conclude with an introduction to non-parametric statistics.

APPLIED PSYCHOLOGY 422: Military Psychology, Part Two [1.5] **(3,0,0)**

A required course for students electing the BSc major program.

This course is a continuation of AP 322 and consists of a comprehensive examination of several militarily relevant topics.

APPLIED PSYCHOLOGY 441: Personnel Psychology [1.5] **(3,0,0)**

A required course for students electing the BSc major program.

This course consists of a comprehensive review of essential personnel psychology concepts and techniques; recruitment and placement; training and development; compensation and motivation; appraisal and career management; and the legal environment.

APPLIED PSYCHOLOGY 452: Psychological Tests and Measurement [1.5] **(3,0,0)**

An elective course for students electing the BSc major program. A required course for students admitted to the honours BSc major program.

A study of the basic concepts of measurement in psychology and the application of these concepts in selected areas of psychology. The principal topics of the course will be historical foundations, basic concepts such as reliability, validity, and invariance, the use of different tests and instruments, scaling, and the unique aspects of measurement encountered in different areas of psychology.

APPLIED PSYCHOLOGY 461: Cognitive Processes [1.5] **(3,0,0)**

A required course for students electing the BSc major programs.

This course provides the student with an introduction into mental processes and information processing. The topics include human memory, attention, and thought processes. Both visual and auditory cognition will be discussed, as well as the cognitive approach to higher mental processes. The methods used in measuring mental processes will be examined with examples provided by various in-class experiments and demonstrations. In addition, the topic of artificial intelligence and the problems facing the design of "thinking machines" will be discussed in the course.

APPLIED PSYCHOLOGY 462: Human Factors in Engineering [1.5] (3,0,0)

A required course for students electing the BSc major program.

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)

A required course for students electing the BSc major program.

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 [1.5] (3,0,0)

An alternate course to AP 452 for students admitted to the honours BSc major programs.

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 483: Psychology Honours Thesis [2.5] (0,3,0/0,3,0)

A required course for students admitted to the honours BSc major programs.

Fourth Year students in the Honours program will complete research in an area related to Applied Military Psychology. The thesis must be defended in accordance with thesis regulations. Students should familiarize themselves with the regulations of this Calendar which pertain to RRMC Honours programs.

CHEMISTRY 103: General Chemistry [3] (3,0,3/3,0,3)

This course introduces the fundamental laws that govern the behaviour of matter. The material presented develops an understanding of current modern theories by introducing them as they were developed historically from simple ideas of atoms to quantum theory.

The first semester focuses on the properties of the electron. A physical and mathematical description is developed that allows an understanding of atomic properties, bonding and structure. The second semester is concerned with molecular interactions is gases, liquids, solids and solutions. Energetics of chemical reactions are studied with an emphasis on equilibrium, kinetics, thermodynamics and electrochemistry. The course finishes by relating all these ideas to topics of current chemical interest.

The laboratory course is designed to complement the lecture material by illustrating important chemical principles while at the same time introducing standard laboratory techniques. Included are methods of separation and purification, redox and pH titrations, voltaic cell construction and gas reactions. Modern spectrophotometric methods are used for quantitative analysis and equilibrium and kinetic studies.

CHEMISTRY 203: Thermodynamics [3] **(2,0,0/3,0,0)**

The course is offered for second year Engineering studentsand 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. Free energy, chemical potential and equilibrium; electrode potentials and cells, the phase rule, time phase systems 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.

Co-requisite: Math 223 or Math 233

CHEMISTRY 243: Thermodynamics [3] **(2,0,0/3,0,3)**

Taken by Science students in both semesters.

This course consists of the lecture series covered by Chem 203, plus, in the second semester, a weekly laboratory session which accompanies 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.

Co-requisite: Math 223 or Math 233

CHEMISTRY 312: Applications of Chemistry [1.5] **(3,0,0)**

Topics chosen from:

Chemical Technology: review of bonding and structural chemistry;fuels, combustion processes; explosives; lubricants and protective coatings; organic and inorganic polymers; structures and properties of solids; electrochemistry of power sources; corrosion and corrosion control.

Chemical Industry: process development and process control; Industrial Bases: chlorine and sodium hydroxide, chemical and electrolytic preparation; limestone, lime and slaked lime. Air Quality: photochemical smog, acid rain and ozone, pollutant classification and control. Primary Inorganic Chemicals: sulphur and sulphuric acid, phosphoric acid and the potash industry, nitrogen containing materials. Chemical Perspectives of Topical Environmental Issues.

Given 1992/93 and in alternate years.

Prerequisite: Chem 103, 203/243, or equivalent.

CHEMISTRY 401: Applied Thermodynamics [1.5] **(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; psychometry and the application of thermodynamics to meteorology.

Prerequisite: Chemistry 203 or 243, or equivalent.

COMPUTER SCIENCE 122: An Introduction to Computing [1.5] **(2,0,2)**

A required course for 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 language Pascal is introduced and used as the language of instruction.

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

An elective course for Second Year Science students espe- cially those students wishing to take further Computer Science courses.

Topics from Computer Science. The contents will introduce students to a diversity of topics related to Computer Science and chosen from hardware, software, and operating systems.

Prerequisite: Computer Science 211.

COMPUTER SCIENCE 211: Programming Techniques and Applications [1.5] **(2,0,2)**

For second year Science or Engineering students.

Advanced programming language techniques, and application of these techniques to typical scientific problems. The basic programming techniques of Pascal learned in CS 122 are extended to include records, user-defined types, pointers and recursion. An introduction to data structures is given, including linked lists, stacks and trees. Algorithm efficiency is considered. Application of these ideas to problems of

searching, sorting, and expression evaluation is discussed. FORTRAN is introduced in the latter part of the course; syntactic differences with Pascal are presented, with emphasis on semantic similarities. Programming applications to solve basic problems in numerical analysis using the above ideas are done in FORTRAN.

Prerequisite: Computer Science 122

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

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

Prerequisite: Computer Science 211 or consent of the PIC, Computer Science.

COMPUTER SCIENCE 321: Theory of Computing [1.5] **(3,0,0)**

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

Prerequisite: Computer Science 211.

COMPUTER SCIENCE 332: Organization of Programming Languages [1.5] **(3,0,1)**

A study of several high level languages. Students will learn C, with emphasis both on its similarity to other languages such as Pascal, as well as important differences in its approach to certain problems. Ada may be discussed. Other languages of a quite different nature, such as Lisp or Prolog, will be studied, with attention paid to those characteristics notably different from algorithmic languages such as C and Pascal.

Prerequisite: Computer Science 341 or consent of the PIC, Computer Science.

COMPUTER SCIENCE 341: Data Structures [1.5] **(3,1,0)**

An introduction to Data Structures, with discussion of file processing. The course will examine the concept of an abstract data structure, with emphasis on both the implementation and application of such structures. Particular structures considered will include stacks, queues, trees and graphs, including variations of these. Application of these to problems such as data compression will be included. The course will also include an introduction to the managing and processing of data in files.

Prerequisite: Computer Science 211.

COMPUTER SCIENCE 402: Data Base Management Systems [1.5] **(3,0,0)**

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

Prerequisite: Computer Science 341.

COMPUTER SCIENCE 411: Operating Systems [1.5] **(3,0,1)**

Resource management including memory, processor, processes and devices. Topics concerned with memory management will include operation of loaders, segmentation and paging. Control of multiple processes will include discussion of process dispatching and queue management. Concurrency, mutual exclusion, synchronization and communication, I/O buffering and request processing will be considered.

Prerequisite: Computer Science 302 and 332 or consent of the PIC, Computer Science.

COMPUTER SCIENCE 412: Digital Design [1.5] **(2,0,4)**

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

Prerequisite: Computer Science 421.

