Undergraduate Catalog Issue
1970-71
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# Calendar

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University Calendar 1970-71

Semester I
1970
September 13, Sunday
September 14, Monday
September 14, Monday
September 15, Tuesday
September 17, Thursday
September 25, Friday
October 14, Wednesday
November 6, Friday
November 16, Monday
November 24, Tuesday
November 29, Sunday
November 30, Monday
December 11, Friday

1971
January 3, Sunday
January 4-15, Monday-Friday
January 18, Monday
January 26, Tuesday
January 28, Thursday
January 31, Sunday

Semester II
February 7, Sunday
February 8, Monday
February 9, Tuesday
February 13, Saturday
February 19, Friday
March 10, Wednesday
March 19, Friday
March 28, Sunday
March 29, Monday
April 2, Friday
April 9, Friday
May 10-21, Monday-Friday
May 24, Monday
May 31, Monday
June 1, Tuesday
June 4, Friday
June 4, Friday
June 6, Sunday

8 A.M. Residence halls open
Registration
4 P.M. First faculty meeting
8 A.M. Classes begin
1 P.M. Opening Convocation
4:30 P.M. Last day to add courses
4:30 P.M. Last date for partial-tuition refund on withdrawal
8 A.M. Classes resume
7 P.M. Residence halls close, Thanksgiving
2 P.M. Residence halls open
7 P.M. Residence halls close, Christmas
2 P.M. Residence halls open
Registration
8 A.M. Classes resume
Classes held, Monday schedule
4:30 P.M. Last day to add courses
4:30 P.M. Last day for partial-tuition refund on withdrawal
7 P.M. Residence halls close
2 P.M. Residence halls open
8 A.M. Classes resume
4:30 P.M. Last day to drop courses
9 P.M. Mid-semester reports for freshmen due
Reading Period
8 A.M. Semester I final examinations begin
9 A.M. Senior grades due
6 P.M. Final examinations end
8 P.M. Residence halls close
Commencement
8 A.M. Semester II final examinations begin
9 A.M. Senior grades due
6 P.M. Final examinations end
8 P.M. Residence halls close
Commencement
8 A.M. Senior grades due
Memorial Day holiday
Trustees of the University

His Excellency Walter R. Peterson
A.B.
Governor of New Hampshire
ex officio

Frank T. Buckley
Commissioner of Agriculture
ex officio

Commissioner of Education
ex officio

John W. McConnell
B.A., Ph.D., D.Sc.
President of the University
ex officio

Harold E. Hyde, B.S., M.S., Ed.D.
President of Plymouth State College
ex officio

Leo F. Redfern, B.A., M.A., M.P.A., Ph.D.
President of Keene State College
ex officio

Fred W. Hall, Jr., B.S., LL.B.
Rochester (1966-1973)
Chairman of the Board

Richard W. Daland, B.S.
Durham (1966-1970)
Vice Chairman of the Board

Norman S. Weeks, B.S.
Laconia (1965-1973)
Secretary of the Board

J. Fred French
Manchester (1961-1972)

Sinclair Weeks, A.B., LL.D.
Lancaster (1961-1973)

Albert R. Furlong, B.E., M.E.
Keene (1963-1971)

Norman C. Berube, B.A., M.D.
Manchester (1963-1971)

George R. Hanna, B.A., LL.B.
Keene (1963-1971)

Mildred McA. Horton
B.A., M.A., LL.D.
Randolph (1963-1971)

Bernard I. Snierson, A.B., LL.B.
Laconia (1963-1971)

Ray Howland, Jr.
Stratham (1966-1970)

George T. Gilman, B.S.
Farmington (1967-1971)

Mildred K. Perkins, B.E.
Concord (1967-1971)

Charles V. Spanos, B.A., LL.B.
Claremont (1967-1971)

Lewis J. Fisher, LL.B.
Dover (1968-1971)

Frederick C. Walker, B.S., Ed.M.
Dover (1968-1972)

Richard H. Keefe, A.B., LL.D.
Dover (1968-1972)

Philip S. Dunlap, B.S.
Principal Officers of Administration

John W. McConnell, Ph.D.
President of the University

Norman W. Myers, B.S.
Vice President-Treasurer

Eugene S. Mills, Ph.D.
Academic Vice President

Robert N. Faiman, Ph.D.
Vice President for Research and Special Program Administration

Harry A. Keener, Ph.D.
Dean of the College of Life Sciences and Agriculture and Director of the Agricultural Experiment Station

Jan E. Clee, Ph.D.
Dean of the Whittemore School of Business and Economics

H. Trevor Colbourn, Ph.D.
Dean of the Graduate School

Richard S. Davis, Ph.D.
Dean of the College of Technology

Lawrence W. Slanetz, Ph.D.
Dean of the School of Health Studies

Melville Nielson, Ph.D.
Acting Dean, College of Liberal Arts

John B. Hrabu, Ph.D.
Dean of the Office of Institutional Research and Planning

Richard F. Stevens
Dean of Student Affairs

J. R. Sandberg, M.B.A.
Director of Development and Informational Services

C. Robert Keesey, B.A.
Secretary of the University

Andrew T. Mooradian, M.S.
Director of Department of Intercollegiate Athletics

Pierre D. Boy, B.S.
Director of Alumni Affairs

For officers of administrative divisions, see page 57.
Faculty and Professional Staff

Faculty Emeritus

Abell, Max F.
*Extension Associate Professor Emeritus of Agricultural Economics*
B.S., Cornell University, 1914; Ph.D., *ibid.*, 1924. (1926 to 1954)

Babcock, Donald C.
*Professor Emeritus of Philosophy*

Barraclough, Kenneth E.
*Professor Emeritus of Forestry*
B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940. (1926 to 1963)

Bartley, Irving D.
*Associate Professor Emeritus of Music and University Carillonneur*
M.M., Syracuse University, 1935; M.M., *ibid.*, 1938. (1945 to 1968)

Barton, Philip S.
*Director Emeritus, Thompson School of Applied Science, and Professor Emeritus of Applied Animal Science*
B.S., University of New Hampshire, 1928; M.Ed., *ibid.*, 1938. (1939 to 1969)

Bingham, Sylvester H.
*Professor Emeritus of English*
A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; Ph.D., Yale University, 1937. (1936 to 1970)

Bowles, Ella S.
*Publications Editor Emeritus*
Plymouth Normal School, 1905. (1943 to 1951)

Brackett, Thelma
*University Librarian Emeritus*

Campbell, Willis C.
*Research Associate Emeritus, Engineering Experiment Station*
B.S., New Hampshire College, 1906. (1938 to 1954)

Carroll, Herbert A.
*Professor Emeritus of Psychology*
A.B., Bates College, 1923; A.M., Brown University, 1928; Ph.D., Columbia University, 1930. (1941 to 1962)

Colby, Halstead N.
*Associate Professor Emeritus of Soil and Water Science*
B.S., University of New Hampshire, 1930. (1932 to 1936, 1946 to 1968)

Cortez, Edmund A.
*Professor Emeritus of Speech*
B.A., Taylor University, 1923; B.O., Asbury College, 1924; B.D., Asbury Theological Seminary, 1924; M.A., Columbia University, 1926; Ed.M., Harvard University, 1927. (1927 to 1965)

Danoff, Alexander P.
*Assistant Professor Emeritus of German*
DeQuoy, Ruth W.
Associate State 4-H Leader Emeritus
(1929 to 1965)

Donovan, Edward T.
Professor Emeritus of Mechanical Engineering
B.S., University of Wisconsin, 1921.
(1926 to 1968)

Ellis, Elizabeth E.
Extension Associate Professor Emeritus of Home Economics
B.S., Teachers College, Columbia University, 1927; M.A., ibid., 1929. (1929 to 1960)

Grinnell, Harold C.
Dean Emeritus, College of Life Sciences and Agriculture and Professor Emeritus of Resource Economics
B.S., Cornell University, 1921; M.S., ibid., 1930; Ph.D., ibid., 1941. (1932 to 1965)

Hall, Harry H.
Professor Emeritus of Physics
B.S., Union College, 1926; Ph.D., Harvard University, 1934. (1940 to 1969)

Hennessy, William G.
Professor Emeritus of English

Hitchcock, Leon W.
Professor Emeritus of Electrical Engineering
B.S., Worcester Polytechnic Institute, 1908. (1910 to 1956)

Huddleston, Eric T.
Professor Emeritus of Architecture
B.Arch., Cornell University, 1910. (1914 to 1957)

Iddles, Harold A.
Professor Emeritus of Chemistry
B.S., Michigan State College, 1918; M.S., University of Iowa, 1921; Ph.D., Columbia University, 1925; D.Sc. (Hon.), University of New Hampshire, 1966. (1929 to 1965)

Johnson, Arthur W.
Professor Emeritus of Business and Economics
B.B.A., College of Business Administration, Boston University, 1922; M.B.A., ibid., 1929; C.P.A., (1920 to 1963)

Johnson, G. Reid
Associate Professor Emeritus of History
A.B., Muskingum College, 1916; M.A., Princeton University, 1920; Ph.D., University of Edinburgh, 1922. (1932 to 1963)

Koch, Wayne S.
Professor Emeritus of Education
B.S., Muhlenberg College, 1941; Ed.M., Harvard University, 1945. (1945 to 1968)

Lavine, Irvin
Professor Emeritus of Chemical Engineering
B.S., University of Minnesota, 1924; Ph.D., ibid., 1930. (1948 to 1949, 1951 to 1965)

Mills, Marian E.
Assistant Professor Emeritus of Botany
B.S., Teachers College, Columbia University, 1917; M.A., ibid., 1920. (1927 to 1957)

Morrow, Kenneth S.
Professor Emeritus of Dairy Science
B.S., University of Minnesota, 1918; M.S., ibid., 1925. (1934 to 1966)

O'Brien, Daniel A.
County Agent Leader Emeritus
B.S., Cornell University, 1913. (1920 to 1953)

O'Kane, Walter C.
Professor Emeritus of Economic Entomology
B.A., Ohio State University, 1897; M.A., ibid., 1909; B.Sc. (Hon.), ibid., 1932. (1909 to 1947)

Parker, Clifford S.
Professor Emeritus of Languages
A.B., Harvard University, 1912; A.M., ibid., 1914; Ph.D., Columbia University,
Perry, Errol C.
Professor Emeritus of Farm Management
b.s., Massachusetts State College, 1920.
(1929 to 1942, 1946 to 1962)

Phillips, Thomas G.
Professor Emeritus of Agricultural and Biological Chemistry
b.s., Ohio State University, 1912; m.s., ibid., 1913; ph.d., University of Chicago, 1918. (1925 to 1957)

Prince, Ford S.
Professor Emeritus of Agronomy
b.s., University of Illinois, 1913. (1925 to 1957)

Richardson, Edythe T.
Professor Emeritus of Zoology
b.s., New Hampshire College, 1922; m.s., University of New Hampshire, 1924. (1922 to 1966)

Sackett, Everett B.
Dean Emeritus of the College of Liberal Arts and Professor Emeritus of Education
b.a., Hamline University, 1923; m.a., University of Minnesota, 1926; ph.d., Columbia University, 1931. (1938 to 1967)

Seiberlich, Joseph
Research Professor Emeritus, Engineering Experiment Station
Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, ibid., 1928. (1941 to 1962)

Shimer, Stanley R.
Professor Emeritus of Biochemistry
b.s., Muhlenberg College, 1918; m.s., Pennsylvania State College, 1923. (1924 to 1966)

Skelton, Russell R.
Professor Emeritus of Civil Engineering
b.s., Purdue University, 1924; c.e., ibid., 1934; s.m., Harvard University, 1939. (1928 to 1966)

Stevens, Clark L.
Professor Emeritus of Forestry
b.s., New Hampshire College, 1917; m.f., Yale University, 1926; ph.d., ibid., 1930. (1919 to 1964)

Stevens, Henry B.
Director Emeritus of University Extension Service
a.b., Dartmouth College, 1912. (1918 to 1956)

Stolworthy, E. Howard
Professor Emeritus of Mechanical Engineering
b.s., Tufts College, 1922. (1922 to 1968)

Swasey, Henry C.
Associate Professor Emeritus of Intercollegiate Athletics
b.s., Amherst College, 1915; m.s., Indiana University, 1941. (1921 to 1962)

Thames, Sarah
Associate Professor Emeritus of Home Economics
b.s., Simmons College, 1930; m.a., Teachers College, Columbia University 1942. (1945 to 1961)

Tirrell, Loring V.
Professor Emeritus of Animal Science
b.s., Massachusetts Agricultural College, 1920; m.s., Massachusetts State College, 1941. (1921 to 1925, 1930 to 1966)

Tyrrell, Doris E.
Associate Professor Emeritus of Secretarial Studies
b.s., University of Minnesota, 1926; m.a., ibid., 1932. (1938 to 1966)

Walsh, John S.
Professor Emeritus of Languages
a.b., Harvard University, 1915; a.m., Boston University, 1928; d.h.l. (Hon.), University of New Hampshire, 1965. (1922 to 1962)

Webster, Robert G.
Professor Emeritus of English
b.a., University of New Hampshire, 1926; m.a., ibid., 1930. (1927 to 1970)
Woodruff, Ruth J.
Professor Emeritus of Economics
B.A., Bryn Mawr, 1919; A.M., ibid., 1920; 
Ph.D., Radcliffe College, 1931. (1931 to 1967)

Yale, William
Professor Emeritus of History
Ph.D., Sheffield Scientific School, Yale 
University, 1910; M.A., University of 
New Hampshire, 1928. (1928 to 1957)

Zimmerman, Oswald T.
Professor Emeritus of Chemical 
Engineering
B.S.Eng., University of Michigan, 1929; 
M.S.Eng., ibid., 1931; Ph.D., ibid., 1934. 
(1930 to 1970)

* Indicates time devoted to Cooperative Ex-
tension Service.
† Indicates time devoted to Agricultural Ex-
periment Station.

Faculty

Abbott, Helen D.
Associate Professor, Head Cataloger 
A.B., Wheaton College, 1929; S.B. in L.S., 
Simmons College, 1930; A.M., Middle-
bury College, 1939. Appointed 1943.

Adams, Myrna C.
Assistant to the Academic Vice President 
and Assistant Professor of Spanish 
Appointed 1969.

Adams, Robert L. A.
Instructor in Geography 
B.A., Williams College, 1961; M.A., Clark 

Adamovich, Frank W.
Instructor, Documents Librarian 
B.S., Fitchburg State Teachers College, 
Appointed 1968.

Albers, Carl H.
Adjunct Professor of the Whittemore 
School 
B.A., Valley City State Teachers College, 
1943; M.B.A., University of Denver, 1947. 
Appointed 1968.

Allard, John A. (Major, U.S.A.) 
Assistant Professor of Military Science 
B.A., University of Vermont, 1961. 
Appointed 1968.

†Allen, Fred E.
Professor of Animal Science and 
Veterinarian 
B.S., University of New Hampshire, 1932; 
D.V.M., Ohio State University, 1936. 
Appointed 1940.

Allen, Richard 
Associate Professor of Hospital 
Administration, Whittemore School 
B.S., Trinity University, 1954; M.H.A., 
Allmendinger, E. Eugene  
Associate Professor of Mechanical Engineering  

Alonzo, Roy S.  
Thompson School Assistant Professor of Food Service Management  

Alperi, Robert W.  
Assistant Professor of Mechanical Engineering  

Amell, Alexander R.  
Professor of Chemistry  
B.S., University of Massachusetts, 1947; Ph.D., University of Wisconsin, 1950. Appointed 1955.

Amman, William  
Lecturer in Occupational Therapy  
M.R.C.S., L.R.C.P., University College Hospital, 1937; Diploma of Public Health, 1944; University of Cape Town, L.M.C.C., Canada, 1950. Appointed 1965.

Amsden, Katherine  
Assistant Professor of Physical Education  

Andersen, Kenneth K.  
Professor of Chemistry  

Anderson, Charlotte K.  
Professor, Assistant Librarian  

Anderson, Franz E.  
Assistant Professor of Geology  

Andrew, Michael D.  
Assistant Professor of Education  

†Andrews, Richard A.  
Associate Professor of Resource Economics  
B.S., University of Maine, 1949; M.S., Pennsylvania State University, 1951; Ph.D., University of Minnesota, 1959. Appointed 1959.

Annis, William H.  
Associate Professor of Agricultural Education  

Archambault, Raymond R.  
Assistant Professor, Cataloger  

Arnold, Charles G.  
Assistant Professor of Physical Education  

Arnoldy, Roger L.  
Associate Professor of Physics  
B.S., St. Mary's College, 1956; M.S., University of Minnesota, 1959; Ph.D., ibid., 1962. Appointed 1967.
Batho, Edward H.
Professor of Mathematics

Beasley, Wayne M.
Research Associate Professor, Engineering Experiment Station, and Adjunct Associate Professor of Materials Science

Bechtell, Homer F., Jr.
Associate Professor of Mathematics

Beckett, John A.
Forbes Professor of Management
B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946; C.P.A.
Appointed 1962.

Beckwith, Marion C.
Professor of Physical Education
Appointed 1935.

Bell, R. Virginia
Associate Professor of Occupational Therapy

Bennett, Albert B.
Assistant Professor of Mathematics

Bernier, Raymond J.
Instructor and Technical Director in Speech and Drama
Appointed 1967.

Betz, George W.
Associate Professor of Economic Development
A.B., University of Kansas, 1952; Ph.D., University of Wisconsin, 1966.
Appointed 1969.

Birmingham, Frank P.
Instructor in Philosophy
Appointed 1968.

Bittner, Richard H.
Director, Thompson School of Applied Science and Thompson School Associate Professor of Applied Science

Blanchard, Fletcher A., Jr.
Professor of Electrical Engineering

†Blickle, Robert L.
Professor of Entomology
B.S., Ohio State University, 1937; M.S., University of New Hampshire, 1939; Ph.D., Ohio State University, 1942.
Appointed 1938 to 1941, 1946.

Blood, Edward J.
Assistant Professor of Physical Education, Supervisor of Athletic Facilities
B.S., University of New Hampshire, 1935.
Appointed 1936.

Bobick, Melvin T.
Associate Professor of Sociology
Appointed 1958.
Ashley, Charles H.
Assistant Professor of Education and Coordinator of Secondary School Student Teaching

Aultman, Dwight E., III
Trainee, Physical Therapist; Assistant Professor of Physical Education

Austin, Gilbert R.
Assistant Professor of Education

Azzi, Victor D.
Associate Professor of Mechanics

Balderaechi, Arthur E.
Assistant Professor of The Arts

Balling, L. C.
Associate Professor of Physics

Balomenos, Richard H.
Professor of Mathematics Education

Bardwell, John D.
Director, Audio Visual Center; Media Specialist for the New England Regional Center, and Lecturer in Education

Barlow, Robert F.
Professor of Economics

Barrett, James P.
Associate Professor of Forest Resources

Barstow, Thomas R.
Assistant Professor of Physical Education, Faculty in Residence, Babcock Hall

Barstow, Clara H.
Research Associate in Microbiology
B.S., Miami University, 1923; M.A., University of Michigan, 1926; Ph.D., University of Kansas, 1935. Appointed 1945.

Batchelder, Gerald M.
Research Associate Professor,
Engineering Experiment Station and Adjunct Associate Professor of Civil Engineering
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952. Appointed 1953.

Batcheller, Joseph D.
Professor of Speech and Drama
Batho, Edward H.  
Professor of Mathematics  

Beasley, Wayne M.  
Research Associate Professor,  
Engineering Experiment Station, and Adjunct Associate Professor of Materials Science  

Bechtell, Homer F., Jr.  
Associate Professor of Mathematics  
b.s., Grove City College, 1951; m.a., University of Wisconsin, 1956; Ph.d., ibid., 1963. Appointed 1966.

Beckett, John A.  
Forbes Professor of Management  
b.s., University of Oregon, 1939; m.b.a., Harvard University, 1946; c.p.a.  
Appointed 1962.

Beckwith, Marion C.  
Professor of Physical Education  
Appointed 1935.

Bell, R. Virginia  
Associate Professor of Occupational Therapy  

Bennett, Albert B.  
Assistant Professor of Mathematics  

Bernet, Charles V.  
Assistant Professor of Chemistry  
Appointed 1965.

Bernier, Raymond J.  
Instructor and Technical Director in Speech and Drama  

Betz, George W.  
Associate Professor of Economic Development  

Birmingham, Frank P.  
Instructor in Philosophy  

Bittner, Richard H.  
Director, Thompson School of Applied Science and Thompson School Associate Professor of Applied Science  
b.s., Iowa State University, 1952; M.S., ibid., 1958; Ph.D., Michigan State University, 1962. Appointed 1969.