COMPUTER SCIENCE 421: Microcomputer Architecture [1.5] **(2,0,4)**

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

Prerequisite: Physics 371 and Computer Science 302 or consent of the PIC, Computer Science.

COMPUTER SCIENCE 431: Interactive Computer Graphics [1.5] **(3,0,0)**
(also named EG 431)

Course content will include introduction to interactive computer graphics software and hardware; computer graphics programming using Pascal with standard

graphics packages; two- and three-dimensional transformations; data structures for representing graphical objects; and achieving realism in the display of three-dimensional images.

This course is intended primarily for Science students who are conversant in Pascal.

Prerequisite: Computer Science 112 (Engineering 261 is recommended)

EARTH OBSERVATIONAL SCIENCE 311: Descriptive Oceanography (also named OC 301) [1.5] **(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.

EARTH OBSERVATIONAL SCIENCE 321: Space and Surveillance Systems (also named EG 321) [1.5] **(3,0,0)**

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

EARTH OBSERVATIONAL SCIENCE 332: Meteorology (also named OC 412) [1.5] **(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.

EARTH OBSERVATIONAL SCIENCE 342: Applied Optics and Remote Sensing (also named PH 342) [1.5] **(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.

EARTH OBSERVATIONAL SCIENCE 411: Satellite Dynamics (also named EG 411) [1.5] **(3,0,0)**

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

EARTH OBSERVATIONAL SCIENCE 431: Digital Image Processing [1.5] **(3,0,0)**

This course will introduce the basic concepts and techniques of digital image processing. Topics to be covered include digital image fundamentals, such as the elements of visual perception, types of imagery, image transforms such as the discrete Fourier, histogram modification, filtering, pseudo-colour, image restoration, methods of image compression, pattern recognition, and tracking algorithms. Extensive use will be made of the College ultra-high resolution Gould Image Processing System. The course will focus on imagery of the Canadian Arctic, applications used to measure the extent and thickness of ice packs, evidence of human activities, as well as thermal structures evident in infrared imagery of coastal oceans to determine water parameters pertaining to the acoustic detection of submarines.

EARTH OBSERVATIONAL SCIENCE 442: Robotics and Applications (also named EG 402, OC 402) [1.5] **(3,0,0)**

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

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

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

EARTH OBSERVATIONAL SCIENCE 452: Satellite and Aerial Surveillance [1.5] **(3,0,0)**

This course deals with the application of image processing and pattern recognition techniques to various kinds of imagery from satellite- and aircraft-borne systems. Among systems to be examined are SAR, SLAR, RADARSAT, DMSP, SARSAT, and GOES. Representative images in the visible, microwave, and infrared parts of the spectrum will be analyzed on the College's Image Analysis Systems. The kinds of information to be extracted include the extent and thickness of ice in the Canadian Arctic, the strength of winds and sea surface temperatures off Canada's coasts as well as meteorological conditions around the world. The effects on ambient noise levels and propagation are examined.

Note: To be offered in AY 93/94

EARTH OBSERVATIONAL SCIENCE 462: Satellite Communications [1.5] **(3,0,0)**

This course introduces the radio and laser aspects of satellite telemetry and communication systems. Existing satellite inventories and their purposes are described. The basic properties of signal power, propagation channels, coding and modulation methods, transponders and frequency bands are described. Satellite networks and their interactions are described. The radio aspects of the GPS system are covered. Applications to Search and Rescue.

Note: To be offered in AY 93/94

EARTH OBSERVATIONAL SCIENCE 491: Space; Law and Politics (also named PS 461) [1.5] **(3,0,0)**

This course examines the legal and political dimensions of space exploration. A general introduction to international law - including the relationship of law to politics - will be followed by an examination of the conventions governing the law of the sea and airspace. An understanding of the legal foundations of these subjects is preparatory to an appreciation of the nature and limits of the existing laws regulating activities in outer space. Topics to be discussed include the general regulation and administration of space activity, geostationary and sunsynchronous orbits, direct broadcasting satellites, problems of space debris, remote sensing, the boundaries of space, the status of weapons systems in space, private activities and responsibilities in space exploration and exploitation, and projections for future developments.

ENGINEERING 232: Mechanics of Materials [2] **(3,0,2)**

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

Review of statics; stresses due to axial loads, strain and axial deformation; stress due to temperature change; physical properties of materials, torsion of circular shafts and thin walled tubes; analysis of plane stress, stresses in beams due to bending, combined stresses. The elastic properties are emphasized throughout.

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

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

For second year General and Honours Science students.

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

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

For second year Engineering students.

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

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

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

ENGINEERING 321: Space and Surveillance Systems (Also named EO321) [1.5] **(3,0,0)**

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

ENGINEERING 322: Applied Fluid Mechanics [1.5] **(3,0,1)**

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

ENGINEERING 411: Satellite Dynamics [1.5] (Also named EO411) **(3,0,0)**

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

ENGINEERING 402: Robotics and Applications [1.5] (Also named OC402 and EO 442) **(3,0,0)**

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

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

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

Prerequisite: Physics 322.

ENGINEERING 431: Interactive Computer Graphics (also named CS 431) [1] **(3,0,1)**

Course content will include introduction to interactive computer graphics software and hardware; computer graphics programming using Pascal with standard graphics packages; two- and three-dimensional transformations; data structures for representing graphical objects; and achieving realism in the display of three-dimensional images.

This course is intended primarily for Science students who are conversant in Pascal.

Prerequisite: Computer Science 112 (Engineering 261 is recommended)

HISTORY 221: Canadian History for Engineers [1.5] **(3,0,0)**

This is a lecture survey course for second year Science and Engineering students, covering the history of Canada from 1867 to 1980, with particular emphasis on Canadian military history.

HONOURS PROJECT 473: Honours Science Project [1] **(0,0,2/0,0,2)**

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

The topic must be approved by Faculty Council.

LITERATURE 113: Literature of Science and Society [3] **(3,0,0/3,0,0)**

This is a required course in the first year Science & Engineering students.

This course focuses upon the teaching of the basic skills of writing through an examination of a series of model essays, short stories and various literary gears in the first term.

In the second term, the course is devoted to an analysis and an interpretation of utopian and dystopian themes based on the writings of Plato and More and a number of dystopian texts.

At the instructor's discretion, the work may involve the exploration of various themes, subjects and periods from ancient Greece to the present.

By adopting a humanitarian, ethical and interactional approach to socio-political problems, the course exposes officer cadets to ideals required by effective peacekeepers in the global vilage of our world.

MATHEMATICS 113: Calculus and Linear Algebra [5] **(5,3,0/5,2,0)**

For first year Science and Engineering students.

This course includes the normal topics of a first year calculus course and selected topics from elementary linear algebra.

Topics from both areas will be selected in each semester.

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

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

MATHEMATICS 223: Calculus, Vector Calculus, and Differential Equations [3] **(3,1,0/3,1,0)**

For General Science students and most Engineering students.

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

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

MATHEMATICS 233: Advanced Calculus, Vector Calculus, and Differential Equations [4] **(4,1,0/4,1,0)**

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

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

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

MATHEMATICS 241: Probability and Statistics [1.5] **(3,0,0)**

For second year Engineering students and General Science students.

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

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

MATHEMATICS 252: Linear Algebra [1.5] (3,0,0)

For second year Engineering students and all students intending to continue in Third Year Science programs at RRMC.

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

MATHEMATICS 301: Differential Equations [1.5] (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 superposition and Fourier series; applications to problems such as wave motion, heat transfer, gravitational potential, control theory, and Sturm-Liouville systems.

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

MATHEMATICS 302: Numerical Analysis [1.5] (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.

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

MATHEMATICS 401: Complex Analysis [1.5] (3,0,0)

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

Prerequisite: Mathematics 301, or consent of the Department.