Blanchard, Fletcher A., Jr.  
Professor of Electrical Engineering  

‡Blickle, Robert L.  
Professor of Entomology  
b.s., Ohio State University, 1937; M.S., University of New Hampshire, 1939; Ph.d., Ohio State University, 1942. Appointed 1938 to 1941, 1946.

Blood, Edward J.  
Assistant Professor of Physical Education, Supervisor of Athletic Facilities  

Bobick, Melvin T.  
Associate Professor of Sociology  
Bolland, Thomas W.
Assistant Professor of Business Administration

Bonnice, William E.
Associate Professor of Mathematics

Borror, Arthur C.
Associate Professor of Zoology

Bothner, Wallace A.
Assistant Professor of Geology

Bozak, John C., Jr.
Thompson School Assistant Professor of Forest Technology

Braff, Allan J.
Associate Professor of Economics and Business

Bratton, Karl H.
Professor of Music

Bravo, Donald
Lecturer in Music

Breeding, Charles H. J.
Thompson School Associate Professor of Applied Soil Sciences

Briggs, Janet C.
Lecturer in Animal Science

Brinsfield, Shirley D.
Adjunct Professor of the Whittemore School

Brooke, Paul T.
Associate Professor of Philosophy
Brown, Richard G.
Instructor in Mathematics and Education
A.B., University of Rochester, 1958; M.A., University of Michigan, 1968.
Appointed 1968.

Browne, Evelyn
Professor of Physical Education

Bruce, Robert J. (Captain, USA)
Assistant Professor of Military Science

Bruns, Paul E.
Professor of Forest Resources
A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D., University of Washington, 1956. Appointed 1958.

Bryce, Forbes O.
Lecturer in Sociology

Bullock, Wilbur L.
Professor of Zoology
B.S., Queens College, 1942; M.S., University of Illinois, 1947; Ph.D., ibid., 1948. Appointed 1948.

Bunker, Laurel G.
Assistant Professor of Occupational Therapy

Burns, Thomas R.
Assistant Professor of Sociology

Burton, David M.
Associate Professor of Mathematics

Burton, Royce E.
Instructor in English

Burtt, Elizabeth A.
Assistant Professor of Nursing
R.N., Hillsboro County General Hospital, 1947; B.S., McCoy College, Johns Hopkins University, 1961; M.S., Boston University, 1965. Appointed 1968.

Bushey, Betty C.
Lecturer in German

Byers, Gordon L.
Professor of Soil and Water Science

Cabral, Robert M.
Instructor in Sociology

Caldwell, S. Anthony
Assistant Professor of Spanish

Callan, Richard J.
Associate Professor of English

Cappon, Alfredo
Instructor in German
Carbonneau, Lionel J.
Coach of Lacrosse and Assistant Professor of Physical Education

Carnicelli, Thomas A.
Associate Professor of English

Carter, Gavin H.
Associate Professor of Physical Education

Casas, R. Alberto
Professor of Spanish

Catala, Pierre J.
Instructor in Electrical Engineering

Cavanaugh, John R.
Assistant Professor of Education

Celikkol, Barbaros
Instructor in Mechanical Engineering

Chadwick, Howard B., Jr.
Lecturer in Music

Chaltas, John G.
Associate Professor of Education

Chapman, Donald H.
Professor of Geology
B.A., University of Michigan, 1927; M.A., ibid., 1928; Ph.D., ibid., 1931. Appointed 1931.

Chesbro, William R.
Professor of Microbiology

Ching, Chauncey T. K.
Assistant Professor of Resource Economics

Chupp, Edward L.
Professor of Physics

Clark, Charles E.
Associate Professor of History

Clark, David G.
Associate Professor of Physics

Clark, Ronald R.
Associate Professor of Electrical Engineering
B.S., University of New Hampshire, 1956; M.E., Yale University, 1957; Ph.D., Syracuse University, 1963. Appointed 1957.

Clark, William E.
Assistant Professor of Mechanical Engineering
B.S., University of New Hampshire, 1931. Appointed 1946.
Clee, Jan E.
Dean of the Whittemore School of Business and Economics and Associate Professor of Organizational Development
B.A., Social Academy, 1953; M.S., Case Institute, 1963; Ph.D., ibid., 1967.
Appointed 1967.

Cohen, Allan R.
Associate Professor of Business Administration
Appointed 1967.

Colbourn, H. Trevor
Dean of the Graduate School and Professor of History

Cole, Lawrence P.
Assistant Professor of Economics

†Collins, Walter M.
Professor of Poultry Science
B.S., University of Connecticut, 1940; M.S., ibid., 1949; Ph.D., Iowa State University, 1960. Appointed 1951.

†Colovos, Nicholas F.
Professor of Animal Science
B.S., University of New Hampshire, 1927; M.S., ibid., 1931. Appointed 1928.

Congdon, Robert C.
Director of Counseling and Testing Service and Assistant Professor of Psychology
A.B., University of California, 1947; Ed.D., Harvard University, 1961.
Appointed 1952.

†Conklin, James G.
Professor of Entomology
B.S., Connecticut Agricultural College, 1926; M.S., University of New Hampshire, 1929; Ph.D., Ohio State University, 1941. Appointed 1931.

Conner, Theodore W.
Coach of Baseball and Assistant Professor of Physical Education

Coolidge, Clyde R.
Visiting Lecturer in Business Administration

Cooper, Matthew
Instructor in Anthropology

Copeland, Arthur H., Jr.
Professor of Mathematics

Copeland, Lynda P.
Lecturer in Music

†Corbett, Alan C.
Associate Professor of Poultry Science
B.S., University of Maine, 1936; M.S., ibid., 1937; D.V.M., Michigan State College, 1940. Appointed 1941.

Corell, Robert W.
Professor of Mechanical Engineering
B.S.M.E., Case Institute of Technology, 1956; M.S.M.E., Massachusetts Institute of Technology, 1959; Ph.D., Case Institute of Technology, 1964. Appointed 1964.

Craig, Robert E.
Instructor in Political Science
Crane, Robert W. (Captain, USAF)
Assistant Professor of Aerospace Studies
B.S., Husson College, 1956.
Appointed 1968.

Croker, Robert A.
Assistant Professor of Zoology

Crowe, Deborah
Instructor, Children's Librarian

Cunningham, George E.
Associate Professor of History
A.B., Dillard University, 1951; M.S., University of Wisconsin, 1953. Appointed 1969.

Curcio, Ronald P.
Assistant Professor of Education

Curry, Joan F.
Instructor in Education

Cushing, Daniel
Honorary Fellow in Metallurgy
Ph.D., Yale University, 1912.
Appointed 1952.

Daggett, Albert F.
Professor of Chemistry
B.S., University of New Hampshire, 1928; M.S., ibid., 1930; Ph.D., Columbia University, 1934. Appointed 1928-31, 1935.

Datillo, Louis J.
Instructor in Physical Education

Dauphinais, Edward J.
Assistant Professor, Technology Branch Librarian

Davenport, Gilbert B.
Assistant Professor of Speech and Drama

Davies, B. Carolyn
Assistant Professor of Nursing

†Davis, Henry A.
Associate Professor of Analytical Services
B.S., University of New Hampshire, 1932; M.S., ibid., 1934. Appointed 1932.

Davis, Myra L.
Associate Professor of Secretarial Studies
B.S., Central Missouri State Teachers College, 1939; M.A., State University of Iowa, 1945. Appointed 1945.

Davis, Richard S.
Dean of the College of Technology and Professor of Materials Science
B.Sc., University of Toronto, 1951; M.A.Sc., ibid., 1952; Ph.D., ibid., 1954. Appointed 1968.

Davis, Robert M.
Instructor in French

Davis, Ruth E.
Associate Professor of Home Economics
Dawson, Charles O.  
Professor of Civil Engineering  
B.C.E., Ohio State University, 1930; M.S., ibid., 1940. Appointed 1930.

Dawson, John F.  
Assistant Professor of Physics  

Deane, Nancy H.  
Assistant Professor of English  

Degler, Carroll M.  
Professor of Business and Economics  

Deichert, Lillian C.  
Assistant Professor, Loan Librarian  

Deoss, Dister L. (Major, USA)  
Assistant Professor of Military Science  

Desjardins, Andrea Ruth  
Instructor in Home Economics  

Desrosiers, Richard V.  
Assistant Professor of Classics  

Devincenzo, Salvatore, Jr.  
(Major, USAF)  
Assistant Professor of Aerospace Studies  

DeVoto, Mark B.  
Assistant Professor of Music  

Dewey, Richard S.  
Professor of Sociology  

Dimambro, Arthur R.  
Lecturer in Occupational Therapy  

Dishman, Robert B.  
Professor of Political Science  

Dodds, John A.  
Thompson School Associate Professor of Applied Animal Science  

Dodge, Peter  
Associate Professor of Sociology  

*Dodrill, Isabel  
State Home Economics Leader, Cooperative Extension Service, and Associate Professor of Home Economics  
A.B., Fort Hays State College, 1937; B.S., Kansas State University, 1941; M.A., Teachers College, Columbia University, 1957. appointed 1965.

Doherty, Edward J.  
Director of Placement  
Dolcino, Luigi N.
Lecturer in Occupational Therapy
Liceo Ginnasio Andre, Doria Genoa, Italy, Maturita Classica, 1940; University of Genoa, Italy, M.D., 1946.
Appointed 1969.

Donovan, John V.
Assistant Professor of Economics
Appointed 1965.

Dotchin, L. William, Jr.
Instructor in Physics, Research Physicist, Space Science Center

Dowling, John, Jr.
Assistant Professor of Physics

Downs, Richard E.
Associate Professor of Anthropology
B.A., Harvard University, 1942; CERT. OF ETHN., University of Paris, 1949; PH.D., University of Leiden, 1956.
Appointed 1962.

Draves, David D.
Associate Professor of Education
B.A., University of Wisconsin, 1948; M.A., ibid., 1949; Ph.D., ibid., 1957.
Appointed 1964.

Drew, William H.
Associate Dean of the Graduate School and Professor of Resource Economics
B.S., Pennsylvania State College, 1947; M.S., Rutgers University, 1949; Ph.D., Vanderbilt University, 1961.
Appointed 1956.

Drukker, Frances S.
Lecturer in Music
B.M., Boston University, 1948.
Appointed 1967.

Duffy, John J.
Assistant Professor of English
B.S.S., Georgetown University, 1957; M.A., University of Vermont, 1958; Ph.D., University of Syracuse, 1965. Appointed 1969.

Duncan, Lillian R.
Associate Professor, Public Service Librarian
B.A., University of Oklahoma, 1933.
Appointed 1934.

†Dunlop, William R.
Professor of Poultry Science

†Dunn, Gerald M.
Professor of Agronomy
B.S., West Virginia University, 1948; M.S., Purdue University, 1950; Ph.D., ibid., 1951. Appointed 1951.

†Dunn, Stuart
Professor of Botany
B.S., University of Minnesota, 1923; M.S., Iowa State College, 1925; Ph.D., University of Minnesota, 1931.
Appointed 1926.

Durgin, Owen B.
Associate Professor of Resource Economics

Durnall, Edward J.
Director of the Division of Continuing Education, and Associate Professor of Education

Durost, Walter N.
Adjunct Professor of Education

Dusek, Rudolph V.
Instructor in Philosophy
B.A., Yale University, 1963.
Appointed 1966.
Dwyer, Jayne Elizabeth
Assistant Professor of The Arts
B.S., Massachusetts College of Art, 1954.
Appointed 1965.

Edwards, John C.
Director of Theater and Associate Professor of Speech and Drama
Appointed 1961.

Edwards, Ruth S.
Lecturer in Music

†Eggert, Russell
Professor of Horticulture

Ellis, B. Robert
Instructor in Mathematics
Appointed 1969.

Ellis, David W.
Associate Academic Vice President and Associate Professor of Chemistry

Elmer, Joseph O.
Instructor in Civil Engineering

Elmore, Ray E., Jr.
Instructor and Coordinator of Exhibitions in The Arts

Elwell, Albert R.
Assistant Professor of Education

Emery, Harvard B.
Assistant Professor of Graphics
Cert. in M.E., Lowell Institute, 1938.
Appointed 1954.

Engalichev, Nicolas
Associate Professor of Resource Economics

Erickson, Raymond L.
Professor of Psychology

†Estes, George O.
Assistant Professor of Plant Science

Estes, James W.
Instructor in Mathematics

Faiman, Robert N.
Vice President for Research and Program Administration, Professor of Electrical Engineering
B.S.E.E., North Dakota State College, 1947; M.S.E.E., University of Washington, 1948; Ph.D., Purdue University, 1956.
Appointed 1959.

Fairchild, Thomas P.
Assistant Professor of Dairy Science

Fan, Stephen S. T.
Associate Professor of Chemical Engineering
Farnsworth, Kirk E.
Psychologist, Counseling and Testing Center, and Assistant Professor of Psychology
B.S., Iowa State University, 1962; M.S., ibid., 1966; Ph.D., ibid., 1968.
Appointed 1968.

Fasanelli, James A.
Associate Professor of the Arts
A.B., State University of Iowa, 1951; A.M., Harvard University, 1958.
Appointed 1960.

Faudon, Bernard
Visiting Assistant Professor of French
Appointed 1969.

Fell, Roger B.
Instructor in Electrical Engineering
A.B., Harvard University, 1967; M.S., University of New Hampshire, 1969.
Appointed 1969.

Fernald, Mary Louise
Associate Professor of Nursing

Fernald, Peter S.
Associate Professor of Psychology

Fink, Stephen L.
Visiting Associate Professor of Organizational Development and Psychologist, Counseling and Testing Center

Fisher, Lester A.
Instructor in English
Appointed 1968.

Fisher, G. Thomas
Assistant Professor of Entomology
B.S., Iowa State University, 1950; M.S., Rutgers University, 1952; Ph.D., ibid., 1954. Appointed 1969.

Flather, Herbert H. (Colonel, USA)
Professor of Military Science
M.A., University of Missouri, 1966.
Appointed 1969.

Fogg, Marguerite F.
Associate Professor of Nursing
Diploma, Pillsbury Hospital School, 1940; Certificate, Hague Hospital, 1945; B.S., Boston College, 1957; M.S., ibid., 1960.
Appointed 1967.

Foley, Madeline J.
Lecturer in Music

Ford, Joseph P.
Assistant Professor of Political Science

Foret, John E.
Assistant Professor of Zoology
Appointed 1967.

Forsyth, G. Alfred
Assistant Professor of Psychology

Forsyth, Peggy D.
Instructor in Psychology

Fort, Marron C.
Associate Professor of German
Appointed 1969.
Forward, John R.
Assistant Professor of Psychology
B.A., University of Melbourne, 1960; Ph.D., University of Michigan, 1967.
Appointed 1969.

Foss, Stephen D.
Instructor in Chemical Engineering

†Foster, Bennett B.
Associate Professor of Forest Resources
B.S.F., Colorado State University, 1952; M.F., Oregon State University, 1957; Ph.D., Duke University, 1966.
Appointed 1964.

Fox, Leslie A.
Assistant Professor of Psychology

Frankhouser, Richard C.
Instructor in Spanish

Francq, Edward N.
Assistant Professor of Zoology
B.S., University of Maryland, 1956; M.S., University of Idaho, 1962; Ph.D., Pennsylvania State University, 1967.
Appointed 1965.

†Frick, George E.
Adjunct Professor of Resource Economics

Friel, Gerald J.
Head Basketball Coach and Lecturer in Physical Education

Frost, Albert D.
Professor of Electrical Engineering
Appointed 1957.

Fullam, David C.
Instructor in Sociology

Fuller, Gene B.
Assistant Professor of Animal Science
B.S., Sam Houston State College, 1962; M.S., Oklahoma State University, 1964; Ph.D., Purdue University, 1968.
Appointed 1969.

†Furman, Thomas E.
Associate Professor of Botany
B.S., Montana State College, 1952; Ph.D., Washington State University, 1958.
Appointed 1967.

Gadon, Herman
Professor of Business Administration

†Gaudette, Henri E.
Associate Professor of Geology

Gay, Paul E.
Lecturer in Music

†Gee, Glendon W.
Assistant Professor of Soil and Water Science
B.S., Utah State University, 1961; Ph.D., Washington State University, 1966.
Appointed 1966.

Gehrhardt, Henry M.
Associate Professor of Chemical Engineering
B.S., Pennsylvania State University, 1960; Ph.D., Kansas State University, 1965.
Appointed 1964.
Gerhard, Glen C.
Assistant Professor of Electrical Engineering

Gile, Albert
Thompson School Instructor in Soil, Water, and Construction Technology

Gilman, Paul A.
Thompson School Associate Professor of Soil, Water, and Construction Technology
B.S., University of Vermont, 1938; M.S., Pennsylvania State University, 1951. Appointed 1945.

Gilmore, Robert C.
Associate Professor of History
B.A., University of Vermont, 1944; M.A., McGill University, 1947; M.A., Yale University, 1951; Ph.D., ibid., 1954. Appointed 1952.

Gilsdorf, William O.
Assistant Professor of Speech and Drama

Glanz, Filson H.
Assistant Professor of Electrical Engineering

Goffe, Lewis C.
Associate Professor of English

Goodfellow, James R.
Assistant Coach of Athletics and Lecturer in Physical Education

Goodman, Earl O., Jr.
Associate Professor of Home Economics

Goodrich, Robert W.
Assistant Professor of Electrical Engineering
B.S.E.E., University of New Hampshire, 1957; M.S.E.E., Purdue University, 1958. Appointed 1959.

Granger, Ralph H.
Thompson School Professor of Commerce Technology
B.S., Massachusetts State College, 1935; M.S., ibid., 1939. Appointed 1946.

Grant, Clarence L.
Research Professor, Engineering Experiment Station and Adjunct Professor of Chemistry

Grant, Ruth H.
Assistant Professor, Senior Cataloger

Gray, Daniel
Adjunct Associate Professor of the Whittemore School
A.B., Hobart College, 1941; M.A., University of Buffalo, 1951; Ph.D., Massachusetts Institute of Technology, 1958. Appointed 1968.

†Green, D. MacDonald
Professor of Biochemistry

Greenleaf, William
Professor of History
Griewank, George  
_Instructor in English and Education  
M.A., University of Chicago, 1956. 
Appointed 1966.

Griewank, Virginia W.  
_Instructor in Home Economics  

Grishman, Alan  
_Associate Professor of Music  
B.S., Mannes College of Music, 1965;  
Appointed 1967.

Haaland, Gordon A.  
_Associate Professor of Psychology  
A.B., Wheaton College, 1962;  
Ph.D., State University of New York at Buffalo, 1966. 
Appointed 1945.

Haendler, Helmut M.  
_Professor of Chemistry  
B.S., Northeastern University, 1935;  
Ph.D., University of Washington, 1940. 
Appointed 1945.

Hagmann, Erick L.  
_Instructor in Chemistry  
Appointed 1969.

Hagstrom, Earl C.  
_Associate Professor of Psychology  
B.S., Tufts University, 1952;  
M.S., Brown University, 1954;  
Ph.D., ibid., 1957. 
Appointed 1965.

Hall, Francis R.  
_Associate Professor of Soil and Water Science  
B.S., Stanford University, 1949;  
M.A., University of California at Los Angeles,  
1953;  
Ph.D., Stanford University, 1961.  
Appointed 1964.

Hall, Helen P.  
_Lecturer in Home Economics  
B.S., Kansas State University, 1941;  
M.N.S., Cornell University, 1949;  

**Hall, Otis F.**  
_Professor of Forest Resources  
A.B., Oberlin College, 1943;  
M.F., Yale University, 1948;  

Handy, Allan W.  
_Lecturer in Occupational Therapy  
B.S., Tufts College, 1934;  

Hanrahan, Edward J.  
_Instructor in English  
Appointed 1966.

Hansen, Flemming  
_Visiting Associate Professor of Business Administration  
B.A., Copenhagen School of Business, 1960;  
M.B.A., ibid., 1962;  

Hapgood, Robert D.  
_Professor of English  
B.A., University of California, 1950;  
M.A., ibid., 1951;  
Ph.D., ibid., 1955. 
Appointed 1965.

Hardy, Hubert A.  
_Psychologist, Counseling and Testing Service, and Assistant Professor of Education  
A.A., San Diego Junior College, 1954;  
A.B., George Washington University, 1958;  
M.A., ibid., 1963;  

Harris, Larry G.  
_Assistant Professor of Zoology  
A.B., University of California, 1965;  

Harter, Robert D.  
_Assistant Professor of Soil and Water Science  
B.S., Ohio State University, 1961;  
M.S., ibid., 1962;  
Ph.D., Purdue University, ibid. Appointed 1969.
Haskell, John R.
Assistant to the Dean, Whittemore School of Business and Economics and Instructor in Economics

Haslerud, George M.
Professor of Psychology
B.A., University of Minnesota, 1930; Ph.D., ibid., 1934. Appointed 1945.

Hatch, John W.
Professor of The Arts

Hebert, David J.
Assistant Professor of Education

Heidgerd, Lloyd H.
Associate Professor, Biology Branch Librarian

Heilbronner, Hans
Professor of History

Held, Warren H., Jr.
Associate Dean of the College of Liberal Arts and Professor of Classics

†Henry, William F.
Professor of Resource Economics
B.S., Louisiana State University, 1940; M.S., University of Connecticut, 1942. Appointed 1952.

Hepler, Elizabeth M.
Assistant Professor, Serials Librarian

†Herbst, Edward J.
Professor of Biochemistry
B.S., University of Wisconsin, 1942; M.S., ibid., 1944; Ph.D., ibid., 1949. Appointed 1962.

Herr, Guenter K. W.
Assistant Professor of German
M.A., University of Freiburg, Germany, 1956; Ph.D., University of Texas, 1966. Appointed 1968.

Hess, Irvin T.
Coach of Wrestling and Assistant Professor of Physical Education

Hettinger, Stanley D.
Assistant Professor of Music

Heylinger, Donald E.
Instructor in Physical Education

Hickson, Fred T.
Assistant Professor of Microbiology

Higbie, Paul R.
Research Associate in Physics

**Higgins, Leroy J.
Associate Professor of Agronomy
†Hill, John L.
Associate Professor of Forest Resources
B.S., Colorado State University, 1942; M.S., Yale University, 1947; Ph.D., ibid., 1954. Appointed 1964.

Hochgraf, Frederick G.
Associate Professor of Materials Science

†Hocker, Harold W., Jr.
Associate Professor of Forest Resources

†Hodgdon, Albion R.
Professor of Botany
B.S., University of New Hampshire, 1930; M.S., ibid., 1932; Ph.D., Harvard University, 1936. Appointed 1930-32, 1936.

Hoch, Roger S.
Research Associate in Political Science

Hoff, Phyllis
Assistant Professor of Physical Education

Hogan, John A.
Carter Professor of Economics

Hogarth, Karen
Assistant Professor of Physical Education

*Hoitt, Samuel W.
Director of the Cooperative Extension Service and Professor of Agricultural Education
B.S., University of New Hampshire, 1928; M.S., ibid., 1931. Appointed 1929.

Holden, John T.
Professor of Political Science
A.B., Wesleyan University, 1936; M.P.A., Harvard University, 1941; M.A., ibid., 1942; Ph.D., ibid., 1943. Appointed 1947.

Holder, Mary E.
Associate Professor of Home Economics

Hollingsworth, Helen
Instructor in English

Holt, Charles E., Jr.
Coach of Hockey and Golf, and Lecturer in Physical Education

†Holter, James B.
Associate Professor of Dairy Science

Hoornbeek, Frank K.
Associate Professor of Zoology

Horrigan, James O.
Associate Professor of Business Administration
Hosek, William R.  
Assistant Professor of Economics  

Houston, Robert E., Jr.  
Professor of Physics  
B.S., Michigan State University, 1949; M.S., ibid., 1951; PH.D., Pennsylvania State University, 1957. Appointed 1957.

Howarth, Charles H.  
Director of the University Health Service  

Hraba, John B.  
Dean, Office of Institutional Research and Planning, and Professor of Electrical Engineering  

Hubbard, Colin  
Assistant Professor of Chemistry  

Hudon, Edna S.  
Visiting Associate Professor of French  

Hudon, Louis J.  
Professor of French  

Hull, John J.  
Instructor, Assistant Order Librarian  

Hunter, William B., Jr.  
Professor of English  

Hunziker, Nancy B.  
Lecturer in Music  

Ihra, Diane M.  
Assistant Professor of Nursing  

†Ikawa, Miyoshi  
Professor of Biochemistry  
B.S., California Institute of Technology, 1941; M.S., University of Wisconsin, 1944; PH.D., ibid., 1948. Appointed 1963.

Ingersoll, Richard L.  
Assistant Professor of Sociology  

Irwin, Isabel A.  
Instructor in Spanish  

Irwin, Manley R.  
Professor of Economics  

Jacoby, Robb  
Professor of Mathematics  

Jaffe, Erwin A.  
Associate Professor of Political Science  

Jaffe, Marianne H.  
Instructor in Speech and Drama  
*James, Jesse
State Leader, 4-H Youth Development, Cooperative Extension Service and Associate Professor of Agricultural Education

James, Marion E.
Associate Professor of History

†Jansen, Edmund F., Jr.
Associate Professor of Resource Economics

Jefferson, Brian T.
Instructor in The Arts

Jellison, Charles A., Jr.
Professor of History

Jenkins, Melvin E., Jr.
Thompson School Associate Professor of Forest Technology

Jenkins, Robert W.
Instructor in Physics, Research Associate, Space Science Center

Jenks, R. Stephen
Assistant Professor of Business Administration

Jervis, Frederick M.
Professor of Psychology

Johnson, Richard E.
Professor of Mathematics

Jones, Galen E.
Thompson School Associate Professor of Forest Technology

Jones, Meredyth M.
Lecturer in Music

Jones, Paul R.
Professor of Chemistry

Jones, William R.
Associate Professor of History

Kaplan, Barry D.
Adjunct Assistant Professor in Hotel Administration

Kaufmann, Richard L.
Associate Professor of Physics
Kauppinen, Tenho S.
Assistant Dean of the College of Technology and Associate Professor of Mechanical Engineering

Kayser, John R.
Assistant Professor of Political Science

*† Keener, Harry A.
Dean of the College of Life Sciences and Agriculture, Director of the Agricultural Experiment Station, and Professor of Dairy Science
B.S., Pennsylvania State College, 1936; M.S., West Virginia University, 1938; Ph.D., Pennsylvania State College, 1941. Appointed 1941.

Keener, C. Robert
Secretary of the University
B.A., Oberlin College, 1948.
Appointed 1960.

Kelley, Ann B.
Assistant Professor of Nursing
Diploma, Peter Bent Brigham Hospital, 1955; B.S., Boston University, 1959; M.S., ibid., 1966. Appointed 1965.

Kemnitz, Thomas M.
Assistant Professor of History
A.B., University of Michigan, 1964; Ph.D., University of Sussex, 1969.
Appointed 1969.

Kennedy, Robert C.
Thompson School Professor of Applied Plant Science

Kertzer, Joyce
Instructor in Physical Education
Appointed 1968.

Kertzer, Robert
Associate Professor of Physical Education and Assistant to the Dean, School of Health Studies

Khlief, Bud B.
Associate Professor of Education and Sociology

Kichline, William L.
Professor of Mathematics
B.A., Lehigh University, 1924; M.S., ibid., 1928. Appointed 1931.

Kimball, Robert O.
Associate Professor of Mathematics

Kimball, Roland B.
Professor of Education

Klein, Mark P.
Assistant Professor of Physics

Klinger, Burton I.
Assistant Professor of Psychology

†Klippenstein, Gerald L.
Assistant Professor of Biochemistry
Klotz, Louis H.
Associate Professor of Civil Engineering
B.S.C.E., Pennsylvania State University, 1951; M.C.E., New York University, 1952; Ph.D., Rutgers University, 1967.
Appointed 1965.

Knowlton, Elizabeth E.
Assistant Professor of Physical Education
B.A., Syracuse University, 1959; M.S., University of Wisconsin, 1967.
Appointed 1963.

Kolb, Trudy M.
Instructor in Home Economics
B.S., University of Cincinnati, 1968; M.S., Pennsylvania State University, 1969.
Appointed 1969.

Korbel, John
Professor of Economics and Business

Kuo, Shan S.
Professor of Applied Mathematics
B.S., National Chung Chen University, 1944; M.S., Ohio State University, 1948; M.E., Harvard University, 1954; D.Eng., Yale University, 1958. Appointed 1964.

Laddanyi, Peter A.
Instructor in Microbiology
Appointed 1969.

Ladd, Dwight R.
Professor of Business Administration

LaDuke, A. Jeanne
Assistant Professor of Mathematics
A.B., De Pauw University, 1960; M.S., University of New Hampshire, 1962; Ph.D., University of Oregon, 1969.
Appointed 1969.

Lambert, Robert H.
Professor of Physics

*Langer, Clarence A.
Professor of Horticulture
B.S., Michigan State University, 1933; M.S., ibid., 1948; Ph.D., ibid., 1952. Appointed 1962.

Langley, Harold E., Jr.
Associate Professor of Civil Engineering

Larson, David L.
Associate Professor of Political Science

Laurent, John L.
Professor of The Arts

Lavoie, Marcel E.
Associate Professor of Zoology

Leahy, John A., Jr.
Thompson School Instructor in Applied Plant Sciences

Leak, William B.
Adjunct Assistant Professor of Forest Resources
LeBlanc, Robert G.
Assistant Professor of Geography

Legedza, Roman
Instructor in Russian

Leighton, Charles H.
Associate Professor of Spanish

Lentz, Jacob B.
Instructor in History

Adjunct Associate Professor of Resource Economics

Lesh, Lona M.
Instructor in Physical Education for Women

Lewis, Ronald W.
Instructor in French

Limbert, David E.
Assistant Professor of Mechanical Engineering
B.S., Iowa State University, 1964; M.S., Case-Western Reserve University, 1965; Ph.D., ibid., 1969. Appointed 1969.

Linden, Allen B.
Assistant Professor of History

Linsky, Arnold S.
Associate Professor of Sociology

Littlefield, Karen A.
Assistant Professor, Cataloger

Lockwood, John A.
Professor of Physics
A.B., Dartmouth College, Thayer School of Engineering, 1941; M.S., Lafayette College, 1943; Ph.D., Yale University, 1948. Appointed 1948.

Logan, Terence P.
Assistant Professor of English

Long, David F.
Professor of History

†Loy, James B.
Assistant Professor of Plant Science

Lucha, Carol A.
Instructor in Speech and Drama

Lyle, Gloria G.
Associate Professor of Chemistry
B.A., Vanderbilt University, 1944; M.S., Emory University, 1946; Ph.D., University of New Hampshire, 1958. Appointed 1951.
Lyle, Robert E., Jr.
Professor of Chemistry
B.A., Emory University, 1945; M.S., ibid., 1946; Ph.D., University of Wisconsin, 1949. Appointed 1951.

Magnuson, Allen H.
Instructor in Mechanical Engineering

Marple, Sylvia H.
Assistant Professor of Home Economics

Marschner, Donald C.
Professor of Business Administration

Marshall, Grover E.
Assistant Professor of French and Italian

Marshall, Thomas O.
Professor of Education
A.B., Colgate University, 1929; Ed.M., University of Buffalo, 1933; Ed.D., Harvard University, 1941. Appointed 1947.

Matheson, Raymond E.
Instructor in Political Science, Foreign Student Adviser, and Director of Cultural Events

Mathieson, Arthur C.
Associate Professor of Botany

Mautz, William W.
Assistant Professor of Forest Resources

Maynard, Max S.
Associate Professor of English

McConnell, John W.
President

McFadden, Lorne A.
Professor of Plant Pathology

McPherson, Frances A.
Professor of Physical Education
B.S., University of Nebraska, 1945; M.S., University of Illinois, 1949; Ph.D., University of Wisconsin, 1965. Appointed 1969.

McQuade, Elizabeth A.
Associate Dean of Students

Mead, Jean M.
Instructor in Physical Education

Meagher, Judith A.
Assistant Professor of Education

Melvin, Donald W.
Associate Professor of Electrical Engineering

Menge, Carleton P.
Professor of Education
Mennel, Robert M.  
Assistant Professor of History  

Merritt, Richard D.  
Associate Professor of The Arts and University Photographer  

Metcalf, Theodore G.  
Professor of Microbiology  
B.S., Massachusetts College of Pharmacy, 1940; Ph.D., University of Kansas, 1950. Appointed 1956.

Meyers, T. Ralph  
Professor of Geology  
B.A., Ohio State University, 1926; M.A., ibid., 1929. Appointed 1927.

Michael, Joseph E., Jr.  
Lecturer in Law, Whittemore School  

Miller, Edmund G.  
Associate Professor of English  

Mills, Betty J.  
Assistant Professor of Physical Education  
B.S., Georgia State College for Women, 1949; M.S., University of Tennessee, 1953. Appointed 1967.

Mills, Eugene S.  
Academic Vice President and Professor of Psychology  

Mills, Richard L.  
Assistant Professor of Business and Economics and Assistant Dean of the Whittemore School  

Milne, Lorus J.  
Professor of Zoology  
B.A., University of Toronto, 1933; M.A., Harvard University, 1934; Ph.D., ibid., 1936. Appointed 1948.

Milne, Margery  
Lecturer in Physical Education  

Mitchell, James R.  
Associate Professor of Agronomy  

Mittelstadt, James W.  
Assistant Professor of Education  

Moak, Peter V.  
Assistant Professor of The Arts  

Mooradian, Andrew T.  
Director, Department of Intercollegiate Athletics, and Associate Professor of Physical Education  
B.S., University of New Hampshire, 1948; M.S., Boston University, 1958. Appointed 1950.

Moore, Asher  
Donald C. Babcock Professor of Philosophy  
Moore, Berrien, III  
*Assistant Professor of Mathematics*  
B.S., University of North Carolina, 1963;  
Ph.D., University of Virginia, 1969.  
Appointed 1969.

Moore, Francis E.  
*Lecturer in Business Administration*  
B.B.A., Boston University, 1923.  
Appointed 1964.

*Moore, Herbert C.*  
*Associate Professor of Dairy Science*  
B.S., Purdue University, 1923; M.S., University of Minnesota, 1925.  
Appointed 1928.

Morin, Robert R.  
*Assistant Professor, Coordinator Cooperative Library Service*  
B.A., University of New Hampshire, 1963;  
M.S., Simmons College, 1965.  
Appointed 1965.

Morison, James D.  
*Associate Professor of Chemistry*  
B.S., Franklin and Marshall College, 1958;  
Ph.D., Northwestern University, 1963.  
Appointed 1965.

Morison, Jean M.  
*Assistant Professor of Physical Education*  

Morse, Thomas K.  
*Assistant Professor of English*  

Mosberg, William  
*Associate Professor of Mechanical Engineering*  
B.S.M.E., Columbia University, 1956;  
M.Eng., Yale University, 1960.  
Appointed 1958.

Moss, May K.  
*Instructor in Botany*  
B.S., Southern University, 1959; M.S., Yale University, 1960. Appointed 1969.

Mower, Lyman  
*Professor of Physics*  
B.S., University of California, 1949; Ph.D., Massachusetts Institute of Technology, 1953. Appointed 1957.

Mulhern, John E., Jr.  
*Professor of Physics*  

Munroe, M. Evans  
*Professor of Mathematics*  
B.A., University of Texas, 1940; Sc.M., Brown University, 1941; Ph.D., ibid., 1945. Appointed 1959.

Murdoch, Joseph B.  
*Professor of Electrical Engineering*  

Murray, Donald M.  
*Professor of English*  

Murray, Frederick P.  
*Associate Professor of Speech and Drama*  

Myers, Norman W.  
*Vice President-Treasurer*  

Nast, Charlotte G.  
*Professor of Botany*  
B.A., University of Wisconsin, 1927; M.A., ibid., 1929; Ph.D., University of California, 1938. Appointed 1948.

Newell, L. Jackson  
*Assistant Dean, College of Liberal Arts*  
Newman, Barbara K.  
Associate Professor of Physical Education  

Nichols, Ernest E.  
Instructor in Electrical Engineering  

Nicoloff, Philip L.  
Professor of English  
b.a., University of California at Los Angeles, 1949; m.a., Columbia University, 1952; ph.d., ibid., 1959. Appointed 1954.

Nielsen, John P.  
Associate Professor of Civil Engineering  

Nielson, Melville  
Acting Dean of the College of Liberal Arts and Associate Professor of Sociology  
b.s., Bowling Green State University, 1942; m.a., Ohio State University, 1947; ph.d., ibid., 1955. Appointed 1950.

Nordgren, Eric A.  
Associate Professor of Mathematics  

Norris, Douglas M., Jr.  
Associate Professor of Mechanical Engineering  

Northway, Philip E.  
Assistant Professor of Education  

*Nott, Sherrill B.  
Assistant Professor of Resource Economics  

O'Connell, Lawrence W.  
Assistant Professor of Political Science  

O'Connor, James T., Jr.  
Associate Professor of Animal Science  

O'Donnell, Dorothy C.  
Associate Professor of Home Economics  

Olsen, James H.  
Assistant Professor, Assistant to the Librarian  

†Olsen, David P.  
Associate Professor of Forest Resources  

Orent, Amnon  
Assistant Professor of Anthropology  

Owens, Betty  
Instructor, Cataloger  
b.a., University of New Hampshire, 1958; m.s.l.s., Western Michigan University, 1967. Appointed 1969.

Owens, Charles W.  
Associate Professor of Chemistry  
Paella, Natalo A.
Lecturer in Music

Palmer, Stuart H.
Professor of Sociology

Parent, Claude R.
Instructor in Hotel Administration

Partridge, Allan B.
Associate Professor of History
A.B., Clark University, 1922; A.M., ibid., 1923. Appointed 1925.

Pawuk, William H.
Instructor in Plant Pathology

Peabody, Patricia A.
Instructor, Assistant Reference Librarian

*Peck, Rhoda M.
Assistant Professor of Home Economics

*Peerce, Lincoln C.
Professor of Plant Science

*Peters, Joan A.
Editor, Cooperative Extension Service, and Assistant Professor of Home Economics

*Peterson, Nobel K.
Associate Professor of Soil and Water Science
B.S., Kansas State College, 1948; M.S., Purdue University, 1950; Ph.D., Rutgers University, 1957. Appointed 1957.

Petroski, Joseph J.
Associate Professor of Education

Pew, Richard H.
Associate Professor of Hotel Administration
B.S., Cornell University, 1933. Appointed 1963.

Pfanner, Helmut F.
Associate Professor of German

Phelps, John E.
Assistant Professor of Chemistry
B.S., East Texas State University, 1964; Ph.D., University of Texas, 1970. Appointed 1969.

Pierce, Robert S.
Adjunct Associate Professor of Forest Resources and Soil and Water Science

Pilar, Frank L.
Professor of Chemistry
B.S., University of Nebraska, 1951; M.S., ibid., 1953; Ph.D., University of Cincinnati, 1957. Appointed 1957.

Pineus, Michael S.
Associate Professor of Spanish
Pine, Gerald J.  
Professor of Education  
Appointed 1966.

Pine, Mary A.  
Instructor in Education  

Plummer, Sandra J.  
Instructor in Nursing  

Plunkett, Frances J.  
Assistant Professor of Physical Education  

Poisson, Leandre  
Instructor in Home Economics  

Pokoski, John L.  
Assistant Professor of Electrical Engineering  
B.S., St. Louis University, 1959; M.S., Arizona State University, 1965; Ph.D., Montana State University, 1967. Appointed 1967.

Polk, Keith  
Associate Professor of Music  

Poll, Solomon  
Professor of Sociology  

Potter, Alfred R.  
Associate Professor of The Arts  

Potter, Hugh M., III  
Assistant Professor of English  

Prince, Allan B.  
Assistant Vice-President for Research, Assistant to the President for the Budget, and Professor of Soil and Water Science  

Pritchard, Hugh C.  
Professor, Reference Librarian  

Puth, Robert C.  
Assistant Professor of Economics  

Pyati, Sudhindranath  
Assistant Professor of Electrical Engineering  

Radlow, James  
Professor of Applied Mathematics  

Rainbolt, Wynn M.  
Thompson School Instructor in Communications  

Rand, M. Elizabeth  
Associate Professor of Home Economics  
Rasmussen, Mary H.
Visiting Assistant Professor of Music

Reade, Lewis P.
Adjunct Associate Professor of the Whittemore School
B.S.M.E., University of Miami (Florida), 1953. Appointed 1969.

Reed, Robert C.
Associate Professor, Order Librarian

Reeves, Roger Marcel
Associate Professor of Entomology and Forest Resources

Reid, Donald E. (Lt. Colonel, USA)
Assistant Professor of Military Science

Reid, Samuel R.
Professor of Business and Economics
B.S., St. Louis University, 1950; M.S., ibid., 1959; Ph.D., ibid., 1962. Appointed 1969.