MATHEMATICS 422: Digital Signal Processing [1.5] (3,0,0)

Frequency domain signal analysis, linear systems. The Fast Fourier Transform and Discrete Systems, including digital filter design, will be covered.

Prerequisite: MA 301, or consent of the instructor.

Not offered in 92/93.

MATHEMATICS 432: Advanced Applied Mathematics [1.5] (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.

Offered on demand.

Prerequisite: Mathematics 301, and consent of the Department.

MATHEMATICS 451: Analogue Signal Processing [1.5] **(3,0,0)**

Introduction to the one-dimensional Fourier Transform, linear systems. Reviews of probability theory, function of random variables. Characterization of random process; elementary signal detection.

Prerequisite: MA 301

MILITARY PSYCHOLOGY 111: The Psychology of the Individual - Part 1 (1.5] **(3,0,0)**

A required course for first year students in science and engineering.

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 PSYCHOLOGY 212: Social Psychology [1.5] **(3,0,0)**

A required course for all students.

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.

MILITARY PSYCHOLOGY 311: Organizational Leadership and Management [1.5] **(3,0,0)**

A required course for all students.

The purpose of this course is to study human behaviour in organizations at the individual and group level, including the effect of organization structure on behaviour. Specific attention will be given to concepts for developing and improving interpersonal skills. Topics include self awareness, leadership, group dynamics, work stress, problem solving, conflict resolution and interviewing/counselling.

MILITARY PSYCHOLOGY 402: Professional and Ethical Issues [1.5] **(3,0,0)**

A required course for all students.

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.

OCEANOGRAPHY 301: DESCRIPTIVE OCEANOGRAPHY
(also named EO 311) [1.5] **(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.

OCEANOGRAPHY 311: TOPICS IN OCEANOGRAPHY
(METOC COURSE) [1.5] **(3,0,0)**

This is a full-time three week course given in June each year under the sponsorship of the Directorate of Meteorology and Oceanography. Course participants are usually members of the Armed Forces or other government departments with occupations that require an understanding of the ocean and the basic processes which occur within it. The course focuses on physical oceanography and acoustics and includes topics such as seawater properties, ocean topography, ocean currents and circulation, heat budgets, ice, surface and internal waves, tides, turbulence, coastal oceano- graphy, acoustics, instrumentation, and data analysis. An introduction to marine geology, geophysics, biology and chemistry is also presented. Lectures and seminars are supplemented with tours of local waters which is used to demonstrate sampling, instrumentation and data handling techniques.

Thomson, A Study Guide for the MetOc Introductory Physical Oceanography Course.

Pickard and Emery, Descriptive Physical Oceanography.

Pond and Pickard, Introductory Dynamical Oceanography.

Urich, Principles of Underwater Sound.

OCEANOGRAPHY 321: Biological Oceanography [1.5] **(2,0,2)**

This is an introductory course in biological oceanography. Emphasis is placed on the physical and chemical processes in the oceans which influence marine life. In particular, the course is dedicated towards an understanding of the factors which control primary productivity (the base of the marine food chain). This leads to an estimate of the potential global fish production. Topics examined include: principles of taxonomy, bioluminescence, vertical migration of marine organisms, toxic red tides, evolution and marine ecosystems. Combined laboratory with OC 331.

OCEANOGRAPHY 331: Chemical Oceanography [1.5] **(3,0,1)**

This course considers the chemical composition and properties of seawater; in short, "what makes the sea salty?". This question is addressed both through traditional means, as well as using current advances for the definition of biogeochemical cycles.

Topics include: major and minor constituents of seawater; origins, cycling, residence times; marine organic matter; composition and formation of sediments; gas cycles within the ocean; the carbon dioxide cycle; chemical speciation; anthropogenic influences (pollution issues).

In the associated laboratory program, the adjacent Esquimalt Lagoon is used as a study area for the collection of samples. Procedures illustrate the approaches used during a formal oceanographic investigation. Subsequent analyses cover topics relevant to both OC 321 and 331. Thus, the data are interpreted in terms of the seasonal changes in the chemistry and biology of a marine ecosystem. Combined laboratory with OC 321.

OCEANOGRAPHY 352: Oceanographic Methods [1.5] **(2,0,4)**

The principles covered in Oceanography 301, 321, and 331 are applied in practical field and laboratory studies of the physics, biology and chemistry of local waters. Sea time will be available aboard both the College launch, (the Tayut) and the MSSV Strickland (in cooperation with the University of Victoria). Modern instrumentation will be employed in the measurement of current; temperature; salinity; oxygen, nutrient, trace metal concentrations; marine pollutants, etc. Data reduction and interpretation will be required. The student must submit a project report following the format outlined in the honours thesis regulations.

Prerequisite: Oceanography 301, 321, 331

OCEANOGRAPHY 362: Acoustics [1.5] **(3,0,0)**
(also named PH 362)

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.

Prerequisite: Physics 211, Mathematics 301.

OCEANOGRAPHY 401: Geophysical and Geological Oceanography [1.5] **(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; geodesy; geomagnetism and palaeomagnetism; geothermal studies; marine geophysics and geophysical prospecting.

Prerequisite: Physics 332

Co-requisite: MA 301

OCEANOGRAPHY 402: Robotics and Applications [1.5] (3,0,0)
(also named EG 402, EO 442))

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

This course abrings 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.

OCEANOGRAPHY 412: Meteorology [1.5] (Also named EO332) (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.

OCEANOGRAPHY 432: Geochemistry of Marine Sediments [1.5] (3,0,0)

This course considers the sources, distribution and fate of material accumulating on the ocean floor. Lithogenous, cosmogenous, and biogenous components are considered, as is the influence of pollution. Fluxes between the water column and sediments are discussed in terms of their effect on the overall biochemistry of selected elements. The establishment of sedimentary redox zones as a consequence of organic matter degradation and the influence of these on cycling processes will receive considerable attention. Pelagic and coastal regions will be compared and contrasted. Mineral resources (ocean mining, petroleum and gas reserves, manganese nodules, hydrothermal vents) will be considered in terms of their economic value, technological challenges and ownership implications. The impact of man's activities on the marine environment will be discussed using examples of current interest.

Offered on demand in alternate years.

Prerequisite: Oceanography 331, or consent of the Head of the Department of Chemistry.

OCEANOGRAPHY 442: Practical Marine Oceanography [0.5] (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 Head of the Department of Chemistry.

OCEANOGRAPHY 451: Introduction to Dynamic Oceanography [1.5] (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 Head of the Department of Chemistry.

OCEANOGRAPHY 462: Advanced Dynamic Oceanography [1.5] (3,0,0)

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

Prerequisite: Oceanography 451, Mathematics 301.

PHYSICS 103: Mechanics [2] (2,0,1/2,0,1)

For all first year students taking the Science and Engineering program of studies.

An introduction to the principles of physics through the study of mechanics. In the first semester the course includes the following topics: vectors; Newtonian kinematics; motion along a straight line, in a plane, and in three dimensions; friction; work; mechanical energy; conservation of energy; statics.

In the second semester topics include: dynamics; collisions; conservation of momentum; simple harmonic motion; Hooke's Law; the simple pendulum; rotational dynamics; moment of inertia; rotational energy; introduction to special relativity; law of universal gravitation.

PHYSICS 113: Optics and Electricity [3] (3,0,2/3,0,2)

For all First Year students taking the Science and Engineering program of studies.

An introduction to the principles of physics through the study of optics and electricity. In the first semester the course includes the following topics: nature and propagation of light; reflection; refraction; interference; diffraction; polarization; mirrors; lenses; optical instruments; electric charge and matter; Coulomb's Law; electric field; electrical potential; capacitance.

In the second semester the following topics are covered: electric current; Ohm's Law; DC circuits; Kirchhoff's Laws; concepts of magnetic field and Lorentz' force.