Reske, Hermann W.
Professor of German

Reske, Hildegard S.
Instructor in German

Rich, Avery E.
Professor of Plant Pathology

†Richards, Mathias C.
Associate Dean of Life Sciences and Agriculture and Professor of Botany
B.S., Utah State Agricultural College, 1932; Ph.D., Cornell University, 1938. Appointed 1941.

Richardson, John C.
Professor of English
A.B., Dartmouth College, 1941; M.A., Columbia University, 1942; Ph.D., Boston University, 1959. Appointed 1946.

†Ringrose, Richard C.
Professor of Poultry Science
B.S., Cornell University, 1932; Ph.D., ibid., 1936. Appointed 1942.

Robinson, Frederick J.
Associate Director, Merrimack Valley Branch and Assistant Professor of Mathematics

Rogers, Ada-Louise H.
Visiting Assistant Professor of Music

Rogers, John E.
Assistant Professor of Music

†Rogers, Owen M.
Associate Professor of Horticulture

Romoser, George K.
Professor of Political Science
Root, James F.
Football Coach and Assistant Professor of Physical Education
B.A., Miami University, Ohio, 1953.
Appointed 1968.

Rose, Alan H.
Instructor in English
Appointed 1969.

Rosen, Sam
Professor of Economics

Ross, Nancy W.
Instructor, Assistant Order Librarian
Appointed 1969.

Ross, Shepley L.
Professor of Mathematics
A.B., Boston University, 1949; A.M., ibid., 1950; Ph.D., ibid., 1953.
Appointed 1955.

Rothwell, Kenneth J.
Professor of Economics

Rouman, John C.
Assistant Professor of Classics

†Routley, Douglas G.
Professor of Biochemistry and Plant Science

Royal, Mary P.
Instructor in Home Economics

Rutstein, Barbara S.
Instructor in Spanish
B.A., University of Vermont, 1962.
Appointed 1969.

Rutstein, Joel S.
Instructor, Assistant Reference Librarian

Rutledge, Edward F.
Assistant Professor of Psychology

Rutman, Darrett B.
Professor of History
A.B., University of Illinois, 1950; Ph.D., University of Virginia, 1959.
Appointed 1968.

Sabatelli, Philip J.
Instructor in Speech and Drama

Samuels, Fred
Associate Professor of Sociology
B.S., City College of New York, 1950; M.A., University of Hawaii, 1963; Ph.D., University of Massachusetts, 1966.
Appointed 1966.

Sarkady, Antal A.
Instructor in Physics and Project Engineer, Space Science Center

Sasner, John J., Jr.
Associate Professor of Zoology

Savage, Eugene Arnold
Director of Admissions
Appointed 1969.
Savage, Godfrey H.
Professor of Mechanical Engineering

Savage, Peter R.
Associate Professor of Political Science

Sawyer, Albert K.
Associate Professor of Chemistry
A.B., Colby College, 1940; M.S., University of Maine, 1947. Appointed 1949.

Sawyer, Philip J.
Professor of Zoology
B.S., University of New Hampshire, 1940; M.S., ibid., 1948; Ph.D., University of Michigan, 1956. Appointed 1952.

Schaefer, Paul E.
Associate Professor of Zoology
A.B., Bethany College, 1926; M.S., Ohio State University, 1931; Ph.D., ibid., 1936. Appointed 1941.

Schenk, Katherine
Assistant Professor of Nursing
B.S., Simmons College, 1941; M.S., Boston University, 1959; Ph.D., University of Florida, 1969. Appointed 1969.

Schneer, Cecil J.
Professor of Geology

†Schreiber, Richard W.
Professor of Botany
B.S., University of New Hampshire, 1951; M.S., ibid., 1952; Ph.D., University of Wisconsin, 1955. Appointed 1957.

Schreiner, Ernst J.
Adjunct Professor of Forest Resources
B.S., Syracuse University, 1926; Ph.D., Columbia University, 1930. Appointed 1964.

Schriver, Charles B.
Assistant Professor of Chemical Engineering
B.S., University of Rhode Island, 1957; M.S., Iowa State University, 1960; Ph.D., ibid., 1963. Appointed 1965.

Schudel, Paul H.
Assistant Coach of Athletics and Lecturer in Physical Education
B.S., Miami University, Ohio, 1966. Appointed 1968.

Schulz, Ann T.
Assistant Professor of Political Science

Schulz, James H.
Associate Professor of Economics

Schwarz, Marc L.
Assistant Professor of History

Seperson, Marvin A.
Instructor in Education

Shapiro, Howard M.
Assistant Professor of Sociology

Shattuck, Gerald B.
Lecturer in Occupational Therapy

Shaw, Winifred C.
Associate Professor of The Arts
Shepard, Harvey K.
Assistant Professor of Physics

Shepard, Herbert A.
Visiting Professor of Organizational Behavior
B.A., McMaster University, 1941; M.A., University of Toronto, 1947; Ph.D., Massachusetts Institute of Technology, 1950. Appointed 1968.

Sheridan, Philip J.
Instructor in Classics

Sherman, Heidemarie C.
Instructor in Economics

Sherman, James L.
Assistant Professor of German

Shigo, Alex L.
Adjunct Professor of Botany
B.S., Waynesburg College, 1956; M.S., West Virginia University, 1958; Ph.D., ibid., 1959. Appointed 1966.

Shor, Ronald E.
Associate Professor of Psychology

Shore, Samuel D.
Associate Professor of Mathematics

Siddall, David V.
Assistant Professor of English

Silva, J. Donald
Thompson School Assistant Professor of Communications

Silverman, Robert J.
Professor of Mathematics

Simpson, Robert E.
Associate Professor of Physics

Sims, Wilburn L.
Instructor in Speech and Drama

Singer, Frank P.
Thompson School Assistant Professor of Forest Technology

Sivaprasad, Kondagunta
Visiting Assistant Professor of Electrical Engineering

Skelton, Carolyn D.
Lecturer in Music

Skelton, John B.
Lecturer in Music
Skoglund, Winthrop C.
Professor of Poultry Science
B.S., University of New Hampshire, 1938;
M.S., Pennsylvania State College, 1940;
Ph.D., Pennsylvania State University,

Skutt, H. Richard
Associate Professor of Electrical
Engineering
B.S., Virginia Polytechnic Institute, 1954;
M.S., ibid., 1960; Ph.D., Worcester Poly-

Sloan, Roger P.
State Forestry Leader, Cooperative
Extension Service, and Assistant
Professor of Forest Resources
B.S., University of New Hampshire, 1942;
Appointed 1946.

Smith, Elizabeth C.
Lecturer in Animal Sciences
B.S., St. Lawrence University, 1951; M.S.,
Pennsylvania State University, 1954;

Smith, Gerald L.
Associate Professor of Animal Science
B.S., University of New Hampshire, 1948;
M.S., Pennsylvania State College, 1951.
Appointed 1948.

Smith, Mark R.
Assistant Professor of English
Appointed 1966.

Smith, M. Daniel
Associate Professor of Education
A.B., Dartmouth College, 1948; M.M.,
University of Michigan, 1950; Ed.M.,
Harvard University, 1958; Ed.D., ibid.,

Smith, Philip M.
Assistant Professor of Education
B.A., Boston University, 1958; M.Ed., ibid.,

Smith, Samuel C.
Associate Professor of Biochemistry and
Poultry Science
B.S., Pennsylvania State University, 1955;
M.S., ibid., 1958; Ph.D., ibid., 1962.
Appointed 1961.

Soukaris, Pauline
Associate Professor of Social Work
B.S., University of New Hampshire, 1950;
M.S., Boston University School of Social

Spangenberg, James L.
Associate Professor of Home Economics
B.A., University of Florida, 1943; B.D.,
Southern Baptist Theological Seminary,
1946; M.A., University of Michigan, 1957;
Ph.D., Pennsylvania State University, 1966.
Appointed 1967.

Spies, Richard C.
Instructor in Spanish
B.A., Brooklyn College, 1967; A.M., Har-

Splaine, John E., Jr.
Instructor and Administrative
Assistant in Education
B.A., University of New Hampshire, 1963;

Sprague, Linda G.
Instructor in Production Management
B.S., Massachusetts Institute of Technol-
ogy, 1961; M.B.A., Boston University,

Stackhouse, Larry L.
Assistant Professor of Animal Science
B.S., Ohio State University; Ph.D., Uni-

Steele, Donald E.
Professor of Music
B.M., New England Conservatory of
Music, 1946; M.A., Colorado College,
Stepenuck, Stephen J.
Instructor in Chemistry
B.S., Merrimack College, 1959; M.S., College of the Holy Cross, 1961.
Appointed 1969.

Stevens, Richard F.
Dean of Student Affairs
Appointed 1961.

Stewart, Glenn W.
Associate Professor of Geology
B.S., University of New Hampshire, 1935; M.S., Syracuse University, 1937; M.A., Harvard University, 1950.
Appointed 1938-39, 1941.

Stewart, James A.
Assistant Professor of Biochemistry
Appointed 1968.

Stokes, Samuel E., Jr.
Associate Professor of French

Stone, Deborah E.
Assistant Professor of Education
B.Ed., Plymouth Teachers College, 1940; Ed.M., Boston University, 1951.
Appointed 1962.

Stone, Robert B.
Assistant Professor, Assistant Reference Librarian

Storms, Jack R.
Thompson School Associate Professor of Food Service Management

Stotz, Kerwin C.
Associate Professor of Electrical Engineering

Straus, Murray A.
Professor of Sociology

Strout, Richard G.
Professor of Poultry Science

Summers, Richard B.
Lecturer in Music

Swan, Emery F.
Professor of Zoology
B.S., Bates College, 1938; Ph.D. University of California, 1942. Appointed 1952.

Sweeney, Anita R.
Assistant Professor of Nursing
Diploma, New Hampshire Hospital School of Nursing, 1952; B.S., St. Anselm’s College, 1957; M.S., Adelphi University, 1959. Appointed 1969.

Sweet, Paul C.
Coach of Track and Cross Country and Professor of Physical Education
B.S., University of Illinois, 1923; M.S., University of Southern California, 1941. Appointed 1924.

Sylvester, Robert P.
Associate Professor of Philosophy and Lecturer in Music
Taft, Charles K.
Professor of Mechanical Engineering

Teeri, Arthur E.
Professor of Biochemistry
B.S., University of New Hampshire, 1937; M.S., ibid., 1940; Ph.D., Rutgers University, 1943. Appointed 1938-40, 1943.

Tepper, Louis A., Jr.
Assistant Coach of Athletics and Lecturer in Physical Education

Terminko, John
Assistant Professor of Business Administration
B.S.E.E., Newark College of Engineering, 1961; M.S., Massachusetts Institute of Technology, 1962; Ph.D., Case-Western Reserve University, 1968. Appointed 1967.

Thomas, George R.
Professor of The Arts

Tillinghast, Edward K.
Assistant Professor of Zoology

Tischler, Herbert
Professor of Geology

Trout, Ben T.
Instructor in Political Science

Turner, Leslie C.
Registrar

Uebel, J. John
Associate Professor of Chemistry

Underwood, Dale S.
Professor of English

Upham, Thomas F.
Coach of Skiing and Lecturer in Physical Education

Urban, Willard E., Jr.
Associate Professor of Biometrics and Statistician, Agricultural Experiment Station

Valentine, Russell L.
Associate Professor of Mechanical Engineering
Certificate in Machine Design, Wentworth Institute, 1942; B.S., Michigan State College, 1951; M.S.M.E., Purdue University, 1953. Appointed 1953.

Valenza, Daniel L.
Associate Professor of The Arts

Van Ameyden Van Duym, Hidde H.
Instructor in English

Van Ameyden Van Duym, Penelope L.
Instructor in English
Verrette, Paul F.
Assistant Professor of Music
B.A., University of New Hampshire, 1952.
Appointed 1962.

Vincent, Donald E.
Professor, Librarian
B.A., University of Buffalo, 1949; A.M.L.S.,
University of Michigan, 1952; A.M., ibid.,

Voll, John O.
Assistant Professor of History
A.B., Dartmouth College, 1958; M.A., Harvard
University, 1960; Ph.D., ibid., 1969.
Appointed 1965.

Vreeland, Robert P.
Associate Professor of Civil Engineering
B.S., Yale University, 1932; M.S., Columbia
University, 1933; M.E., Yale University,

Walker, Ian M.
Visiting Instructor in The Arts
B.S., University of Rhode Island, 1958;
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Wallace, Oliver P., Sr.
Associate Professor of Forest Resources
B.S., University of New Hampshire, 1937;
B.S.F., University of Michigan, 1938; M.F.,
ibid., 1947; Ph.D., ibid., 1954.
Appointed 1953.

Wallace, William H.
Professor of Geography
B.S., Beloit College, 1948; M.S., University
of Wisconsin, 1950; Ph.D., ibid., 1956.
Appointed 1957.

Walsh, Anthony A.
Instructor in Psychology
A.A., Worcester Junior College, 1961; B.A.,
American International College, 1964;
Appointed 1968.

Wang, Tung-Ming
Associate Professor of Civil Engineering
B.S.C.E., National Chiao-Tung University,
1945; M.S.C.E., University of Missouri,
1954; Ph.D., Northwestern University,

Warren, Richard
Professor of Poultry Science
B.S., Cornell University, 1934; M.S., ibid.,

Watson, Deborah
Instructor, Cataloger
B.A., University of New Hampshire, 1963;

Watson, Robert I.
Professor of Psychology
A.B., Dana College, 1933; A.M., Columbia
University, 1935; Ph.D., ibid., 1938.
Appointed 1967.

Wear, Robert E.
Associate Professor of Physical Education
and Athletics
B.A., Oberlin College, 1941; M.A., University
of Michigan, 1951; Ph.D., ibid., 1955.
Appointed 1964.

Webb, Wayne D.
Assistant Professor of Education
B.A., University of Redlands, 1955; M.A.,
ibid., 1956; Ph.D., Stanford University,

Webber, Laurance E.
Research Professor and Director,
Engineering Experiment Station
B.S., University of New Hampshire, 1934;
M.E., ibid., 1940; M.S., ibid., 1946.
Appointed 1937.

Webber, William R.
Professor of Physics
B.S., Coe College, 1951; M.S., University
of Iowa, 1955; Ph.D., ibid., 1957.
Appointed 1969.

Weber, James H.
Associate Professor of Chemistry
B.S., Marquette University, 1959; Ph.D.,
Ohio State University, 1963.
Appointed 1963.
Weeks, Silas B.
Associate Professor of Resource Economics
B.S., Cornell University, 1937.
Appointed 1954.

Weesner, Theodore W.
Assistant Professor of English
B.A., Michigan State University, 1959; M.F.A., University of Iowa, 1965.
Appointed 1966.

Weiland, Walter E.
Associate Professor of Physical Education

Wells, Otho S.
Assistant Professor of Plant Science
B.S., North Carolina State University, 1961; M.S., Michigan State University, 1963; Ph.D., Rutgers University, 1966.
Appointed 1966.

Wetzel, William E.
Assistant Professor of Business Administration

†Weyrick, Richard R.
Associate Professor of Forest Resources
B.S., University of Minnesota, 1953; M.F., ibid., 1961; Ph.D., ibid., 1968.
Appointed 1964.

Wheeler, Charles M., Jr.
Associate Professor of Chemistry
B.S., West Virginia University, 1947; M.S., ibid., 1949; Ph.D., ibid., 1951.
Appointed 1950.

Wheeler, Douglas L.
Associate Professor of History

White, Christopher C.
Assistant Professor of Mathematics

White, Susan O.
Instructor in Political Science
Appointed 1969.

Whitlock, John B.
Associate Professor of Music

Whitman, Kathryn M.
Instructor in Occupational Therapy
Diploma, Boston School of Occupational Therapy, 1945. Appointed 1968.

Whittier, Duane H.
Associate Professor of Philosophy

Wicks, John D.
Associate Professor of Music

Williams, Howard H.
Assistant Professor of Music

Williams, Thomas A., Jr.
Professor of English

Willits, Robin D.
Associate Professor of Business Administration
Wilson, John A.
Assistant Professor of Mechanical Engineering

Winn, Alden L.
Professor of Electrical Engineering

Wiseman, William J.
Assistant Professor of Geology

Witthoft, William G.
Assistant Professor of Mathematics

Wochholz, Harold F.
Assistant Professor of Electrical Engineering

Wood, Langley
Professor of Zoology

Woodruff, John H.
Associate Professor of Political Science

Wooster, Caroline S.
Associate Professor of Physical Education
Cert., Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934. Appointed 1944.

Wright, Claire W.
Academic Counselor, Office of the Dean of Liberal Arts, and Instructor in Education

Wright, Paul A.
Professor of Zoology

Wrightsman, Dwayne E.
Associate Professor of Finance

Wurzburg, Frederic W.
Associate Professor of Political Science

Wybourn, Marjory A.
Professor of Home Economics

Yang, Jane C.
Assistant Professor, Cataloger

Yeaton, Carl G. (Colonel USAF)
Professor of Aerospace Studies
B.S., Ohio State University, 1958. Appointed 1968.

Yen, Yin-Chao
Adjunct Associate Professor of Chemical Engineering
B.S., National Taiwan University, 1951; M.S., Kansas State University, 1956; Ph.D., Northwestern University, 1960. Appointed 1965.
Yildiz, Asim  
*Professor of Mechanics*  
B.S., M.S., Technical University of Istanbul, 1953; D.ENG., Yale University, 1958.  
Appointed 1967.  

Yount, John A.  
*Associate Professor of English*  

Zabarsky, Melvin J.  
*Associate Professor of The Arts*  
Appointed 1969.  

Zaso, Gus C.  
*Associate Professor of Recreation and Parks*  

Zoller, J. Harold  
*Professor of Civil Engineering*  
B.S.C.E., University of Wyoming, 1941; B.S.S.E., University of Illinois, 1945; Ph.D., University of Wisconsin, 1953.  
Appointed 1958.  

---  

**Professional Staff, Instruction and Research**  

Adams, John P.  
*Assistant University Photographer*  
Franklin Technical Institute, 1957.  
Appointed 1959.  

*Ballard, Horace C.*  
*Agricultural Agent, Belknap County*  
B.S., Cornell University, 1936.  
Appointed 1949.  

*Barker, Floyd V.*  
*Extension Coordinator, Natural Resource Development*  
B.S., University of Maine, 1948.  
Appointed 1967.  

Beckingham, Kathleen R.  
*Supervisor of Testing, Counseling and Testing Center*  

Bladen, Lynn M.  
*4-H Youth Development Agent,*  
*Rockingham County*  
B.S., University of Maryland, 1969.  
Appointed 1969.  

†Booska, Emery P.  
*Assistant to the Dean, College of Life Sciences and Agriculture*  
Appointed 1966.  

*Breck, Robert W.*  
*Forester, Hillsborough County*  
B.S., University of New Hampshire, 1940; M.F., Yale School of Forestry, 1941.  
Appointed 1947.  

*Brook, Munro S.*  
*4-H Youth Development Agent,*  
*Coos County*  
Appointed 1967.  

51
*Buck, Charles W.
4-H Youth Development Agent, Hillsborough County
B.S., University of Maine, 1951; M.S., University of New Hampshire, 1968.
Appointed 1955.

*Butterfield, Marcius R.
4-H Youth Development Agent, Cheshire County
B.S., University of Vermont, 1958.
Appointed 1962.

*Chamberlin, Roxann
Assistant 4-H Youth Development Agent, Grafton County
B.S., University of Vermont, 1964.
Appointed 1968.

*Clark, Virginia E.
Extension Home Economist Merrimack County
B.E., Keene State College, 1942.
Appointed 1963.

Clarke, E. Warren
Coordinator, Civil Defense Training Program

*Clifford, Robert L.
4-H Youth Development Agent, Belknap County
B.S., University of New Hampshire, 1957.
Appointed 1960.

*Colby, Perley D.
Agricultural Agent, Hillsborough County
B.S., University of New Hampshire, 1952.
Appointed 1953.

*Colby, Stanley W.
Agricultural Agent, Sullivan County
B.S., University of New Hampshire, 1934.
Appointed 1940.

*Comerford, Edward V.
Agricultural Agent, Cheshire County
B.S., University of New Hampshire, 1937.
Appointed 1945.

*tCorrow, Henry W., Jr.
Editor, Cooperative Extension Service
B.S., Boston University, 1948.
Appointed 1953.

*Currier, Muriel B.
Extension Home Economist, Grafton County

*Cutter, Arthur H.
Agricultural Agent, Strafford County

*Damon, John F.
Agricultural Agent, Carroll County
B.S., University of New Hampshire, 1961.
Appointed 1961.

*Danko, Thomas
Poultry Area Agent, Belknap, Cheshire, Hillsborough, and Merrimack Counties
B.S., University of Massachusetts, 1952; M.S., University of New Hampshire, 1968.
Appointed 1957.

*Davis, Marion S.
Extension Home Economist, Sullivan County
B.E., Keene Normal School, 1929.
Appointed 1937.

DesRuisseaux, Louis R.
Emergency Operations Instructor, Civil Defense Training Program
B.S., Fordham University, 1946.
Appointed 1966.

*Dodge, Arthur G., Jr.
Forester, Carroll County
A.A., Boston University, 1950; B.S. in FOR., University of Massachusetts, 1953; M.S.F., Harvard University, 1961.
Appointed 1960.

Dodsworth, Barbara M.
Research Associate, Department of Physics
B.S., University of Rhode Island, 1954; Ph.D., University of California (Berkeley), 1963. Appointed 1969.
DuBois, Thomas E.
Clinical Psychologist, Counseling and Testing Center

*Fabrizio, Richard F.
4-H Youth Development Agent, Grafton County

*Fenton, Paul J.
Agricultural Agent, Merrimack County
B.S., University of New Hampshire, 1929; M.S., Cornell University, 1941. Appointed 1952.

*Ferguson, John R., Jr.
Forester, Cheshire County

Field, Kenneth A., Jr.
Resources Management Instructor, Civil Defense Training Program

Forrest, David J.
Research Associate, Department of Physics

*George, Ernest A.
Dairy Area Agent, Hillsborough, Merrimack, and Rockingham Counties

Gilman, Francis E.
Extension Agricultural Engineer

*Hall, James W.
Dairy Area Agent, Belknap, Carroll, Coos, and Strafford Counties

*Head, Ivan E.
4-H Youth Development Agent, Sullivan County

Higbie, Paul R.
Research Associate, Department of Physics

*Josselyn, Dorothy
Chemist

Kelly, Pauline A.
4-H Youth Development Agent, Merrimack County

*Kendall, Shirley M.
Extension Home Economist, Cheshire County

*Kennedy, Kevin B.
Dairy Area Agent, Cheshire, Grafton, and Sullivan Counties

*Knowles, Stanley W.
Forester, Rockingham County

*Knox, Harry B.
4-H Youth Development Agent, Rockingham County
*Leighton, Roger S.
Forester, Strafford County
b.s., University of New Hampshire, 1941.
Appointed 1952.

Lezniak, Jerry A.
Research Associate, Department of Physics

Loughlin, John R.
Administrative Assistant in Education
Appointed 1968.

*Marty, Mamie
Extension Home Economist, Strafford County

McClendon, Roy E.
Administrative Assistant to the Dean of Education
b.a., Oberlin College, 1950; M.A.T., University of New Hampshire, 1968.
Appointed 1968.

Miklic, Joseph F.
Assistant Forester, Hillsborough County

Miller, Carl R.
Radiological Defense Instructor, Civil Defense Training Program

*Miller, Milan M.
Assistant Forester, Grafton County

Moore, Donald A.
Assistant to the Dean, College of Technology

†Morse, Wallace J.
Entomologist

Murphy, Carmita A.
Assistant Director of the Division of Continuing Education

*Nickerson, Dorothy A.
Extension Home Economics, Home Management

*Nissen, Harriet J.
Extension Home Economist, Hillsborough County

Nolet, Richard J.
Forester, Coos County

Olanyk, Mary Ellen
Extension Home Economist, Coos County

Olivier, Maurice E.
Operations Manager, Bureau of Educational Research and Testing Services

Olsen, Carl E.
Research Associate in Chemistry

*Ouellette, Gerald J.
County Forester-at-Large, Forest Recreation Business Specialist
Pratt, Leighton C.
Agricultural Agent, Coos County
B.S., University of Vermont, 1951; M.S., University of Rhode Island, 1953.
Appointed 1969.

Prough, Elizabeth A.
4-H Youth Development Agent, Hillsborough County
B.S., Pennsylvania State University, 1958.
Appointed 1960.

Puffer, Winthrop F.
Assistant to the Dean, Whittemore School of Business and Economics
B.B., Tufts University, 1956; S.T.B., Boston University School of Theology, 1959.
Appointed 1967.

Putz, George J.
Liaison Officer, Bureau of Educational Research and Testing Services
B.A., Lawrence University, 1964.
Appointed 1968.

Roeloff, Edmond C.
Research Associate, Department of Physics
A.B., University of California, Los Angeles, 1959; Ph.D., University of California, Berkeley, 1966.
Appointed 1969.

*Roper, Elizabeth R.
4-H Youth Development Agent, Carroll County
B.A., University of New Hampshire, 1928.
Appointed 1928.

*Rutherford, Richard R.
Agricultural Agent, Grafton County
B.S., University of New Hampshire, 1940.

*Sargent, Leslie B., Jr.
Forester, Grafton County
B.S., University of New Hampshire, 1943.
Appointed 1954.

Schroeder, Calvin E.
4-H Youth Development Agent, Strafford County
B.S., University of New Hampshire, 1967.
Appointed 1969.

Scott, Donald H.
Forester, Belknap County
B.S., Michigan Technical University, 1956; M.S., University of Michigan, 1957.
Appointed 1969.

Serotkin, Jeffrey C.
Assistant to the Dean of the College of Technology
B.S., Delaware Valley College, 1964; M.S., University of New Hampshire, 1968.
Appointed 1968.

Shulda, Joseph F.
Assistant to the Director of the Division of Continuing Education
Appointed 1967.

Soper, Margaret B.
Assistant to the Director of the Division of Continuing Education
B.A., University of New Hampshire, 1939.
Appointed 1966.

Steiner, Robert J.
Assistant to the Director for the Merrimack Valley Branch
Appointed 1966.

*Stevens, Robert A.
Program Specialist, 4-H Youth Development
B.S., University of New Hampshire, 1937.
Appointed 1955.

*Stewart, Edwina P.
Extension Home Economist, Grafton County

*Stimson, Ruth G.
Extension Home Economist, Rockingham County
B.S., University of New Hampshire, 1940; M.Ed., ibid., 1944. Appointed 1942.
*Stocking, Marion I.  
*Extension Home Economist,  
*Carroll County  
b.s., Simmons College, 1949.  
*Appointed 1958.

*Szymujko, Joseph A.  
*Forester, Sullivan County  
*Appointed 1957.

*Upham, Edward F.  
*Agricultural Agent, Rockingham County  
b.s., University of Massachusetts, 1953;  

†Whittaker, Donald A.  
†Poultry Farm Superintendent  
†Appointed 1967.

Williams, Charles H.  
*Ornamentals Area Agent  
b.s., Pennsylvania State University, 1956;  
m.s., Michigan State University, 1967.  
*Appointed 1969.

Wilson, Irja H.  
*Consultant Nurse Trainer  
New England Deaconess Hospital School of Nursing, 1943; b.s., Boston University, 1954; m.n., University of Minnesota, 1958. Appointed 1968.

*Wyman, Christine C.  
*4-H Youth Development Agent,  
*Strafford County  
b.s., University of New Hampshire, 1944.  
*Appointed 1963.
Administrative Divisions

Academic Vice President
Eugene S. Mills, Academic Vice President
David W. Ellis, Associate Academic Vice President

Administrative EDP Systems
Roderick R. Ricard, Jr., Manager

Admissions
Eugene A. Savage, Director

Alumni Affairs
Pierre D. Boy, Director
George W. Bamford, Fund Director
L. Franklin Heald, Editor
Mary Semitros, Recorder
Edward A. Snell, Activities Director

Audio-Visual Center
John D. Bardwell, Director

Bookstore
Robert B. Stevenson, Manager

Business Office
Herbert E. Kimball, Business Manager

Center for Educational Field Services
Jason E. Boynton, Director

Chaplains
Rev. Charles N. Gross, Protestant Chaplain, United Protestant Association
Rev. Vincent Lawless, Catholic Chaplain, Pastor, St. Thomas More
Rev. Albert W. Snow, Episcopal Chaplain, Rector, St. George's

Civil Defense Training
E. Warren Clarke, Coordinator

Computation Center
W. Richard Burrows, Manager

Continuing Education, Division of
Edward J. Durnall, Director

Cooperative Extension Service
Samuel W. Hoitt, Director

Coordinator of Research
William H. Drew, Coordinator

Counseling and Testing Center
Robert G. Congdon, Director
Kathleen R. Beckingham, Supervisor of Testing

Cultural Events
Raymond E. Matheson, Director

Development and Informational Services
J. R. Sandberg, Director
L. Franklin Heald, Director of University Publications
Thomas H. Slayton, News Editor
Richard C. Plumer, Internal Communications

Dining Services
Jane E. Griswold, Director

Engineering Design and Analysis Laboratory
Godfrey H. Savage, Director
Fletcher A. Blanchard, Associate Director

Engineering Experiment Station
Laurance E. Webber, Director
Educational Research and Testing Services
Gilbert R. Austin, Director

Financial Aids
Jane B. Stearns, Financial Aids Officer

Graduate School
Trevor Colbourn, Dean
William H. Drew, Associate Dean

Health Service
Charles H. Howarth, M.D., Director
Richard Cilley, M.D.
Richard W. Watson, M.D.
Harriet C. Nason, R.N., Supervisor of Nursing

Health Studies, School of
Lawrence W. Slanetz, Dean

Intercollegiate Athletics
Andrew T. Mooradian, Director

International Student Adviser
Raymond E. Matheson, Director

Institutional Research and Planning
John B. Hraba, Dean

Jackson Estuarine Laboratory
Galen E. Jones, Director

Liberal Arts, College of
Melville Nielson, Acting Dean
Warren H. Held, Associate Dean
L. Jackson Newell, Assistant Dean
Claire W. Wright, Academic Counselor

Library
Donald E. Vincent, Librarian

Life Sciences and Agriculture, College of
Harry A. Keener, Dean and Director of the Agricultural Experiment Station
Mathias C. Richards, Associate Dean
Samuel W. Hoitt, Director

Cooperative Extension Service
Richard H. Bittner, Director

Thompson School of Applied Science
Emery P. Booska, Assistant to the Dean

Marine Science and Technology
E. Eugene Allmendinger, Executive Officer

Memorial Union
Wayne W. Justham, Director

Merrimack Valley Branch
Gordon O. Thayer, Director
Frederick J. Robinson, Associate Director

Museum
Philip A. Wilcox, Curator

New England Center for Continuing Education
Harry P. Day, Director
Arthur S. Adams, Consultant

Personnel Office
Omer R. Morin, Officer

Photo Service
Richard D. Merritt, University Photographer

Physical Plant Development
Richard M. Brayton, Director
Vincent E. Todd, Assistant Director

Placement Service
Edward J. Doherty, Director

President's Office
John W. McConnell, President
Allan B. Prince, Assistant to the President for the Budget
C. Robert Keesey, Secretary of the University
W. Arthur Grant, Assistant to the President

Printing Service
Reginald W. King, Manager

Properties (Buildings and Grounds)
Eugene H. Leaver, Superintendent
Clifton P. Hildreth, Security Officer
John F. Donovan, Fire Chief

Public Administration Service
Lawrence W. O'Connell, Director
Public Television
Keith J. Nighbert, Manager,
    New Hampshire Network (WENH-TV)

Purchasing
Russell C. Smith, Purchasing Agent

Radiation Safety Officer
Carl Miller, Radiation Safety Officer

Registration and Records
Leslie C. Turner, Registrar

Research and Special Programs
Administration
Robert N. Faiman, Vice President
Allan B. Prince, Assistant Vice President

Reserve Officers Training Corps
Col. Herbert H. Flather, Professor
    of Military Science
Col. Carl G. Yeaton, Professor
    of Aerospace Studies

Resources Development Center
William F. Henry, Chairman
Owen B. Durgin, Associate Chairman

Space Science Center
William R. Webber, Director
Dale L. Chinburg, Associate Director

Student Affairs, Dean of
Richard F. Stevens, Dean
Ruth A. Hurley, Associate Dean
Peter L. Schofield, Associate Dean

Summer Session
Edward J. Durnall, Director

Technology, College of
Richard S. Davis, Dean
Tenho S. Kauppinen, Assistant Dean

Thompson School of Applied Science
Richard H. Bittner, Director

University Residences
Stanley E. Plummer, Director

Vice President-Treasurer
Norman W. Myers, Vice President-
    Treasurer
W. Kent Martling, Assistant Treasurer

Water Resources Research Center
Gordon L. Byers, Chairman

Whittemore School of Business
    and Economics
Jan E. Clee, Dean
Richard L. Mills, Assistant Dean
General Information

Facts About the University

History

The University of New Hampshire, founded in 1866 as the New Hampshire College of Agriculture and the Mechanic Arts, was among the early state institutions of higher education made possible by federal government land grants to establish colleges serving the sons and daughters of farming and laboring families.

First located in Hanover as part of Dartmouth College, New Hampshire College moved to its present campus in Durham in 1893 after Benjamin Thompson, a prosperous farmer, bequeathed his land and money to further the development of the state college. His estate was valued at $800,000 when it became available to the College in 1910.

The College prospered in Durham, and in 1923 the State Legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928. The two-year program in agriculture which had been offered since 1895 was formally recognized in 1939 (now the Thompson School of Applied Science). In 1962 the Whittemore School of Business and Economics was established.

In 1963 the state's system of higher education was created when the former teachers' colleges at Plymouth and Keene were made divisions of the University and brought under the same Board of Trustees as the Durham campus. In 1969 the State Legislature recognized the extended functions of the College of Agriculture, renaming it the College of Life Sciences and Agriculture; and the School of Health Studies was established as part of the University at Durham.

Since 1967, the University has provided a widening range of undergraduate and graduate studies through its evening education program at the Merrimack Valley Branch in Manchester, where preliminary planning for a permanent campus is under way.

In the 1969-70 academic year, the University at Durham had 7,729 students enrolled. The State Colleges at Plymouth and Keene had a combined enrollment of 3,700 students, and more than 1,250 students were enrolled in Merrimack Valley Branch programs.

Physical Plant

The University campus in Durham covers 156 acres. There are 35 buildings devoted to instruction, research, and administration; 25 residence halls housing about 3,900 men and women; and three modern dining halls. Total University lands—including athletic fields and woodlots—comprise 3,075 acres. Book value of the physical plant exceeds $53 million. Major construction completed during the past five years includes:

University Library, with 500,000 volumes, 4,000 periodicals, and a substantial microfilm collection, has been expanded to accommodate up to one million volumes and to provide increased study area.
General Information

Social Science Center, housing the Graduate School offices and the Departments of Political Science, Sociology, and History.

Whittemore School of Business and Economics occupies a new three-story building containing classrooms, seminar rooms, lecture halls, offices, and sophisticated business and technological equipment.

Parsons Hall, built in 1966, has been further expanded to provide completely modern facilities for the Department of Chemistry.

Memorial Union, the campus student union and social center, resumes a full operating schedule in 1970-71 after having undergone major expansion.

Athletics—Physical Education Facility, includes indoor swimming pool, track, and gymnasium. Snively Arena, an indoor ice hockey rink, also accommodates convocations and major cultural attractions.

Barton Hall, a two-story classroom and laboratory building augments the facilities of the Thompson School of Applied Science.

Kendall Hall, a five-story building completed in the spring of 1970, is the home of the Animal Sciences Department with offices, classrooms, and laboratories. The library for the College of Life Sciences and Agriculture and for the Departments of Microbiology and Zoology is located on the first floor.

Other new buildings since 1958 include Paul Creative Arts Center, containing an 800-seat formal theater, a theater-in-the-round, and separate wings for music, drama, and the arts; Spaulding Life Sciences building, with facilities for biochemistry, microbiology, and zoology; and modern residential facilities for undergraduate, graduate, and married students.

Teaching, Service, and Research

The University of New Hampshire is committed to offering quality educational programs and first-rank educational opportunities for its students. At Durham, the University's 487 full-time teaching faculty provide a ratio of one faculty member for each 16 students. An additional 90 professional specialists teach part-time. More than half of the full-time faculty hold doctoral degrees, and many have earned national, even international, reputations in their professional fields.

A faculty member's first responsibility is to his students and to teaching. In the tradition of the nation's land-grant colleges, the University also encourages its faculty to contribute to the growth of man's knowledge through scholarly research and service to the community beyond the campus.

The New England Center, a cooperative effort by the six state universities of New England to provide outstanding continuing education programs throughout the region, is located at Durham. Offices for several regionally oriented educational organizations are in its administration center, and its new residence-dining-learning center (opened in 1969) provides modern facilities for adult education conferences and seminars.

Within New Hampshire, the Division of Continuing Education provides formal adult education programs, including credit and non-credit courses. The UNH Cooperative Extension Service, in conjunction with the U. S. Department of Agriculture and coordinating councils in each of the state's ten counties, helps to communicate the research and experience developed on the campus to benefit the people in their home communities.

One of the University's largest service units is the Agricultural Experiment Station, which conducts research, publishes the results, and provides testing services for New Hampshire's farming and agriculture-related industries. The Engineering Experiment Station offers a similar service for industry, providing a research-and-development center for firms which do not have modern technological facilities and staffs at their disposal.
Other University organizations serving the state and its people include: the Resources Development Center, bringing the talents and techniques of the social scientist into closer partnership with government and private agencies; the Public Administration Service, assisting state, county, and local government in the area of municipal services; the Water Resources Research Center, coordinating campus research aimed at conserving and improving the state’s water supply; and the Bureau of Educational Research and Testing Services, which designs, scores, and evaluates student-testing programs at the elementary, secondary, and college levels.

Research in oceanography is carried on in the biological, physical, and engineering sciences, and a number of departments offer courses—some in association with other colleges and universities—oriented toward marine science and ocean engineering. The University’s new Jackson Estuarine Laboratory, situated on the shore of the Great Bay estuary in Durham, provides exceptional facilities for these joint teaching-and-research efforts.

Other specialized research facilities include the Space Science Center in Demeritt Hall; the Engineering Design and Analysis Laboratory, the Antenna Systems Laboratory, and the Computation Center, all located in Kingsbury Hall; and the Ritzman Nutrition Laboratory.

The University also operates New Hampshire’s educational television station, WENH-TV, broadcasting in-school programs for elementary and secondary schools, as well as cultural and educational programs in the evening hours which can be viewed by 98 percent of the state’s people.

Cultural Activities

With two theaters, two art galleries, and auditoriums seating up to 5,000 persons, the University is a major cultural resource for the entire state. The Spaulding Distinguished Lecture Series and the Sidore Series bring provocative, well-known leaders and scholars to the campus throughout the year. The Blue and White Series is host to leading concert artists, and the Allied Arts Series provides a varied program of drama, music, and dance. A student film society sponsors a classic film series, and University students perform frequently in concerts and recitals, and tour throughout New Hampshire and neighboring states with the best productions of their theatrical and musical organizations.

The University Library has music listening rooms and a collection of more than 3,000 records. There is also a student-operated AM-FM radio station on the campus.

Admissions Procedure

The admissions policy of the University is designed to provide for the admission of those students whose personal record, achievement, aptitude, and motivation demonstrate that they have the qualifications for carrying the desired program satisfactorily.

The University admits in-state residents who have a scholastic record ranking them in the upper two-fifths of their graduating classes from accredited or approved secondary schools, provided they are recommended or certified, and have an appropriate college preparatory background.

All candidates for admission to the University are required to submit the results of the College Entrance Examination Board Scholastic Aptitude Test taken during their senior year, except in those cases where the junior Scholastic Aptitude Test is deemed satisfactory. The English Composition Achievement Test taken during the senior year must also be submitted by all candidates; and, for those applying to the College of Liberal Arts and the Whittemore School of Business and Economics, an Achievement
General Information

Test in a foreign language is required. The achievement test results are used in course placement rather than in the admissions evaluation, so it is possible for students to submit these results as late as May of their senior year. Other achievement tests are strongly recommended for applicants in the College of Agriculture and the College of Technology in the area or areas generally related to the student’s prospective major, e.g., Level I Mathematics Test for engineering students.

Interviews are not required as part of the admission process. They may, however, be requested by the Admissions Office if felt to be necessary or desirable to make an equitable decision. Group information sessions by appointment are frequently held on Saturday mornings. These group sessions are essentially opportunities for an exchange of information and are followed by guided tours of the campus. Applicants are encouraged to visit the campus in any event, and regularly scheduled tours leave the Memorial Union at 2:00 p.m. Saturday and Sunday when college is in session.