PHYSICS 201: AC Circuits [1.5] (2.5,0,3)

For all Second Year students taking the Science or Engineering program of studiesl optional for second year Science students.

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.

Prerequisite: Physics 103 and 113, Mathematics 113.

PHYSICS 202: Electromagnetism [1.5] **(2.5,0,3)**

For all Second Year students taking the Science or Engineering program of studies.

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.

Prerequisite: Physics 103 and 113, Mathematics 113.

PHYSICS 203: AC Circuits and Electromagnetism [3] **(2.5,0,3/2.5,0,3)**

For all Second Year students taking the 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.

Prerequisite: Physics 103 and 113, Mathematics 113.

PHYSICS 211: Vibrations and Waves [1] **(2.5,0,0)**

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.

Prerequisite: Physics 103 and 113, Mathematics 113.

PHYSICS 252: Modern Physics [1] **(2.5,0,0)**

For all Second Year students taking the Science or Engineering program of studies; mandatory for all students planning to take Third Year Science programs at RRMC.

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.

Prerequisite: Physics 103 and 113, Mathematics 113.

PHYSICS 322: Intermediate Mechanics [1.5] **(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.

Prerequisite: Physics 211 and 252, Mathematics 301.

PHYSICS 332: Electromagnetic Wave Propagation [2] **(3,0,3)**

This course deals with the creation, propagation, reflection and absorption of electromagnetic waves in homogeneous isotropic or layered media, and by transmission lines, wave guides, antennae, and cavities.

Prerequisite: Physics 203 and 211, and Mathematics 301.

Co-requisite: Physics 302.

PHYSICS 342: Applied Optics and Remote Sensing [1.5]
(Also named EO342) **(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.

PHYSICS 362: Acoustics [1.5] (Also named OC362) **(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.

Prerequisite: Physics 211, Mathematics 301.

PHYSICS 371: Electronics and Microcomputers [2] **(3,0,3)**

The course can be broken into three main sections:

I. Analog electronics; theory of operation of diodes and transistors and typical solid state circuits, operational amplifiers, analog control theory.

II. Digital electronics; gates, counters, registers, ROM, RAM, multiplexers, analog-digital and digital-analog conversion.

III. Introduction to microcomputers; architecture; timing; input- output; interfacing; simple programming; digital control.

The laboratory work deals with experiments on analog (25%) and digital (25%) electronics and with experiments involving simple programming, input-output and timing on single-board microcomputers (50%).

Prerequisite: Physics 203 and 252.

PHYSICS 401: Experimental Physics [0.5] **(0,0,3)**

For all Fourth Year students in the Combined Major Science program as well as for those General Science students who choose Physics 411 or Physics 421.

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

Co-requisite: Physics 411 or Physics 421.

PHYSICS 411: Solid State Physics [1.5] **(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.

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

Co-requisite: Physics 401.

PHYSICS 412: Solid State Device Technology [1.5] **(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, metallization, 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.

Prerequisite: Physics 411 and 421.

PHYSICS 421: Quantum Mechanics [1.5] **(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.

Co-requisite: Physics 401 and Physics 411.

PHYSICS 432: Applied Nuclear Physics [1.5] **(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.

Prerequisite: Mathematics 301, Physics 421 recommended.

SCIENCE 492: Seminar [0] **(0,2,0)**

A series of lectures in various topics of science, presented by guest speakers, members of the College staff, and students in the Honours Program.

SPACE SCIENCE 421: Astrodynamics [1.5] **(3,0,0)**

In this course the concepts to be discussed include time-dependent planetary orbits, trajectory mechanics, point of closest approach of two orbits, the multi-stage rocket problem, optimum planetocentric orbital manoeuvres, coplanar transfers between circular and elliptical orbits, non-coplanar orbital transfers, optimum intercept manoeuvres, optimum interplanetary transfers, minimum fuel, time, or initial weight-in-orbit interplanetary transfers, geocentric, lunar and interplanetary communications. The student should obtain an in-depth understanding of the probmels and solutions associated with putting and keeping man in space.

DEPARTMENT OF SECOND LANGUAGE TRAINING

Senior Teacher and Head of Department - J.G. Donnelly, BA, BPEd, Teach Cert.

Senior Teacher - D. Goulet, BPEd, Manpower Mgmt Cert.

Language Teacher - N. Arnold, BA, DipEd

Language Teacher - A. Hadley, BA, Dip Ed, MEd

Language Teacher - D. Hamel, BEd

Language Teacher - G. Lanteigne, BA, L. es-L., MA

Language Teacher - D. Lavoie, BAC Language, DEC

Language Teacher - B. Leclerc, BA, BEd

Language Teacher - S. Robert, BA, Teach Cert.

Language Teacher - A. Tétreault, BA

Language Teacher - D.R. Toyonaga, BA

One of the objectives of the Canadian Military College system is to develop the ability to communicate in the second language. Consequently, second language training is mandatory for all students who do not already possess a high level of competence in their second language, (i.e., francophones will receive training in English and anglophones will receive training in French).

Upon entry, students will be tested in four skills of their second language:

a. listening
b. speaking
c. reading
d. writing

Proficiency in each of these skills is measured on a six-point scale (0-5) to give a second language profile (e.g., "3321"). A student with a profile which totals 10 or more, including scores of at least level 3 in listening and speaking, will have attained the level of "functional" bilingualism. Scores of at least 4 in listening and speaking, with a minimum total of 14, signify the "integral" bilingualism level. Students reaching the "integral" level are exempt from second language training.

It is expected that many students will reach the "functional" level at the end of their fourth year. However, this level will probably be beyond the reach of those beginning the program with little or no competence in their second language, and relatively low aptitude for learning it. Consequently, a student who completes the language training program is expected to achieve at least the minimum acceptable standard of 2222 (or a total of 8) in order to fulfill the minimum second language training requirement for graduation.

In addition to this minimum requirement for graduation, students enroled in Second Language Training are required to show a satisfactory rate of progress at the end of each academic year.

Small, homogeneous classes, usually composed of eight students, will be established to give students the opportunity to progress according to their learning abilities. Five periods of instruction will be given every week during normal class

hours. First year students who do not achieve the "integral" level by the end of the academic year will also take an intensive summer course which usually lasts ten weeks.

To increase exposure to the second language and to underline the bilingual nature of RRMC, the College has established alternate English weeks and French weeks during which the students have the opportunity of working in their second language. In addition, students are strongly encouraged to take part in Immersion weekends organized by the SLT Department.

DRILL

Officer in Charge of Drill - Captain B. Billings

Drill Sergeant Major - Master Warrant Officer S. Kozlik, CD

Drill Instructor - Sergeant J.G. Dufresne, CD

Drill Instructor - Petty Officer 2nd Class J.J.G.R. Gaignard, CD

Bandmaster - Petty Officer 1st Class T.R. Vickery, CD

The objectives of the Drill program are: to teach the officer cadets the fundamentals of drill as required in the Canadian Forces; to develop discipline and esprit de corps; to stimulate the power of command through mutual instruction; and to promote leadership through responsibility in handling groups of officer cadets.

Reference: A-PD-201-000/PT-000 Canadian Forces Manual of Drill and Ceremonial.

DRILL 103 [0] **(0,0,1/0,0,1)**

Includes rifle, foot, and ceremonial drill.

DRILL 203 [0] **(0,0,1/0,0,1)**

In addition to rifle, foot, and ceremonial drill, this course includes sword drill and mutual instruction.

DRILL 303 [0] **(0,0,1/0,0,1)**

Includes rifle, foot, and colours drill, as well as ceremonial and mutual instruction.

DRILL 403 [0] **(0,0,1/0,0,1)**

Reviews of all phases of drill previously taught.