The number of out-of-state students admitted each year is limited and selection is made primarily on the basis of superior academic achievement in secondary school. Such traits as good character, leadership, initiative, and creative ability are considered.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents are legally domiciled in the state. Students admitted from states other than New Hampshire or from foreign countries are considered as non-resident throughout their entire attendance at the University unless their parents have gained bona fide residence in New Hampshire. A student, though he may be 21, will not be recognized as a resident by the University unless he can clearly establish: that his parents, as stated above, are bona fide residents of New Hampshire; the date such a residence was established; and such other information as may be required by the University. The burden of proof in all cases is upon the applicant. If the student maintains his residency apart from that of his parents, he must clearly establish that his residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University.

Except for early-decision candidates, applications should be submitted only after the first-term grades are available and for non-resident applicants before February 15.

No New Hampshire applicant can be considered whose application is not complete at least by May 1. Thereafter, he may be considered only as vacancies occur. A non-refundable application fee—$10 for residents of New Hampshire and $15 for non-residents—must accompany the application.

The University recommends the secondary academic program outlined in the table titled “Recommended Secondary Program.”

The University will consider applicants who have taken less than the recommended programs with the minimums outlined in the table titled “Minimum Secondary Program.”

Applicants might well include courses or other experiences in music, art, and drama in their secondary school programs in addition to more formal academic preparation.

The University participates in the New England Regional Student Program of the New England Board of Higher Education in which each state university in New England offers a number or regional curricula at the undergraduate level to students from the other New England states. Under this program a student receives preferential admissions consideration and, if admitted, pays in-state tuition. Information may be obtained from the New England Board of Higher Education, 20 Walnut Street, Wellesley, Massachusetts 02181, or from any one of
Recommended Secondary Program

<table>
<thead>
<tr>
<th>Life Sciences &amp; Agriculture</th>
<th>Liberal Arts</th>
<th>Technology</th>
<th>Whittemore Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4 units</td>
<td>4 units</td>
<td>4 units</td>
</tr>
<tr>
<td>Language</td>
<td>2 units*</td>
<td>3 units*</td>
<td>3 units*</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3 units</td>
<td>3 units</td>
<td>4 units†</td>
</tr>
<tr>
<td>Laboratory Sciences‡</td>
<td>3 units</td>
<td>3 units</td>
<td>3 units</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3 units</td>
<td>3 units</td>
<td>2 units</td>
</tr>
</tbody>
</table>

Minimum Secondary Program

<table>
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<tr>
<th>Life Sciences &amp; Agriculture</th>
<th>Liberal Arts</th>
<th>Technology</th>
<th>Whittemore Studies</th>
</tr>
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<tr>
<td>English</td>
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<td>4 units</td>
<td>4 units</td>
</tr>
<tr>
<td>Language</td>
<td>0 units</td>
<td>2 units*</td>
<td>0 units</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2 units</td>
<td>2 units</td>
<td>3 units†</td>
</tr>
<tr>
<td>Laboratory Sciences‡</td>
<td>1 unit</td>
<td>1 unit</td>
<td>2 units</td>
</tr>
<tr>
<td>Social Studies</td>
<td>2 units</td>
<td>2 units</td>
<td>2 units</td>
</tr>
</tbody>
</table>

* of a single foreign language.
† college preparatory math including trigonometry.
‡ excluding “General Science”
|| must include Physics or Chemistry.
§ should include Biology.

the admissions offices of the six New England state universities.

Early Decision

The University is willing to give applicants an indication of admission, based on scholastic attainment for three years, under an early decision procedure. This plan is specifically appropriate for a well-qualified student who has made the University his first choice and who submits a regular application including junior SAT’s with a statement countersigned by the secondary school that UNH is his first-choice college and that other applications will be withdrawn if he is admitted under early decision.

Early decision applications must be submitted between September 10 and December 31.

Early Admission

Secondary school students who show unusual promise may be admitted early to the University. While it does not actively recruit candidates for college entry before graduation from secondary school, the University will, upon recommendation of the school, review the credentials of those whose academic programs have been unusually successful and extensive. Social and emotional maturity are also considered in selecting candidates for early admission.

Advanced Standing

The University will recognize unusual secondary school work by means of advanced placement and credit for those who have taken especially enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations including the College Board Advanced Placement Tests. Further information may be obtained from the Admissions Office.

Transfer Students

Qualified candidates for advanced standing from approved institutions may be admitted. Their status is tentatively determined by the quantity and quality
of the work completed at the institution from which they come. In transfer, credits are allowable for courses which are appropriate to the curriculum for which the student is admitted and for courses in which grades above the lowest passing grade were received.

While the University is pleased to encourage the competent transfer applicant who has valid and legitimate reasons for desiring transfer to New Hampshire, it cannot encourage the applicant with a history of academic or personal difficulty. University admissions policy restricts consideration for transfer to those students with satisfactory academic and personal records. In the event of personal or academic difficulty, a student is usually better advised to return to his former college after an appropriate period and clear his record before attempting to transfer.

Students desiring to transfer for the fall semester must complete application procedures before May 1.

Dining Services

University policy requires that freshmen, sophomores, and juniors, who choose to live in residence halls, excluding sorority and fraternity members who eat in their houses, must board in University dining halls. Two types of meal plans are available to students: A 15-meal-per-week ticket, good for meals from breakfast Monday through Friday dinner (evening) at $440 a year, or a 21-meal ticket at $500 a year. These plans provide students with the least expensive means of eating three well-balanced meals per day.

Students who have special diets will generally find it possible to select these diets from the choices offered in the dining halls. However, students whose diets, because of religion or health, require unusual foods should be aware that Dining Services may not be able to meet their needs. Any exception to the board policy because of strict dietary restriction should be made prior to the beginning of a semester.

Rebates cannot be made for meals missed because of weekend work, and will only be made to students who withdraw or students who have been away from campus for prolonged periods due to illness. Such illness must be substantiated by a letter from the student’s doctor.

Seniors, graduate students, and those not in residence may purchase semester meal tickets if dining hall capacities permit, or they may obtain meals on an a la carte plan from the Memorial Union cafeteria. Snack bar service is also available at the Union.

University Residences

The University has 22 undergraduate residence halls, of which 12 are for women and 10 for men. All freshmen and sophomore women who are under 20 years of age on September 1, are required to live in University housing except those who have parental permission and approval of the Associate Dean of Students to reside outside of University housing. Undergraduate men are not required to live in residence halls, but will be accommodated to the extent of space available. Average room rent is $400 per year.

Assignments to University residence halls are normally completed in July and the notice of room assignment forwarded to the student immediately. Most rooms are designed for double occupancy; however, a limited number of single rooms is available. Frequently, it is necessary to assign three students to some double rooms in a few residence halls.

All residence hall rooms are furnished with beds, mattresses, desks, chairs, wastebaskets, and a chest of drawers. In addition, many have desk lamps, mirrors,
and draperies. Students care for their own rooms and are responsible for any damages. The residence space assigned is available for occupancy beginning at 8:00 a.m. on the Sunday prior to registration. Students assigned to residence hall rooms are required to sign a room contract for the entire academic year beginning in September and ending in June. Room rental charges do not include the several school vacation periods when the halls are closed. Rooms paid for and not occupied one day after registration day may be declared vacant and three-fourths of the room rent returned, unless the individual having the reservation makes written request to the Director of Residences to hold the room.

Applications for a room in the residence halls will be sent to the student at the time of official admittance to the University. In the case of upperclassmen, applications will be available prior to room draw in the spring for the residences for the next academic year.

Financial Aid

The University Financial Aids Office assists promising students who are unable to meet their educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance.

Before an applicant may be considered for assistance through the University, two forms must be submitted: the UNH Application for Financial Aid and the Parents’ Confidential Statement. New Hampshire applicants may obtain these forms from their high school. Non-residents and transfer students may obtain the UNH application form from the Financial Aids Office and the Parents’ Confidential Statement from their local high schools.

Students must meet the following deadlines and should not wait until being admitted to the University before applying for financial aid:

For grants and scholarships—freshmen, by January 15; upperclassmen, including transfer students, by February 15.

For loans—freshmen by July 1; upperclassmen, including transfer students, by February 15.

Grants and Scholarships

A full-time student who is a resident of New Hampshire may be considered for an in-state tuition grant. The amount varies from $100 to full tuition, and the basic consideration is financial need. Non-residents are eligible for similar grants. Scholastic attainment, financial need, and participation in extra-curricular activities are the principal considerations.

The University also participates in the federally sponsored Educational Opportunity Grant Program designed to assist students in exceptional need.

There are scholarships for both resident and non-resident students. The basis of these awards may be scholastic attainment, participation in extra-curricular activities, or meeting other requirements specified by the donor.

These are the major scholarship programs for freshmen; Granite State Merit Scholarships, awarded to 20 New Hampshire residents who are outstanding graduates of high schools in the state; Achievement Scholarships, one to a resident and one to a non-resident, with awards based on high achievement plus high aptitude or special talent recognized by appropriate state or regional groups; Valentine Smith Scholarship, awarded to the incoming freshman judged to have the most thorough preparation for admission to the University, based on the results of the College Entrance Examination Board tests.
General Information

The University also sponsors two National Merit Finalists, a resident and a non-resident, who have indicated UNH as the college of their choice.

Students from out of state should have reasonable financial backing since only limited grants and scholarships are available for non-residents.

Loan Programs

Three loan funds are administered by the University: UNH Loan Fund, National Defense, and Nursing Student Loans. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

Part-Time Employment

The University does not encourage freshmen or transfer students to work during their first semester, but they may do so if they feel they can carry the extra load. The University participates in the College Work-Study Program under Title IC of the Economic Opportunity Act. The purpose of this program is to assist students from low income families and other students who are determined by the University to be in need of financial assistance to complete their college educations.

Students who do not qualify for the College Work-Study Program usually can find part-time employment on or near campus.

Fees and Expenses

The cost for the freshman year at the University averages about $2,250 for a resident of New Hampshire and $3,300 for a non-resident.

Tuition is $810 ($1,775 for non-residents) per academic year. As part of the regional cooperation program of the New England Board of Higher Education, some non-residents from certain states will be eligible at the resident rate in selected curricula. The student must apply to the Registrar for this reduced tuition. Any student registering for nine credits or more per semester pays the full tuition. Any student registering for fewer than nine credits pays $30 per credit hour, plus a registration fee of $15 for residents and $50 for non-residents per semester. The minimum fee for any recorded course is $30.

All students who are admitted to the University must make an advance deposit of $50 for residents and $100 for non-residents. This deposit will be credited on the student’s tuition bill. In case a student decides not to attend the University after making his deposit, it will automatically be forfeited.

Tuition for each semester is payable in advance. Three-fourths will be refunded to a student withdrawing during the first four days of a semester; one-half after four days and within thirty; and none thereafter. There are no refunds of the fees which are charged.

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of Applied Music courses. A charge will be made for riding lessons, as noted in the sections on Physical Education for Women and Animal Science.

Books and classroom supplies cost approximately $135. These may be purchased at the University Bookstore.

There is a Memorial Union assessment of $25; a recreational physical education fee of $30; and a student activity tax of $19.30, which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities. These fees cover the academic year. An athletic admissions fee of $10 is optional.

Housing fees average $400 per academic year.

Personal expenses average $350. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incenitals, and travel.
The University reserves the right to adjust charges for such items as tuition, board, and room rent from time to time. Such changes will be announced as far in advance as feasible.

A deferred payment plan allows a student to pay one-third of his college bill before registration and one-third at the end of the following two months. A $5 fee is charged for this service which is arranged by the Business Office.

The Summer Session

The Summer Session offers a full range of undergraduate and graduate courses in most major academic disciplines. Courses of study offer the same caliber and require the same level of performance as regular academic-year courses. No differentiation is made between courses taken during the academic year and the summer. Credits obtained through summer study may be applied to all degrees offered by the University.

The Summer Session consists of two four-week sessions, one eight-week session, and shorter special-interest workshops and institutes. A complete listing and description of courses offered through summer study, and information related to length of courses, special requirements, and tuition charges are included in the Summer Session catalog, obtained by writing the Director of the Summer Session, Huddleston Hall, University of New Hampshire, Durham, N. H. 03824.

The Division of Continuing Education

The Division of Continuing Education is responsible—in conjunction with the several schools and colleges—for the establishment, maintenance, and academic and fiscal operation of all continuing education activities of the University including credit and non-credit programs, short courses, conferences, and institutes.

This University Division recognizes the following goals as primary in meeting the vast and varied educational needs of today's citizens:

1. To provide on- and off-campus, day and evening courses leading to undergraduate degrees for adults unable to undertake regular, full-time study at the University. Degree programs offered through the Division include provisions for credits earned by examination through the College Level Examination Program and the Advanced Placement Program. Students may also receive credits for service experience, USAFI courses, and specialized courses offered by armed forces or civilian institutions.

2. To provide opportunities for adults to pursue post-baccalaureate studies leading to professional and graduate degrees, without full-time residential study.

3. To provide opportunities for adults to continue their development as individuals and as citizens. These programs enhance intellectual growth, aesthetic enjoyment, and creative activity, and increase understanding of changing personal relationships and use of recreational and discretionary time; thus wiser consumers, more effective workers, better family members, and more responsible community members are trained.

4. To provide opportunities for individuals to continue vocational or professional education beyond and apart from academic degrees; and to contribute to the economic development of New Hampshire by providing continuing educational services to business, labor, government, and the professions, through various non-credit seminars, colloquia, short courses, conferences, and institutes.

The Division catalog, describing programs, courses, admission requirements, and related concerns is available by writing the Division of Continuing Education, Huddleston Hall, University of New Hampshire, Durham, N. H. 03824.

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A student is held responsible for all work required for graduation and for the scheduling of all the necessary courses.

In addition to the particular requirements for specific degrees established by the colleges, the University requires that every candidate for a bachelor's degree must successfully obtain a passing grade in a minimum of 128 credits; must attain a cumulative grade point average at least 2.0 for all courses taken at the University in which a grade is given; and must successfully meet the following general education requirements:

1. Four courses (each of which must carry at least three credits) from the following (biological sciences, physical sciences, and mathematics):

   - Biological Sciences
     - Biochemistry
     - Biology
     - Botany
     - Entomology
     - Microbiology
     - Zoology

   - Physical Sciences and Mathematics
     - Chemistry
     - Geology
     - Mathematics
     - Physical Science
     - Physics

2. Six courses (each of which must carry at least three credits) from the following (arts, humanities, and social sciences):

   - Arts and Humanities
     - Arts
     - English
     - Foreign Languages (except elementary year) and Literature
     - Humanities
     - Liberal Arts
     - Music
     - Philosophy
     - Speech & Drama

   - Social Sciences
     - Anthropology
     - Economics
     - Education 481 and 657
     - Geography (except physical geography)
     - History
     - Political Science
     - Psychology
     - Resource Economics (except 501 and 504)
     - Sociology
     - Social Science

3. Six courses, one of which must be freshman English unless specifically exempted by the English Department, (and each of which must carry at least three credits), from all courses offered by the University including those listed above.

The University, College, or Department may prescribe up to eight of the sixteen courses used to satisfy the general education requirements. A minimum of eight courses are to be freely elected by the student. Courses taken to satisfy general education requirements may not be in the student's major department.
A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a written English proficiency examination. The freshman English course may not be used to satisfy the arts and humanities requirement in general education.

Proficiency in physical education is required of all undergraduates. Students who do not pass the proficiency standards determined by the Departments of Physical Education will take an appropriate program without credit until such time as they pass proficiency tests or for a period not to exceed two years.

Grades and Honors

Grades: an instructor may assign grades as listed below. The intermediate grades are designated by adding plus to the letter grade. Grade points assigned to plus grades are 0.5 higher than those assigned to the letter grade without the plus.

A (Excellent)—academic achievement of outstanding quality.
B+—intermediate grade.
B (Good)—academic achievement of high quality.
C+—intermediate grade.
C (Acceptable)—academic achievement of a quality acceptable in satisfying the minimum requirements for graduation.
D+—intermediate grade.
D (Unsatisfactory)—academic performance below the minimum level established as a prerequisite for graduation, but not so deficient as to demand repetition of the courses, unless such repetition is essential for demonstration of competence in the major field.
F (Failure)—academic performance so deficient in quality as to be unacceptable for academic credit.
Inc. (Incomplete)
Cr. (Credit)—given in certain courses authorized by Senate action.
P—a passing grade in a course taken under the Pass-Fail option.

Grade points per semester hour shall be assigned as follows: A, 4; B+, 3.5; B, 3; C+, 2.5; C, 2; D+, 1.5; D, 1; F, 0; Cr., 0; P, 0.

Freshman grade reports are forwarded to the high school (or other secondary-level institution) from which the student entered the University as a source of information for guidance purposes.

Honors: Students completing a semester with at least 10 semester hours whose grade point averages are 3.0 or higher for the semester are designated as Honor Students for the following semester. These categories will be used: 3.0 to 3.4, Honors; 3.5 and 3.6, High Honors; 3.7 to 4.0, Highest Honors. Seniors who have earned honors for their entire college work will be graduated with the honors earned.

Pass-Fail: While earning a bachelor's degree the pass-fail option for grading may be carried in a maximum of four courses outside the courses required by the major department upon election by the undergraduate student. The status of the student is to be known prior to the end of the ten day “add period.” The course will not be included in the grade point calculation, but the Pass or Fail will be recorded, and in the case of a Pass the course credits will be counted toward degree requirements. The Pass-Fail option may not be available for courses taken for a minor. Consult the appropriate College for information.

Students may not use the Pass-Fail option to repeat a course.

Minimum Graduation Average

A cumulative grade point average of 2.0 is the minimum acceptable level for undergraduate work in the University, and for graduation from the University. The Committee on Scholastic Standing examines the records of students periodically, and may place academically deficient or potentially deficient students on warning, or may exclude, suspend, or dismiss those who are academically deficient.
Quota of Semester Credits

Any student registering for less than 12 or more than 20 credits must receive the approval of his college dean.

An undergraduate is assigned class standing on the basis of semester credit hours of academic work completed with a passing grade, as follows:

To be a Sophomore 26 credit hours
To be a Junior 58 credit hours
To be a Senior 90 credit hours

Withdrawal from the University

Students who leave the University after Registration Day are expected to file formal withdrawal notification.

Residence

Students who are candidates for a bachelor’s degree must attain the last one quarter of credit toward the degree in residence unless granted permission by the Committee on Scholastic Standing to transfer part of this work from other accredited institutions.
College of Life Sciences and Agriculture

Harry A. Keener, Dean
M. C. Richards, Associate Dean

Departments
Animal Sciences
Biochemistry
Botany
Entomology
Forest Resources
Home Economics
Plant Science
Resource Economics
Soil and Water Science

Degrees, Majors, and Specializations
BACHELOR OF SCIENCE:
Agricultural Education
Animal Sciences
  Animal Science
  Dairy Science
  Poultry Science
  Pre-Veterinary Medicine
Biochemistry
Botany
Entomology
General Studies
Home Economics
  Family Studies
  Human Nutrition and Dietetics
Plant Science
Resource Economics
Soil and Water Science
  Agricultural Engineering
  Hydrology
  Soil Science
Wildlife Management

BACHELOR OF SCIENCE IN FORESTRY:
Forestry
General Information

Purpose and Programs
The objectives of the College of Life Sciences and Agriculture are to give the student a fundamental education in the biological, physical, and social sciences and to introduce him to the arts and humanities. In addition, specific technical courses are provided in the student's interests and in his major.

The College offers two undergraduate degrees: the Bachelor of Science and the Bachelor of Science in Forestry.

Advisory System
A member of the faculty closely related to the student's area of interest is appointed as an adviser to assist the student in planning his academic program. The student may select his major upon entering the College or he may wait until registration for the sophomore year.

Dual Degree Program
A student may obtain more than one undergraduate degree at the University by completing all the curriculum, departmental, scholastic, and other requirements for each degree. Students wishing to earn more than one undergraduate degree should make their plans known to their adviser and the College Deans concerned early in their college careers.

Honors Program
The College of Life Sciences and Agriculture, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities. Participation in the honors program is by invitation of a faculty member with the approval of the Department concerned and the Dean of the College. It is limited to those students entering the sophomore or junior year with at least a 3.0 grade point average. The recommending faculty member, his department Chairman, and the Dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and College course requirements may be waived for students in the program. The student will complete the same number of credits to graduate as other students in the department.