PHYSICAL EDUCATION, ATHLETICS AND RECREATION

Director of Athletics - Captain J.C.D. Jobin, BA (PE)

Athletic Administration Officer - Lieutenant (N) M.P. Nimeck, BA

Physical Education Officer - Captain B. Duncan, BA

Chief Instructor - Master Warrant Officer J. Thériault, CD

Physical Education and Recreation Instructors: -

Sergeant R.J. Fuller

Petty Officer 2nd class L. A. Johnston, CD

Sergeant J.C.M. Lambert

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 varsity team sports phase. A progressive four-year program designed for the Canadian Military College is followed.

PHYSICAL EDUCATION 103 [0] **(0,0,2/0,0,2)**

The instructional phase of this course covers a basic knowledge of conditioning principles through sport, combatives, leadership in sports, and aquatics. Physical fitness tests are conducted to further assess individual physical fitness capabilities and status. These fitness tests are continued three times per year throughout their four year program.

PHYSICAL EDUCATION 203 [0] **(0,0,2/0,0,2)**

The instructional phase of this course is designed to develop skills in team sports. An elective program is set up consisting of hockey, broomball, basketball, volleyball and waterpolo. In addition, Officer Cadets have the opportunity to become RLSS bronze cross/medallion certified in aquatics. The high level of instructor ability allows the cadet to develop his/her potential in each activity.

PHYSICAL EDUCATION 303 [0] **(0,0,2/0,0,2)**

This year is a continuation of team sports development. Sports not chosen in second year may be elected in third year. After completing third year, the cadet will have completed comprehensive instruction in four sports.

PHYSICAL EDUCATION 403 [0] **(0,0,2/0,0,2)**

The instructional phase of this course is designed to teach the cadet lifetime sports skills. Sports such as golf, tennis, canoeing, kayaking, squash, weight training, curling, badminton. These sports are taught in small groups - a great opportunity only possible for the fourth year cadets. In addition, cadets have the opportunity to elect weekend courses in lieu of the normal weekday classes. Activities such as mountaineering, scuba diving and sailing are offered and lead to certification in their respective disciplines.

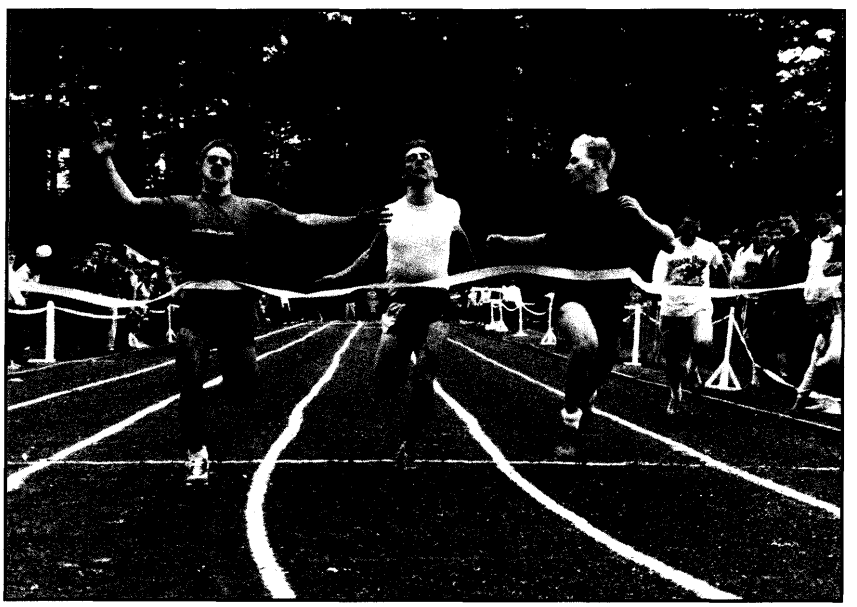
INTRAMURALS, INTERSQUADRON EVENTS AND VARSITY TEAMS

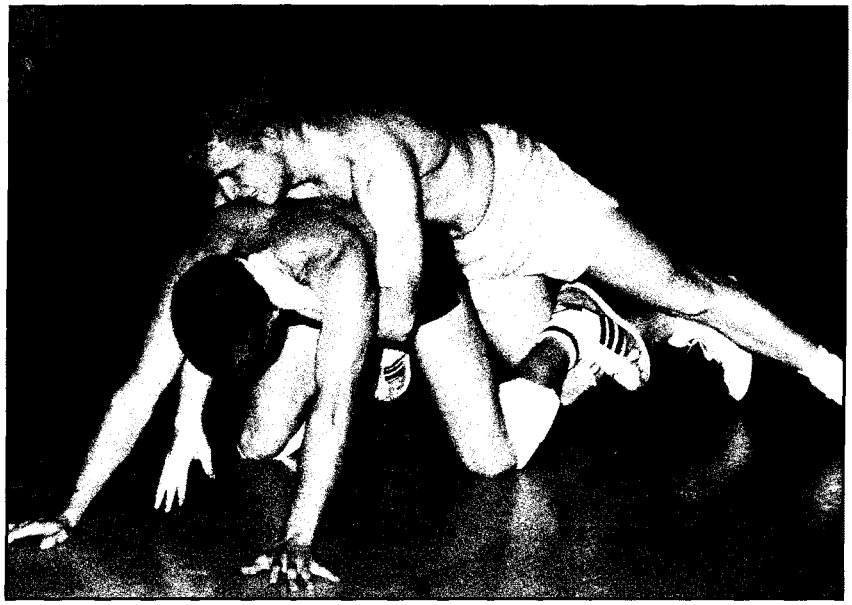
In addition to the two periods per week of instruction in physical education, all cadets participate in a minimum of two after class sports periods. These are in the form of intramural sports (IMs), or varsity teams. The exact sport may vary slightly from year to year, but the IMs usually include soccer, team handball, hockey, broomball, volleyball, basketball, waterpolo, ball hockey, flag football, squash, doubles badminton, doubles tennis and curling. Under supervision of an athletic staff, cadets organize and officiate the IM program and the intersquadron events which are also held throughout the year. These events usually include cross country running, track and field and swimming.

The best coaching cadre is sought for the varsity teams. It has included former Canadian National team members in rowing and rugby. RRMC's focus at the varsity level is on the six sports which capitalize on its unique climatic and geographical features. These sports are rugby, soccer, rowing, sailing, golf and running. All can be practiced outdoors year round. The main organizations, outside the local Victoria area, which RRMC participates in are: the British Columbia Colleges Athletic Association, the Pacific North West Intercollegiate Yachting and Racing Association, the Vancouver Island Running Association, the Vancouver Island Rugby Union and the Vancouver Island Soccer League.

In addition, provincial, national or international class individuals may be able to pursue their quest for athletic excellence, subject to their academic and military commitments. Students are encouraged to discuss their individual cases with the Director of Athletics at (604) 363-4629.

Note: All cadets are required to pass the CMC fitness test three times per year. The test consists of five items: 2400m run, agility run, standing long jump, push-ups and sit-ups. UTPNCMs are also required to pass this test three times per year beginning September 1992.





UNDERGRADUATE STUDY ACADEMIC REGULATIONS

DEFINITIONS

Student: a member of the Canadian Forces attending Royal Roads Military College to study for a baccalaureate degree. Such students may be of the following types:

a. **Officer Cadet:** a student attending RRMC under the Regular Officer Training Plan (ROTP), the Reserve Entry Training Plan (RETP), or the University Training Plan - Non-Commissioned Members (UTPNCM).

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

c. **Special Student:** other members of the Canadian Forces, Department of National Defence or RRMC civilian staff, or dependents of military members, 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.

Subject: a division of the program of studies, e.g., physics or history.

Course: a series of lectures and/or laboratory sessions in a given subject, designated by a number and for which an annual or semester assessment must be provided, e.g., Chemistry 103 Oceanography 401.

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 normally assigned 3 units of credit for a 3 lecture hour course over 26 weeks (2 semesters) and 1.5 units of credit for a 3 lecture hour course over 13 weeks (1 semester). Other courses may be assigned more or fewer credits based on scheduled laboratory or tutorial sessions.

Supplemental Examination: an examination set upon the recommendation of the Faculty Board, and with the approval of Faculty Council and the Commandant, in a course in which a student has failed. A pass in a supplemental examination may be accepted by Faculty Board to remove the deficiency of the failure. If the failed course is required to complete the work of a year, the year is failed until pass standing is obtained in that course.

DURATION OF THE PROGRAM OF STUDIES

1. For students starting their studies at the Royal Military College of Canada, or at the Royal Roads Military College, the duration of the program of studies is four years of two terms or semesters each; for students starting their studies at le Collège militaire royal de Saint-Jean, it is four or five years of two terms or semesters each, depending upon whether the student enters at the First Year or at the Preparatory Year level.

2. The years in the program of studies for students are designated as follows: Preparatory Year (at le Collège militaire royal de Saint-Jean only); the First, Second, Third, and Fourth Years (all three colleges). Entrance to the Preparatory Year and to the First Year requires completion of the secondary school programs as outlined as admission requirements in the appropriate Calendar.

3. Students successfully completing the Second Year at Royal Roads Military College and not entering a Bachelor of Science or Bachelor of Arts program at RRMC will normally complete their final two years at either RMC or CMR.

DEGREES

4a. A degree of Bachelor of Arts or a degree of Bachelor of Science in general, major, combined major or honours patterns in the fields of history, political science, economics, applied military psychology, military and strategic studies, physics, oceanography, earth observational science, or computer science as appropriate shall be granted by Royal Roads Military College to a student who has successfully completed the requirements by the final year at the institution.

4b. A degree of Master of Science in course or thesis patterns in the fields of oceanography and acoustics shall be granted by Royal Roads Military College to a graduate student who has successfully completed the requirements at the institution.

4c. The degree of Doctor of Laws (LLD) honoris causa, Doctor of Science (DSc) honoris causa, and Doctor of Military Science (DMilSc) honoris causa shall be granted by Royal Roads Military College to those considered 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 have 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 students who have 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 Course in Oceanography.

RRMC PROGRAMS OF STUDY

General Limitations

7a. 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.

7b. Students are normally required to register in a minimum semester course load of 7.5 units of credit. The maximum course load permitted is normally 10 units of credit in any semester. With the permission of Faculty Council a minimum of 6 units of credit in one semester may be allowed and the maximum of 10 units of credit may be exceeded.

The First Year

8. All students registered in First Year are required to obtain credit in all courses prescribed in the calendar as mandatory courses for degrees in Arts, Administration, Science or Engineering. Students may transfer into the First Year Arts program of studies following completion of the first semester of the First Year Science or Engineering program of studies.

The Second Year

9a. All students registered in the Second Year Arts programs of studies are required to obtain credit in all the courses prescribed in the calendar as mandatory courses and credit for elective courses as prescribed for each program of studies.

9b. All students registered in a Second Year Science or Engineering program of studies are required to obtain credit in all courses prescribed in the calendar as mandatory courses. 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 - Interdisciplinary, Major and Combined Major Programs

10. Programs of study are offered as follows: Arts with a Major in Applied Military Psychology or with interdisciplinary concentrations (Military and Strategic Studies) in History, Political Science, Economics and Literature, Science with Combined Majors in Computer Science, Oceanography, Physics and Earth Observational Science, with a Major in Applied Psychology, and with interdisciplinary concentrations in Computer Science, Engineering Science, Mathematics, Oceanography, Physics and Earth Observational Science. Details of required and elective courses are as specified in the current calendar.

11. Admission into these programs offered at RRMC normally requires the satisfactory completion of Second Year at any CMC. Specific programs may require certain prerequisite courses as directed by the departments concerned and specified in the current calendar. Students who wish to transfer from a Science program or from another Canadian Military College into an Arts degree program are encouraged to do so by seeking the approval of the Dean of Arts, who, in consultation with the departments concerned, will provide advice on course selection based on an assessment of the individual application.

12a. Candidates for an Arts degree (interdisciplinary concentrations or major) must normally take a semester course loading of 7.5 units of credit and complete a minimum of six units in any semester. Of the minimum 30 units of credit in 200, 300 and 400 level courses that must be obtained over four semesters, 9 units must be in each of two fields for the interdisciplinary concentration programs and 15 units must be in one field for the major programs. For all programs, three units must be in Military Psychology 311 and 402. Elective courses may be selected from the designated Third or Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits. A minimum of three units of credit in elective courses must be completed from among offerings outside the concentration for the particular degree.

12b. For interdisciplinary concentration programs a minimum of 3 units of credit in elective courses must be completed from among offerings outside the field of the concentrations. In a major program, at least nine units of credit in elective courses must be taken from outside the major field.

12c. Candidates for a Science degree (interdisciplinary concentrations) must normally take a semester course loading of 7.5 units of credit and complete a minimum of six units in any semester. Of the minimum 30 units of credit in 300 and 400 level courses that must be obtained over four semesters, 22 units are required in science courses; 9 units must be in each of two fields for the interdisciplinary concentration programs and 15 units must be in one field for the major programs. For all programs, three units must be in Military Psychology 311 and 402. Elective courses may be selected from the designated Third or Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits, but a minimum of 3 units must be in Arts electives.

12d. Candidates for a Science degree (combined major) must normally take a minimum semester course loading of 7.5 units of credit. Of the minimum 36 units of credit in 300 and 400 level courses that must be obtained over four semesters, 30 units are required in science courses of which 12 units must be in each of two fields. For all programs, three units must be in Military Psychology 311 and 402. Elective courses may be selected from the designated Third or Fourth Year level Arts or Science courses for which the student has the prerequisites and timetabling permits, but a minimum of 3 units must be in Arts electives. A minimum weighted average of 55 percent in Science courses must normally be maintained in each semester by the candidate to remain in the combined major programs.

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

Third and Fourth Years - Honours Programs

13a. Honours programs of study are offered by the Arts Division in the Applied Military Psychology and the Military and Strategic Studies degree programs and by the Science Division in conjunction with the Combined Major degree programs. Details of the required courses are as specified in the current calendar.

13b. Candidates for any Honours program must apply for admission in writing to the Dean concerned, no later than the first week of May in the Second Year for Arts students and in the Third Year for Science students. A candidate for a thesis Honours program will have a detailed thesis proposal submitted to Faculty Council in accordance with thesis regulations not later than the first day of October in the Fourth Year.

13c. Admission into the Honours Arts programs requires completion of Second Year Arts with a minimum of second class honours. Students who have achieved less than second class honours may be admitted to the Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Arts program, a candidate must complete an additional six units of credit as directed by the departments concerned.

13d. Admission into the Science Honours program requires completion of a Third Year Science Combined Major with a weighted average of second class

honours in Third Year science and engineering courses. Students who have achieved less than the required average may be admitted to the Honours program on a probationary basis with Faculty Council approval. In addition to completing the regular Science program, a candidate must complete an additional four units of credit as directed by the departments concerned.

13e. To be graduated with an Honours Degree a candidate must normally maintain an overall weighted average of 66 percent or better, with no failures, throughout the Third and Fourth Years of studies.

Extra Courses

14. In certain years of some programs of study a student may, with the permission of Faculty Council, register in an extra course over and above those required for the given program of study. In this case the extra course must be designated in advance and may not be counted for standing and for calculating the student's overall average. A grade will be recorded unless a student formally withdraws from the extra course by application to the Registrar (see Academic Regulation 20). Credit for extra courses taken in the First or Second Years will not normally be granted in lieu of credit for elective courses in the Third and Fourth Years.