Minor Option
A minor may be earned in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with his major adviser. A minor consists of 18 semester credits with C or better in courses which the adviser in the minor discipline approves. No more than 6 credits used by the student to satisfy curriculum requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year.

In the student's final semester the adviser for the minor shall certify to the Registrar that the student has completed the minor requirements. Upon graduation the name of the minor shall appear on the student's transcript.

Bachelor of Science
Many professional careers are open for graduates of the college. There are opportunities for people trained in resource development and conservation in addition to positions for serving in agricultural industries. Newly created countries throughout the world are asking for assistance in all phases of agriculture, including home economics and forestry. In all departments students may prepare for further graduate work in their respective fields of interest.
Following are additional examples of employment agencies and industries and the careers which they offer.

The agricultural industries, feed and fertilizer manufacturers, food processors, cooperatives, and banks employ graduates as price analysts, farm appraisers, and managers.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nurserymen, and landscape gardeners.

The Peace Corps and the Foreign Agricultural Service hire farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The federal-government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required. In addition the student must complete the University academic requirements found on page 71, obtain a written recommendation for graduation from his adviser and department chairman, and achieve a 2.0 cumulative average for all courses taken at the University of New Hampshire.

Agricultural Education

The Agricultural Education curriculum provides for a basic and a liberal college preparation for students who plan to teach agriculture or seek employment with the Cooperative Extension Service as agricultural or 4-H youth agents.

Graduates also find employment in specialized positions with industry or in education where a broad background of technical and professional skills is needed for sales, promotional, administrative, or research activities.

Students in this curriculum satisfy state teacher certification requirements by participation in the one semester education block program of off-campus teaching. Students who wish may arrange participating experiences with County Cooperative Extension personnel in a county office.

Students desiring to major in this curriculum should consult with the professor in charge before the end of the sophomore year. Students who wish to minor in this curriculum should consult the adviser in their major and the professor in charge of this curriculum early in their academic careers.

Animal Sciences

The animal sciences courses are offered to provide students fundamental scientific training in such specialized areas as genetics, physiology, nutrition, animal hygiene, processing, pathology, and management. The student also has an opportunity to further concentrate his studies in the fields of animal, dairy, or poultry science, pre-veterinary medicine, or animal biology.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research, and responsible technical positions in industry and federal and state agencies. Students interested in production and processing can receive training as production managers, for positions in the feed or equipment industries, marketing organizations, animal breeding associations, sales and service work in allied industries, and other areas of the diversified animal industry.
The department maintains Morgan horses for all phases of class work including riding. Herds of Shorthorn, Hereford, and Angus cattle; Yorkshire swine; and a flock of Dorset sheep are maintained.

The nationally recognized dairy herd, consisting of registered Ayrshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

Completed new poultry farm facilities are for instruction and research and include laboratories for both teaching and research in poultry genetics, nutrition, diseases, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, and gas chromatograph, are available in Kendall Hall to provide the latest scientific training in the field of animal hygiene. Kendall Hall is an entirely new facility with five floors devoted to offices, classrooms, and laboratories for the Animal Sciences Department.

The department works closely with the New Hampshire animal industry and frequent class trips are made to leading farms, industrial concerns, processing plants, etc. where opportunities are presented for viewing industry in action.

Students who contemplate veterinary medicine as a career should confer early with the adviser to pre-veterinary medicine students. It should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have some farm experience; and, in fact, it is a prerequisite for admission to some.

Biochemistry

Biochemistry is the study of the chemistry of living things and of life processes. A student majoring in biochemistry will receive a fundamental training in chemistry, including courses in general, analytical, organic, and physical chemistry. An equally broad program in biological sciences is recommended. In addition to training in biochemistry, including an opportunity to participate in basic research during the senior year, students may select courses in botany, zoology, microbiology, and genetics.

The curriculum is designed to provide a strong foundation either for technical positions in universities, experiment stations, research institutes, and industrial or government laboratories or for graduate study in the natural sciences or medicine. Excellent opportunities for teaching and research in biochemistry are available to students who earn graduate degrees in this very rapidly growing field of science.

A student who wishes to major in this department should register for Chemistry 405-406 and for Mathematics 425-426 in the freshman year. Students having an interest in biochemistry are advised to consult with Professor Edward J. Herbst, department chairman.

Botany

The program of the Botany Department is directed toward the understanding of plants and their relevance for human affairs. Students who pursue instruction in botany usually continue their training beyond the bachelor's degree for graduate work. Career opportunities exist mainly in government research and extension positions, secondary school teaching for which education training is desirable, university teaching and research, and industry.
Students at this University usually concentrate on botany courses after the freshman and sophomore years of instruction have given them the broad background in the humanities, social sciences, and the physical sciences necessary for an understanding of plant function. Specialization usually begins after the sophomore year. The department offers a wide range of courses in the following areas: (1) plant physiology, the study of plant function with such practical applications as plant nutrition and requirements for growth; (2) phycology and biological oceanography, a study of algae: their morphology, life history, classification, and ecology; (3) cell biology, the structure, physiology, and development of cells; (4) ecology, the relationships of plants within their environment; (5) plant pathology, a study of plant diseases, their causes, and control; (6) systematic botany, the identification and classification of plants in accord with their evolutionary relationships; (7) anatomy and morphology, a study of the structure, development, and cellular organization of plants, including microscopic techniques.

Students interested in becoming botany majors, whether at the beginning of their college careers or already enrolled in the University, are invited to discuss their interests with Mrs. May Moss.

Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms. Many opportunities exist in the areas of crop protection, forestry, conservation, and in public health.

Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take advanced courses in mathematics and chemistry.

Students contemplating a career in entomology are advised to consult with the Chairman of that department.

General Studies

This curriculum is offered for the student who wishes to secure a broad non-specialized background in several areas related to the College without specializing in any particular department. After completing the University course requirements the student may select courses to fit his specialized or general interests. A student transferring from one major to another may wish to register in the General Studies curriculum until his educational objectives have been more clearly defined, or a student may complete his work for the Bachelor of Science degree in the General Studies curriculum.

Home Economics

The objectives of the program in home economics are to provide, through the facilities of the University, a broad general education in the social and natural sciences, the humanities, and the arts, and to provide specialized instruction based on these disciplines as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

The focus of the department is the strengthening and enrichment of individual and family living through a curriculum to (1) prepare specialists in
family studies to work in schools, daycare centers, adult education programs, family and community agencies, hospitals, and consumer services; and (2) provide educational opportunities in family studies as part of general education for any University student.

The department provides professional preparation through two major programs, open to men and women:

1. Family Studies—professional programs in preparation for secondary-school education, pre-school education, family services, and consumer services.

2. Human Nutrition and Dietetics—to prepare students for a dietetic internship upon successful completion of the undergraduate requirements for the Bachelor of Science degree.

The department has been approved by the New Hampshire State Board of Education, Division of Vocational and Technical Education, for the preparation of secondary-school teachers in vocational home-economics and family-life programs. The program in human nutrition and dietetics has been approved by the American Dietetic Association.

A candidate for the degree of Bachelor of Science completes 32 courses or the equivalent of 128 credits, distributed as follows: University general education requirements, 16 courses or 64 credits (see page 71); professional or specialized education, 16 courses or 64 credits. The latter must include a minimum of 9 courses or 36 credits in home economics, 3 courses or 12 credits in social or natural sciences, and 4 courses or 16 credits of professional preparation to meet certification standards for secondary school teaching, ADA requirements for a dietetic internship, or other specific objectives.

The 9 courses in home economics are to be selected as follows:

Group 1—a minimum of 3 courses from: 462, The Family in Societal Change; 465, Man in Families; 525, Human Development; 557, Consumer Education; 683, Family Relations.

Group 2—a minimum of 3 courses from: 514, Textiles; 573, Human Nutrition; 583, The Young Adult; 615, Specialized Clothing Construction; 626, The Young Child; 627, Creative Activities in Pre-School Programs; 657, Management and Decision-Making in the Family; 671, Introduction to Food Science; 715, Clothing in Relation to Human Behavior; 754, Personal and Family Finance; 776, Nutrition—a World View; 786, Dynamics of Family Change.

Group 3—a minimum of any 3 home economics courses, including seminars, field experience, independent study, methods, practicum. These courses should be related to the student’s interest and objectives.

To fulfill the social or natural sciences requirement, a minimum of 3 courses are to be selected from one of the following groups: psychology, 500-level or above; sociology, 500-level or above; biological and physical sciences, 500-level or above.

A program of study will be required for particular professional areas, such as secondary-school teaching, dietetic internship, teaching in pre-school programs, family services, and consumer services. These programs are available upon request from the department.

Workshops for skill development in areas such as clothing construction, food preparation, management techniques, creative activities, and demonstration techniques will be available regularly on a non-credit basis.

A junior or senior may attend the Merrill-Palmer Institute in Detroit for one semester with full transfer of credit. This program is designed to give students a theoretical knowledge and understanding of human development and the family and to provide practicum training for students preparing to work professionally in various capacities with individuals, families, and groups.
Plant Science

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may take a major or minor in plant science. Because of the diversity of employment possibilities, the plant-science major curriculum is flexible. Students first obtain a basic knowledge of physical and biological sciences. Selected courses then relate these sciences to the individual's interest in science, management, or agribusiness.

Students preparing for advanced study would take additional course work in chemistry, physics, and mathematics. These provide an excellent foundation upon which the student can build his research or teaching career.

Management encompasses production, management, and marketing of commercially important crops. Within this area, students will find opportunities in management of farms, greenhouses, golf courses, or nurseries; on state park or highway planning commissions; and with food and feed processing firms. Students specializing in management would select production and applied courses beyond the basic core of study.

Agribusiness exposes the student to more courses in marketing, economics, accounting, and business procedures while still retaining the fundamental requirements in plant science. Specialization in this area would prepare students for sales and brokerage positions in wholesale or retail marketing or for positions in industry.

Students interested in a plant science major or minor may consult with the Department Chairman, Professor L. C. Peirce.

Resource Economics

This department offers courses in: resource economics, including public resource policy, resource management, conservation economics, community resource development, regional economics; and agricultural economics, including farm management, food marketing and consumption, agricultural price policy, and world food supplies.

The student in resource economics is trained primarily in the science of economics and its use in problem-solving by individuals, households, business firms, communities, and administrators of governmental agencies. In addition, the student is encouraged to take courses which will lead to a broad university education. Resource Economics majors concerned with the conservation and use of natural resources should take courses in the departments of Forest Resources, Soil and Water Science, and Geography. Majors interested in community resource development should take courses in the departments of Forest Resources, Soil and Water Science, Sociology, and Political Science. Those majors who are interested in the economic or business aspects of agriculture will be expected to take courses in the departments of Animal Sciences and Plant Science. All majors in resource economics will be expected to take some selected courses in the Whittemore School of Business and Economics.

Students majoring in the social sciences and Life-Sciences-and-Agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics. In this manner their basic training can be supplemented in a specific area of interest, such as: farm management and agricultural marketing for agricultural majors, and resource development and natural-resource policy for social science majors.
Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. There is presently a strong demand by private business, public institutions, and government agencies for specialists trained in agricultural, fisheries, and forestry marketing; conservation resource development, community development, and land use policy; Cooperative Extension work, resident teaching; and farm management. In many cases the student may wish to further his education and improve his qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Soil and Water Sciences

The subject matter of this program may be classed in both the biological and earth sciences. It includes knowledge of the outermost layer of the earth's crust and that portion of the hydrologic cycle pertaining to the fate of water falling on the earth's surface. Knowledge concerning soil and water is important to persons working in the plant sciences, geology, geography, meteorology, and certain aspects of engineering. Students interested in soil and water science may select one of the two majors described below.

Soil Science: This curriculum helps the student develop an understanding of the nature and properties of soils. It includes the study of the chemical and physical properties of soils, their formation, classification, conservation, and management. Soils are evaluated as a resource in urban and rural community planning. Students obtain a background in the physical and biological sciences as part of their training as soil scientists. Graduate majors find jobs in industry as research specialists in such areas as agricultural chemicals and soil engineering; in federal Civil Service positions with such groups as the Agriculture Research Service, Soil Conservation Service, and Soil Survey; as consultants on resource planning boards; and in foreign service with such groups as the Peace Corps and other technical assistance programs. Those who continue their education and obtain advanced degrees find professional positions available in university teaching and research.

Hydrology: This is the science underlying development and control of water resources on and beneath the earth's surface. Sciences closely related and basic to the analysis and understanding of water in the hydrologic cycle are meteorology, soils, geology, plant ecology, physics, and chemistry. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources.

Employment opportunities are found with various federal and state agencies, private industry, public utilities, recreation groups, community or regional resource planning boards, and international organizations. Scientific or educational institutions also offer opportunities for those who go on to take advanced degrees in hydrology or related fields.

Wildlife Management

This curriculum is for students whose interest is in the production, management, and utilization of game and other forms of wildlife. It is designed to provide a knowledge of wildlife species and of the total forest and field environment of which they are a part. It prepares the student for work with public and private agencies in wildlife management and is a base for graduate study as needed for research and teaching.
Field work is carried out during the academic year on wildlife areas near the campus. In June each year, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. Majors are encouraged to obtain summer employment related to their career objective.

The degree earned is a Bachelor of Science with a major in wildlife management. The program is administered in the Department of Forest Resources and is a cooperative program with the departments of Animal Sciences, Forest Resources, and Zoology. Inquiries should be addressed to the Department of Forest Resources, Pettee Hall.

In addition to the normal University fees and tuition, forestry students are required to meet transportation and meal charges in connection with regularly planned field sessions.

### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Semester Credits</th>
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</thead>
<tbody>
<tr>
<td>Bot. 411</td>
<td>General Botany</td>
<td>4</td>
</tr>
<tr>
<td>Zool. 412</td>
<td>Principles of Zoology</td>
<td>4</td>
</tr>
<tr>
<td>For. Res. 425</td>
<td>Dendrology</td>
<td>4</td>
</tr>
<tr>
<td>Math. 420</td>
<td>Fundamental Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>Eng. 401</td>
<td>Freshman English</td>
<td>4</td>
</tr>
<tr>
<td>Econ. 401</td>
<td>Principles of Economics</td>
<td>4</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Phys. Ed. 301</td>
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### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>An. Sci. 501</td>
<td>Animal Anatomy and Physiology</td>
<td>4</td>
</tr>
<tr>
<td>For. Res. 635</td>
<td>Contemporary Conservation Issues</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>For. Res. 528</td>
<td>Applied Statistics I</td>
<td>4</td>
</tr>
<tr>
<td>Zool. 512</td>
<td>Ornithology</td>
<td>4</td>
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### SPRING FIELD SESSION (JUNE)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>For. Res. 542</td>
<td>Forest Land Surveying</td>
<td>2</td>
</tr>
</tbody>
</table>

Students majoring in wildlife management are required to complete 132 credits for the bachelor’s degree. In completing the curriculum which follows, the student will meet the University general education requirements (see page 71). These requirements should be met by choosing electives from the following: four courses in arts, humanities, or social sciences; and four courses from the other University requirements. In addition, two electives should be chosen from the following: (1) Forest Resources: 544, Forest Economics; 629, Silviculture; 643, Forest Biometrics; 702, Natural Resources Policy; 712, Sampling Techniques; 745, Forest Management; 763, Forest Recreation Seminar; and (2) Soil and Water Science: 501, Introductory Soils; 502, Soil-Plant Relationships; 507, Introductory Hydrology.
### Bachelor of Science in Forestry

The primary objectives of this program are to develop the student as a person and as a professional forester. Graduates are employed in all phases of forest land administration, in many aspects of natural resource protection and utilization, and in maintenance of environmental quality. Production of raw materials from the forest occupies some foresters, but many are also concerned with wildlife, grazing, watershed, and recreation.

Managerial and administrative skills are required of most forestry graduates. The curriculum gives a strong foundation on both biological knowledge and managerial skill, with elective freedom for the student to cultivate his special abilities and interests. The curriculum leads many students further into graduate studies.

Field work is carried out during the academic year on University woodlands adjacent to the campus. In June each year, a two-week field session is held for all students who have completed the sophomore year. There is no additional summer camp. Majors are assisted and encouraged to obtain summer employment related to their career objective.

In addition to the normal University fees and tuition, forestry students are required to meet transportation and meal charges in connection with regularly planned field sessions.

The Department of Forest Resources is accredited by the Society of American Foresters.

Information on the undergraduate program leading to a Bachelor of Science with a major in wildlife management will be found on page 82.

Students majoring in forest resources are required to complete 134 credit hours for the degree of Bachelor of Science in Forestry. In completing the curriculum which follows, the student will meet the University general education requirements (see page 71). These requirements should be met by choosing electives from the following: one course in a science; four courses in arts, humanities, or social sciences; three courses from the other University requirements; and four courses selected from a list available from the adviser to follow the direction of professional interest of the student.
### Bachelor of Science in Forestry

<table>
<thead>
<tr>
<th><strong>FRESHMAN YEAR</strong></th>
<th><strong>SEMESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>For. Res. 425, 426</td>
<td>Dendrology; Wood Technology</td>
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<tr>
<td>English 401</td>
<td>Freshman English</td>
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<tr>
<td>Botany 411</td>
<td>General Botany</td>
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<tr>
<td>Math. 415, 420, or 425</td>
<td>Fundamental Math</td>
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<tr>
<td>Economics 401</td>
<td>Principles of Economics</td>
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<td>Advanced English</td>
<td>Writing or Speaking Development</td>
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<td>Elective</td>
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<td>Phys. Ed. 301</td>
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<th><strong>SOPHOMORE YEAR</strong></th>
<th><strong>SEMESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>For. Res. 527, 528</td>
<td>Silvics, Applied Statistics</td>
</tr>
<tr>
<td>S &amp; W 501</td>
<td>Introductory Soils</td>
</tr>
<tr>
<td>Entomology 506</td>
<td>Forest Entomology</td>
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<tr>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>For. Res. 544</td>
<td>Forest Economics</td>
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<tr>
<td>Math. 401</td>
<td>Computer Programming</td>
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<tr>
<th>SPRING FIELD SESSION (JUNE)</th>
<th><strong>SEMESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>For. Res. 542</td>
<td>Forestland Surveying</td>
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<table>
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<th><strong>JUNIOR YEAR</strong></th>
<th><strong>SEMESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>For. Res. 629</td>
<td>Silviculture</td>
</tr>
<tr>
<td>For. Res. 644</td>
<td>Forest Biometrics</td>
</tr>
<tr>
<td>Bot. 753</td>
<td>Forest Pathology</td>
</tr>
<tr>
<td>Electives</td>
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<tr>
<td>For. Res. 660</td>
<td>Forest Protection</td>
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</table>

<table>
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<th><strong>SENIOR YEAR</strong></th>
<th><strong>SEMESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>For. Res. 745</td>
<td>Forest Management</td>
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<tr>
<td>For. Res. 798</td>
<td>Forest Resources Management Seminar</td>
</tr>
<tr>
<td>For. Res. 753</td>
<td>Operations Control and Analysis</td>
</tr>
<tr>
<td>For. Res. 754</td>
<td>Wood Products Manufacturing and Marketing</td>
</tr>
<tr>
<td>Electives</td>
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<tr>
<th></th>
<th><strong>SEMESTER CREDITS</strong></th>
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<td>16 16</td>
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</tbody>
</table>
Thompson School of Applied Science

Richard H. Bittner, Director

The Thompson School is the two-year division of the College of Life Sciences and Agriculture. It offers programs of study on the technician level. High school graduates with satisfactory grades and a real interest in furthering their education are admitted.

Two years of academic work on campus, totaling 64 semester credits, plus completion of one summer of supervised placement, lead to the degree of Associate in Applied Science.

The Thompson School offers the following curriculums: applied animal science; commerce technician; food service management; forest technician; general; applied plant science; and soil, water and construction technician.

Applicants wanting admission in the Forest Technician and Soil, Water, and Construction Technician curriculums must submit two units in college preparatory mathematics. Applicants for admission in the other curriculums will find biology, chemistry, and mathematics helpful prerequisites for courses in the plant and animal sciences. Each prospective applicant must take the College Board Scholastic Aptitude Test during his senior year in high school.