Limitation of Selection of Third Year Program of Study

15. A student who has been recommended not to take a certain program of study by a Canadian Military College on the completion of the Second Year may be refused permission to register in that program of study in the Third Year.

DRILL AND PHYSICAL EDUCATION

16. Courses in drill and physical education must be taken by all students in all years.

SECOND LANGUAGE TRAINING

17. Courses in second language training must be taken by all students in all years until exempted.

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 normally have a 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 any other compelling reason.

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 of the first and second year 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. Attendance for third and fourth year students is at the discretion of the individual course instructor. Students with First and Second Class standing will have the same privilege as outlined in para 22a.

22c. 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.

25. Faculty Council will recommend to Senate the granting of a degree when the following requirements are met:

a. completion of the academic program requirements with pass standing;

b. obtaining a satisfactory standard in:

i) Second Language Training and

ii) Physical Training and Drill; and

c. obtaining a favourable report in Officer-like qualities.

Aegrotat Standing

26. 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

27. 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.

28. 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

29. Final examinations will be held for all non-laboratory courses at dates, times and in places to be specified in the examination timetable published by the Registrar. With the permission of Faculty Council, the requirement for a final examination in Third and Fourth Year courses may be waived.

30. 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.

31a. 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.

31b. A student who wishes to appeal a non-final, end-semester or final grade in course shall do so in accordance with Academic Regulations 46 and 47. 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.

32. 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.

33. 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

34. 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 that:

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-half unit of credit.

35. Supplemental examinations will be held at dates, times and places specified in the supplemental examination timetable published by the Registrar and shall normally be written within three weeks of the completion of final examinations.

36. 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.

37. Marks obtained in supplemental examinations may not be used to advance a student's overall weighted grade average for the semester or year.

38. With the consent of Faculty Council, a special student may write a supplemental examination.

FAILURE OF A YEAR

39. 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 34; 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 42.

REPEATING A SEMESTER OR YEAR

40a. 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 42 to 45).

40b. A student may be permitted to repeat any first semester or year, including the Fourth Year.

40c. A student may repeat a first semester or year only once during the student's entire program of studies.

40d. 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.

41. 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

42. 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.

43. A student who fails a semester or year may be required to withdraw from the College.

44a. A student who fails a semester or year, having previously failed a semester or year, must withdraw.

44b. A student who fails a course that the student has been allowed to carry shall normally be required to withdraw.

45. 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 or Drill will, on the approval of the Commandant for such action, be required to withdraw.

APPEALS AND PETITIONS

46. 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.

47. 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

48. 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. During examinations, 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.

49. 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 or her particular course at the beginning of the term.

50. 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) in the Fourth Year Science programs of study.

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 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 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 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. Each candidate must draft a detailed thesis proposal for approval by his 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 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 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 3 units of credit 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 semester and the completion of a major research paper in the second semester.

2. The topic selected for an Honours Arts Research Seminar may be drawn from the disciplines of History, Political Science, or Economics, or provided that the topic is considered appropriate to the Military and Strategic Studies program, from the disciplines of English or Military Psychology 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 mid-May of his 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 semester 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 semester, 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 of Canada.

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 major department and to the Graduate Studies Committee. Normally he or 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: A program of studies involving undergraduate or graduate physics, mathematics, oceanography and acoustics courses totalling a minimum of 6.5 credits each semester as approved by the Physics Department and the Dean of Graduate Studies.

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 minimum of 15 credits of graduate courses and a project. Additionally students are normally required to take a number of undergraduate courses in the first semester. The entire program of required studies is selected and approved by the Physics Department and the Dean of Graduate Studies based on the student's academic background.

c. **MSc in Oceanography and Acoustics (Thesis)**

Entrance requirement: a degree in Science or 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 minimum of 9 credits of graduate courses and a thesis. Additionally students are normally required to take a number of undergraduate courses in the first semester. The entire program of required studies is selected and approved by the Physics Department and the Dean of Graduate Studies based on the student's academic background.

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 semester, before starting the semester. Each graduate student is responsible for ensuring his own registration in each semester. An outline of the registration procedure is available to graduate students at the Registrar's office. All registrations are provisional until approved by the Dean of Graduate Studies.

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 Director of Cadets.

Full-time graduate students may be required to perform laboratory or tutorial assistance, but not marking, for up to three hours a week, and minor military duties from time to time.

A Postgraduate Class Senior will be appointed annually by the Director of Cadets in consultation with the Dean of Graduate Studies. The Class Senior shall be responsible to the Director of Cadets 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 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 semester 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 Dean of Graduate Studies at the time of registration, but may be changed at a later date on his recommendation.

c. **Supplemental Examinations**

Candidates for the diploma will be governed by Academic Regulations 34 to 38 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 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 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 is then registered.

Grades for individual courses will be accepted from departments as numerical grades, and will be recorded on the candidate's transcript by the Registrar.

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 Dean of Graduate Studies and shall consist of three members, the head of the major department or his designate, the supervisor and a member who may be 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 research and course work. The supervisor shall submit a report on this progress to the Dean of Graduate Studies 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 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 supervisor, no later than six full weeks before the scheduled date of the Convocation, the original and four copies of the thesis, each complete but unbound, suitable for examination purposes.

The format of the thesis must conform to the guidelines issued by the Dean of Graduate Studies.

The oral examination will be chaired by the Dean of Graduate Studies or his designate. The examination committee will consist of the Dean of Graduate Studies and the supervisory committee, and will normally also include a member appointed by the Dean of Graduate Studies 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.

Following acceptance of the thesis, and prior to the Convocation at which the degree is to be granted, the candidate will submit to the Dean of Graduate Studies the final, unbound manuscript, complete with all tables, figures, illustrations, and attachments, and including a frontispiece page, signed by the candidate, stating that "This thesis may be used within the Department of National Defence but copyright for open publication remains the property of the author." At the same time, the candidate will also submit one copy of a signed Permission to Microfilm form, available from the Dean of Graduate Studies, for the National Library of Canada.

The candidate's major department will arrange for reproduction of the thesis, and will provide the College library with the original and six complete copies, ready for binding. The College library will arrange for binding and will retain the original and one copy. The Dean of Graduate Studies will distribute the remaining copies of the thesis.

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 must be submitted by department heads to the Dean of Graduate Studies on completion of each academic semester. 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 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 due 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 the following patterns:

a. Thesis pattern (minimum of 9 credits of graduate courses plus a thesis)

b. Course pattern (minimum of 15 credits of graduate courses and a project)

Most graduate students will require some preparation and review in the first semester and relevant undergraduate courses will be provided according to individual need.

A typical course load for the MSc program is as follows:

Fall Semester I:	Math 301 Oceanography 451 Oceanography 501 Oceanography 511 Oceanography 531
Winter Semester I:	Physics 362 Physics 502 Oceanography 522 Oceanography 542 Oceanography 552
Fall Semester II:	Physics 511 Oceanography 561 Oceanography 583 or Oceanography 593
Winter Semester II:	Oceanography 583 or Oceanography 593

Diploma in Oceanography

Course Description	First Semester Credits	Lect	Tut	Lab	Second Semester Lect	Tut	Lab	Notes
Oceanography 301 Descriptive Oceanography	1.5	3	0	0	-	-	-	
Oceanography 352 Oceanographic Methods	1.5	-	-	-	2	0	4	
Oceanography 401 Geophysical and Geological Oceanography	1.5	3	0	0	-	-	-	
Oceanography 451 Introduction to Dynamic Oceanography	1.5	3	0	0	-	-	-	
Oceanography 462 Advanced Dynamic Oceanography	1.5	-	-	-	3	0	0	
Oceanography 473 Oceanography Project	1	0	0	2	0	0	2	
Science 492 Seminar	0	-	-	-	0	0	2	
Oceanography 362 Acoustics	1.5	-	-	-	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 choose an elective course are listed below. Other courses offered in the Calendar may also be taken, subject to timetabling.

RELEVANT ELECTIVE LIST:

First Semester

Oceanography 321 - Biological Oceanography
Oceanography 331 - Chemical Oceanography
Mathematics 451 - Analogue Signal Processing

Second Semester

Engineering 322 - Applied Fluid Mechanics
Physics 342 - Applied Optics and Remote Sensing
Oceanography 412 - Meteorology
Oceanography 432 - Geochemistry of Marine Sediment
Oceanography 442 - Practical Marine Oceanography
Mathematics 422 - Digital Signal Processing
Mathematics 432 - Advanced Applied Mathematics

COURSES OF INSTRUCTION

OCEANOGRAPHY 311: Topics in Oceanography (METOC) [1.5] **(3,0,0)**

This is a full-time three week course given in June each year under the sponsorship of the Directorate of Meteorology and Oceanography. Course participants are usually members of the Armed Forces or other government departments with occupations that require an understanding of the ocean and the basic processes which occur within it. The course focuses on physical oceanography and acoustics and includes topics such as seawater properties, ocean topography, ocean currents and circulation, heat budgets, ice, surface and internal waves, tides, turbulence, coastal oceano- graphy, acoustics, instrumentation, and data analysis. An introduction to marine geology, geophysics, biology and chemistry is also presented. Lectures and seminars are supplemented with tours of local waters which is used to demonstrate sampling, instrumentation and data handling techniques.

TEXTS:

Thomson, *A Study Guide for the MetOc Introductory Physical Oceanography Course*

Pickard and Emery, *Descriptive Physical Oceanography*

Pond and Pickard, *Introductory Dynamical Oceanography*

Urich, *Principles of Underwater Sound*

PHYSICS 502: Acoustic Propagation and Modelling [1.5] **(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.

TEXTS:

Brekhovskikh & Lysanov, *Fundamentals of Ocean Acoustics*

Urick, *Sound Propagation in the Sea*

PHYSICS 511: Acoustic System Analysis [1.5] **(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.

TEXTS:

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 501: Applied Topics [1.5] **(3,0,0)**

This course is normally taken by graduate students in the first semester of an oceanography and acoustics program. The course involves lectures and self-study under the supervision of Physics Department faculty on topics such as differential equations, descriptive oceanography, acoustics, FORTRAN, C, UNIX, Star-Base graphics, and other topics chosen to prepare the student for advanced studies and thesis research.

OCEANOGRAPHY 511: Topics in Ocean Physics and Acoustics [1.5] **(3,0,0)**

This course covers a wide variety of topics involving the application of Oceanography to military concerns. The dynamics of surface gravity and capillary waves are developed. This information is applied to satellite remote sensing, sea state development, wave movement and ambient noise. The dynamics and thermodynamics of sea ice are examined with application to acoustics, military operations and commercial concerns in the Arctic. Magnetic anomalies are also discussed. All students prepare a seminar which consists of planning an acoustic operation in some particular ocean region of interest. This provides the student with a knowledge of obtaining, analyzing and applying the appropriate marine and acoustic products and computer models, the suitability of various platforms and sensors to different applications and the importance of adequate planning for such events.

TEXTS:

Pickard & Emery, *Descriptive Physical Oceanography*

Tchernia, *Descriptive Regional Oceanography*

Robinson (ed.), *Eddies in Marine Science*

OCEANOGRAPHY 522: Synoptic Mesoscale Oceanography [1.5] **(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.

TEXTS:

Robinson (ed.), *Eddies in Marine Science*

Kamenkovich, Koshlyakov & Monin, *Synoptic Eddies in the Ocean*

OCEANOGRAPHY 531: Time Domain Analysis with Applications [1.5] **(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.

TEXTS:

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

Press et al., *Numerical Recipes: The Art of Scientific Computing*

Priestly, *Spectral Analysis and Time Series*

OCEANOGRAPHY 542: Spectral Analysis with Applications [1.5] **(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. Advanced applications such as beamforming, digital filtering, Kalman and the analysis of non-stationary time-series may be discussed.

Prerequisite: Oceanography 531 or permission of the Department.

TEXTS:

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

Press et al., *Numerical Recipes: The Art of Scientific Computing*

Priestly, *Spectral Analysis and Time Series*

OCEANOGRAPHY 552: Ocean Dynamics [1.5] **(3,0,0)**

The physics and mathematics of motion in the ocean will be examined at scales ranging from microstructure up to the general oceanic circulation. The hydrodynamic equations governing fluid motion will be developed from the fundamental laws of physics and examined in various forms to study such phenomena as geostrophic currents, inertial currents, Ekman spirals, barotropic and baroclinic currents, the large-scale, wind-forced, oceanic circulation, the thermohaline circulation and western intensification. Wave theory for an unstratified ocean will also be covered and will include an investigation of Rossby, shelf, Poincaré and Kelvin waves.

TEXTS:

Gill, *Atmosphere - Ocean Dynamics (1st Ed.)*

Pond and Pickard, *Introductory Dynamical Oceanography (2nd Ed.)*

OCEANOGRAPHY 561: Dynamical Oceanography [1.5] **(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 552 or permission of the Depart- ment.

TEXTS:

Gill, *Atmosphere - Ocean Dynamics (1st Ed.)*

Pond and Pickard, *Introductory Dynamical Oceanography (2nd Ed.)*

OCEANOGRAPHY 583: Oceanography Project **(0,1,3/0,1,3)**

The purpose of the project is to provide students taking the MSc (Course) program in Oceanography and Acoustics with experience in supervised research. The subject will be in the general area of oceanography or marine science and the report shall be on experimental or theoretical work done under the supervision of a member of the RRMC Chemistry, Engineering, Mathematics or Physics Departments, or by arrangement with Defence Research Establishment, Pacific (DREP); University of

Victoria (UVIC); or Institute of Ocean Sciences (IOS). Regulations regarding acceptance, format and evaluation shall be the same as for a graduate thesis as found in the calendar. The project may be completed after the end of the third term but while the student is still posted to RRMC.

OCEANOGRAPHY 593: Oceanography Thesis **(0,2,2/0,2,2)**

Preparation of the thesis is a major part of the MSc (Thesis) program in Oceanography and Acoustics. It is the method by which the student is expected to achieve a professional depth of understanding in an area of specialization related to his career. The thesis supervisor would normally be a member of the RRMC staff, and the work would be performed at RRMC. However, the work could well be performed using the facilities of the Defence Research Establishment, Pacific; the Institute of Ocean Sciences, Pat Bay; the University of Victoria or the University of British Columbia. RRMC is involved in joint research projects with all these institutions.

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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
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Professor L.A. Brown	1951-1955
Professor C.C. Cook	1955-1961
Doctor E. S. Graham	1961-1984

HONORARY DEGREE RECIPIENTS

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Clennell Haggerston Dickins, Doctor of Military Science

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Charles Perry Stacey, Doctor of Military Science
Keith Rogers Greenaway, Doctor of Military Science

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Owen Connor Struan Robertson, Doctor of Military Science
Robert Thomas Duff Wallace, Doctor of Laws
John William Tranter Spinks, Doctor of Military Science

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Desmond Dillon Paul Morton, Doctor of Military Science
Thomas Charles Pullen, Doctor of Science

1986
Robert Waugh Murdoch, Doctor of Military Science

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Robert Gordon Rogers, Doctor of Military Science

1988
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Charles Roy Slemon, Doctor of Military Science

1989

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Jeanne Sauvé, Doctor of Laws

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Robert Claude Kenrick Peers, Doctor of Military Science
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David See-Chai Lam, Doctor of Military Science
Parzival Copes, Doctor of Military Science
James R. McFarlane, Doctor of Military Science

1992

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Bethel Cameron Ware, Doctor of Military Science
Ramsey Muir Withers, Doctor of Military Science