A catalog may be obtained from the Thompson School of Applied Science, Putnam Hall, University of New Hampshire, Durham, New Hampshire 03824.
College of Liberal Arts

Melville Nielson, Acting Dean
Warren H. Held, Associate Dean
Mrs. Claire Wright, Academic Counselor
L. Jackson Newell, Assistant Dean

Departments
The Arts
Education
English
French and Italian
Geography
Geology
German and Russian
History
Microbiology
Music
Philosophy
Political Science
Psychology
Sociology
Spanish and Classics
Speech and Drama
Zoology

Cooperating Departments
COLLEGE OF LIFE SCIENCES
AND AGRICULTURE:
Botany
Entomology
COLLEGE OF TECHNOLOGY:
Chemistry
Mathematics
Physics
College of Liberal Arts

Programs of Study

BACHELOR OF ARTS:
The Arts
Biology
Botany
Chemistry
Chemistry and Physics
Classics
Earth Science
Elementary Education
English
English Teaching
Entomology
French
General Physical Science
Geography
Geology
German
Greek
History
Latin
Mathematics
Microbiology
Music
  Music History
  Performance Study
  Music Theory
Philosophy
Physics
Political Science
  International Relations
Psychology
Social Service
Sociology
Spanish
Speech and Drama
  Communications
  Theater
  Communication Disorders
Zoology

BACHELOR OF SCIENCE:
Art Education
Music Education

BACHELOR OF MUSIC:
Piano
Organ
Voice
Strings, Woodwind, Brass, or Percussion
Theory

SUPPLEMENTAL NON MAJOR PROGRAMS:
Pre-Dental
Pre-Law
Pre-Medical
Teacher Preparation Program
General Information

Purpose and Objectives
It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help all of its members achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and the realities of the present so that they may recognize and act upon their obligations to the future.

The College endeavors to meet the educational needs of each student through the development of interests and skills which, combined with the student's potential, makes possible the living of a richer and more useful life.

Programs of Study
The College of Liberal Arts offers three degrees: Bachelor of Arts, Bachelor of Science, and Bachelor of Music.

The Bachelor of Arts program is intended primarily to provide a broad liberal education along with a major in one of the fields listed above. Requirements for the Bachelor of Arts degree and information regarding these majors are presented in the section entitled Bachelor of Arts Program.

The Bachelor of Science curricula consist of two programs of study which provide preparation for teaching of the Arts or Music. They are arranged in such a manner as to permit considerable specialization while providing a broad cultural education for the students enrolled in them. Requirements for the Bachelor of Science degree and information regarding these curricula are presented in the section entitled Bachelor of Science Curricula.

The Bachelor of Music curriculum is designed to provide professional training in applied music and in musical theory, and to allow students to develop their talent to the equivalent standard of that offered by conservatories of music. Requirements for the Bachelor of Music curriculum and information regarding this curriculum are presented in the section entitled Bachelor of Music Curriculum.

Although the University will try to provide sufficient facilities so that a student may pursue any major or curriculum for which he meets the requirements, such a privilege cannot be guaranteed. Rapidly increasing enrollment sometimes results in the crowding of required specialized courses beyond capacity. On occasion, a student may remain in a crowded curriculum if he is willing to take certain courses during the summer session.

Combined Programs of Study
In addition to pursuing a single major, a student may combine programs of study as follows:

Minor Option
He may earn a minor in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with his major adviser. A minor consists of 20 semester hours with C or better in subjects that the minor department approves. (Courses taken on the Pass-Fail basis may not be used for a minor.) No more than 8 credits used by the student to satisfy requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year. During his final term he should apply to the Dean to have the minor shown on his transcript.

Dual Major Option
He may earn two majors in any disciplines awarding the Bachelor of Arts degree. No more than 8 credits used to satisfy requirements for one major may be used for the other. A student should declare his intent to earn two majors as early as possible and no later than the end of his junior year. He should
plan his program in consultation with advisers from both majors.

**Dual Degree Program**

The purpose of the two-degree program is to broaden the education of certain students at the undergraduate level. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the dual program.

A candidate for two degrees must complete all the curriculum, departmental, scholastic, and other requirements for each degree. It is expected he will complete five years of academic work. He may not earn a second degree in the same or closely allied major field.

If a student plans to take one of the two degrees in the College of Technology, he should register as a freshman in that College. If he does not plan to include a Technology degree in his program, he may register in any of the other four Colleges. When a student is accepted as a two-degree candidate, supervisors for each major will be appointed. These supervisors will maintain joint control over the student’s academic program. Students who wish to be in this program should confer with the appropriate college dean(s), preferably no later than the end of the freshman year.

**Supplementary Programs of Study**

Although pursuing his studies in the College of Liberal Arts in one of the listed fields, the student may also prepare himself for some related objectives. Two of these are described below, and there is enough freedom of election to make it possible for the student to arrange others.

**Pre-Medical and Pre-Dental**

Students who plan to enter a school of medicine or dentistry may elect to major in almost any field offered under the Bachelor of Arts program, but will of course, need to include all courses specifically required for admission to the professional school. *(No course required by a medical or dental school should be taken on a Pass-Fail basis).* The faculty of the College has established a Pre-Medical Advisory Committee to handle the advising of students and to formulate recommendations to colleges of dentistry and medicine.

Students who have a real interest in either dentistry or medicine should contact Dr. Paul E. Schaefer, Spaulding 207, early in the freshman year or as soon as a decision is reached to pursue a professional career. The office of the Pre-Medical Advisory Committee keeps a file of information on the requirements of all medical and dental colleges of the United States and Canada, plus other pertinent information concerning admission to such schools. Today most colleges of medicine require the Medical College Aptitude Test and a composite recommendation. Information and application forms for the MCAT and the Dental Aptitude Test are available in the office of the committee.

In order to assure adequate information for the composite recommendation, all students who plan to apply to a medical or dental college must register with the Pre-Medical Advisory Office no later than the first semester of the sophomore year.

**Pre-Law**

While the various bar associations and law schools do not prescribe a specific undergraduate curriculum for future lawyers, they recommend that a student who contemplates entering law school should plan a study program which will develop breadth of view and facility of expression. They also urge him to acquire a background of information concerning the society in which he lives and the forces which have shaped modern institutions. They urge him particularly to perfect his use and understanding of the English language in writing and speaking.
The most helpful courses are those which develop oral and written expression; deal with man's social, economic, and political institutions; provide an understanding of the human mind; and develop the art of thinking. A course in the elements of accounting may be useful.

Most law schools require the Law School Admission Test of students seeking admission; each law school will advise a student upon request whether or not he will be expected to take the test in partial satisfaction of admission requirements. Particulars of the examination may be obtained at the office of the Department of Political Science.

Students who plan to enter law school after graduation are advised to consult with the Chairman of the Department of Political Science as soon as they have made their decision, preferably in the sophomore year.

Preparing for Teaching

The University offers two undergraduate programs for teacher education—one for secondary-school teacher preparation and one for elementary-school teacher preparation.

These programs have limited capacity and are selective. Admission to the University does not guarantee admission to the programs even though other selection criteria are met.

Secondary-School Teacher Preparation Program

All students preparing to teach in secondary schools follow a basic professional secondary-school teacher preparation program. Education 481 and 657 are taken before the student-teaching block semester. The block semester contains four courses: Education 658, Education 659, Education 694, and a 691, special methods of teaching course, offered by the student's major department. The block semester is taken during one semester of the senior year, the semester being determined by the student's major field of study.

A student is admitted to the student teaching block semester upon approval of the Department of Education and of his major department. A cumulative grade point average of 2.2 or better and a major subject grade point average of 2.5 or better are required for admission to the block semester. Application for admission to the student-teaching block semester is made through the Coordinator of Secondary Student Teaching during the week of February 14, the semester preceding the academic year during which student teaching will be done.

Secondary-school teacher preparation programs in art, music, men's physical education, women's physical education, and home economics vary slightly from the basic pattern described above. A student preparing to teach one of these subjects should consult early with his major adviser in planning his teacher-preparation program.

A student in the secondary-school teacher preparation program does not major in the Department of Education. He majors in a subject-matter department. A student interested in the program should consult with his major subject adviser and with the Coordinator of Secondary Student Teaching.

Elementary School Teacher Education Program

Students planning to teach in elementary schools will declare elementary education as their major. Information about this major is presented in the section entitled Bachelor of Arts Program.

Elective Courses in Education

Two courses in education are designed to be of interest to the general student as well as to the prospective teacher. Courses in educational psychology (Education 481) and psychology of human learning (Education 657) are substantive rather than procedural and thus are appropriate for any student who wishes to get a better understanding of the process of education.
Student Teaching

Students in both the elementary-school teacher preparation program and the secondary-school teacher preparation program student teach in public schools in the vicinity of the University. Student teachers work with cooperating teachers selected jointly by public school administrators and members of the University faculty. Each student teacher is supervised by his cooperating teacher and a member of the Department of Education. Each student teacher in the secondary-school teacher preparation program is also supervised by a member of his major department. Students in the elementary education program usually are placed in teams of two in order to encourage interaction.

Each student teacher ultimately assumes full teaching responsibility for one or more of his cooperating teacher's classes after a period of observation, planning, and service as a teacher aide.

Accreditation and Certification

The teacher preparation programs of the University are accredited by the National Council for the Accreditation of Teacher Education, for the preparation of elementary teachers, secondary teachers, and school service personnel, with the master's degree as the highest degree approved.

Completion of the approved teacher preparation program of the University qualifies a student for certification as a teacher in most states. There are a few which have unusual requirements for certification. The Chairman of the Department of Education will be glad to advise students regarding requirements.

Honors Program

The College of Liberal Arts offers an honors program as a possible means of challenging students of exceptional ability.

This program has three divisions: 1. Honors offerings for each of the freshman and sophomore years. At present this applies only to English and History. 2. Departmental honors programs, developed and administered by those departments choosing to maintain an honors program. 3. An upper-division, general honors program with two objectives: first, to provide an honors minor program for those students who wish to do honors work but whose major departments do not maintain honors programs; and second, to schedule special lectures, seminars, and other academic activities for all honors students.

Students desiring information about a department's program should consult the department chairman.

The upper-division general honors offerings provide continuity with the freshman-sophomore honors curriculum. Should independent study be involved in such a program, a junior may register for a total of 8 credits of independent study and a senior for a total of 12 credits during the academic year. This work would be done in the 695, 696 course in the appropriate department, and in L.A. 695, 696 where the department has no such offering.

The honors minor program gives an honors option to a student majoring in a department not maintaining an honors program, and may be undertaken by such a student with the approval of his departmental supervisor, the Honors Council, the Dean, and a council member teaching the subject in which the minor would be undertaken. The council member supervises the student's activities.

It is expected that all honors students will maintain a cumulative average of at least 3.0.

Bachelor of Arts Program

The Bachelor of Arts Program provides a broad liberal education with a concentration involving a minimum of 32 credits (typically 8 courses) in a major field.
Degree Requirements

Satisfaction of these requirements ensures satisfaction of the University general education requirements.

These requirements apply to all students who enter the College of Liberal Arts between July 1, 1970 and June 30, 1971 and are seeking a Bachelor of Arts degree. (Students who entered the College at an earlier time may apply for a change to the requirements of this catalog.)

1. 128 credits (typically 32 courses).
2. At least a 2.0 cumulative average in all courses completed at the University of New Hampshire.
3. The University physical education requirement.
4. English 401 (to be completed in the freshman year).
5. Four courses in sciences and/or mathematics from those offered in biochemistry, biology, botany, chemistry, entomology, geology, mathematics, microbiology, physical science, physics, and zoology, outside the major department.
6. Two courses in humanities, selected from those offered in arts, English (beyond 401), foreign languages (beyond 401-402), humanities, liberal arts, music, philosophy, and speech and drama, outside the major department.
7. Two courses in social sciences from those offered in anthropology, economics, Education 481 and/or 657, geography (excluding physical geography), history, political science, psychology, resource economics (excluding 501 and 504), sociology, and social science, outside the major department.
8. Two additional humanities or social sciences courses, outside the major department.
9. Six additional courses, not in a student’s major department, selected from all courses offered by the University. English 401 must be included in these six courses. Students exempted from English 401 must substitute a course not in the major department, to make up a total of six courses in this category.
10. Foreign Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of all students. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completing one of the 401-402 series in any foreign language sequence at the University of New Hampshire. Students having studied a foreign language for two or three years in high school should be able to achieve a satisfactory score on College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement.
11. Major Requirements: A student must complete at least 32 credits of major course work with grades of C or better. The major department may specify certain (but not more than 13) required courses which constitute a major, and may require a senior paper or project, and/or a comprehensive examination. (In majors where courses in the Secondary School Teacher Preparation program are required, these courses are not counted in the maximum of 13 allowed.) These requirements are given in the listing of majors that follows. A major must be selected prior to the beginning of the junior year.

Majors in the Bachelor of Arts Program

The objectives, opportunities, and department requirements of majors in the Bachelor of Arts program are described in the paragraphs which follow.

The Arts

The courses offered by the Department of the Arts provide an opportunity, within the liberal arts framework, for the serious art student to acquire a thorough knowledge of the basic means
of visual expression. In addition, these courses are designed to offer foundation experience for students interested in art but who are majoring in other departments in the University.

All students majoring in The Arts must complete with the grade of C or better a minimum of eight courses (32 credits), of which the following are required: Arts 431, Basic Design; Arts 432, Drawing; Arts 475-476, Introduction to The Arts. Of the remaining four courses, two must be of an intermediate or advanced level (i.e., courses numbered 500 or above).

While the above represents the minimum departmental requirements, a student may wish to plan a program involving greater depth in one or several of the areas in the department, i.e., ceramics, history of art, metal and jewelry, painting, drawing, and graphic arts, photography, sculpture, weaving, and woodworking.

A major adviser in the area of the student's interest will be selected. Students who are interested in majoring in The Arts should consult first with the Department Chairman.

**Biology**

The biology major is intended for students planning to teach in secondary schools. Completion of the biology major will generally not qualify students for admission to graduate schools, either to pursue graduate work in biology or in any of its sub-disciplines. Students interested in pursuing various aspects of biology will find majors in botany, microbiology, entomology, and zoology in the College of Liberal Arts, and in wildlife management (administered by the Department of Forest Resources) in the College of Life Sciences and Agriculture.

Because few positions are available in any year for teaching biology alone, a student should include courses in his program of study which will qualify him for teaching other sciences.

The minimum course requirements are as follows: Chemistry 403-404; Biochemistry 501 or Chemistry 545; Physics 401 or 405; Botany 503; Botany 506 or 742 or 756; Entomology 402; Microbiology 503; Zoology 412, 507-508, 604; Biology 641. Students must also complete all courses in the Secondary School Teacher Preparation Program. At least 32 credits of biology courses (biology, botany, microbiology, entomology, zoology) must be completed with a grade of C or better.

Students interested in majoring in biology are advised to consult with the supervisor, Dr. Paul E. Schaefer, Department of Zoology.

**Botany**

The program of the Botany Department is directed toward the understanding of plants and their relevance for human affairs. Students who pursue instruction in botany usually continue their training beyond the bachelor's degree for graduate work. Career opportunities exist mainly in government research and extension positions; secondary-school teaching, for which education training is desirable; university teaching and research careers; and industry.

Students at this University usually concentrate on botany courses after the freshman and sophomore years of instruction have given them the broad background in the humanities, social sciences, and physical sciences necessary for an understanding of plant function. Specialization usually begins after the sophomore year.

The department offers a wide range of courses in the following areas: (1) plant physiology, the study of plant function with such practical applications as plant nutrition and requirements for growth; (2) phycology and biological oceanography, a study of algae, their mor-
phology, life history, classification, and ecology; (3) cell biology, the structure, physiology, and development of cells; (4) ecology, the relationships of plants within their environment; (5) plant pathology, a study of plant diseases, their causes and control; (6) systematic botany, the identification and classification of plants in accord with their evolutionary relationships; (7) anatomy and morphology, a study of the structure, development, and cellular organization of plants, including microscopic techniques.

Students interested in becoming botany majors, whether at the beginning of their college careers or already enrolled in the University, are invited to discuss their interests with Mrs. May Moss.

Chemistry

Students who are interested in the study of chemistry will find opportunities in such fields as individual work involving the development of processes or production activities, sales work based on a scientific knowledge of the marketable products, the teaching of chemistry and allied subjects in secondary schools or of chemistry in colleges, and graduate study for those students who are interested and particularly proficient in their undergraduate work.

The University offers two channels for study of chemistry: majoring in the subject in the College of Liberal Arts, or enrolling in the prescribed curriculum in chemistry in the College of Technology. Students majoring in chemistry in the College of Liberal Arts may have a wide variety of interests and differing abilities in science.

In order to be well prepared for graduate school or a career in chemistry, each student should have the following courses as a minimum: Chemistry 405-406, or 403-404 and 406; 547-548; 762; 683-684; 685-686; and at least one chemistry course in each semester of the senior year;

Physics 401-402 (Physics 407, 408, 505 desirable for the capable student); Mathematics 425-426. In order to meet American Chemical Society accreditation, the student should satisfy the foreign language requirement in either German or Russian. According to the student's interests, other supporting subjects may be elected to form a broad program of study and to prepare for one of the opportunities listed above.

The department is equipped to furnish the preparation necessary for teaching chemistry in secondary schools. As few positions are available in any year for teaching chemistry alone a student should consider a program of study which may qualify him for teaching chemistry and other sciences, and should consult with the chairman of the Department of Chemistry and the chairman of the Department of Education. Students who are interested in teaching chemistry in college are advised to plan graduate study.

Students who plan to major in chemistry are advised to consult with Professor Alexander R. Amell of the Department of Chemistry and the chairman of the Department of Education. Students who are interested in teaching chemistry in college are advised to plan graduate study.

Chemistry and Physics

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are many opportunities to teach both subjects on the secondary-school level. Chemistry and physics majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Minimum course requirements for the major include: Chemistry 405-406; 545; 683-684 or 786; 685-686; Mathematics 425-426; Physics 407-408; 505-506; 605; and all education courses in the Secondary School Teacher Preparation Program.
Physics 406 (Astronomy) is strongly recommended as an elective for this program.

To be eligible for the required student teaching course, the major must have a cumulative average of 2.2, an average of 2.5 in the required chemistry and physics courses, and a 2.5 average in the required education courses.

Students interested in majoring in Chemistry and Physics should consult with Professor Michael D. Andrew of the Department of Education and with either the Chairman of the Department of Chemistry or the Chairman of the Department of Physics.

Classics

(See Spanish and Classics)

Earth Science

The major in earth science is specifically designed to provide a background for students planning to teach earth science in secondary school.

Students who major in earth science must complete the following minimum requirements with an average of at least 2.5: Geology 401-402, 501; Geography 473; Chemistry 401-402; Physics 406; either Physics 401-402 or Physical Science 401-402; 12 elective credits from intermediate and upper level Geology courses including Geography 670. Students must complete the courses in the Secondary School Teacher Preparation Program.

Students interested in a major in earth science should consult with Professor Herbert Tischler, Department of Geology, and with Professor Michael D. Andrew, Department of Education.

Elementary Education

Students planning to teach in elementary schools major in the Department of Education as elementary-education majors. This major is unique, combining strong liberal arts preparation with a full year of professional study. For the first three years the student follows the Bachelor of Arts program. Also recommended for elementary education majors is either Education 481 and/or Home Economics 425 (no additional education courses should be taken before entrance into the elementary-education block). In addition, it is recommended that elementary education majors take three courses (12 credits) in mathematics in the special 600 series. Elementary education majors must complete 20 credits in a minor subject.

Students should demonstrate a personality suitable for teaching, gain experience working with groups of children, and have a cumulative grade point average of at least 2.2. The entire senior year is devoted to professional study and student teaching by enrolling in Education 741-742, a 32-credit course. Students interested in this program should consult with Professor Deborah Stone or other members of the elementary-education faculty as early as the sophomore year.

English

The Department of English offers two programs of study: the English major and the English-teaching major.

The English major has two chief objectives: to provide all students with a basic variety of literary experiences and to provide each student with the opportunity of shaping a course of study to suit his individual interests. The flexibility and freedom inherent in the second of these objectives place a responsibility upon the student to devise a pro-
gram which has an intelligent rationale. For example, the student who intends to pursue graduate study in English literature should in most cases choose more than the minimum number of advanced literature courses required for the major. The student who intends to pursue a career in writing may, on the other hand, wish to elect only the minimum number of literature courses required for the major. (The student interested more specifically in journalism should note the descriptions of courses in non-fiction writing.) All students should secure the assistance and approval of their advisers in formulating an early plan for their entire major program.

For the English major, students must take one course (4 semester credits), in which they must earn a grade of C or better, from among the following: English 513, 514, 515, 516, 517, 519, 520. They must also take eight English courses numbered above 600 (32 semester credits), in which they must earn a grade of C or better. Of these eight courses, at least five must be in literature (i.e., not courses in writing, grammar, linguistics, or history of the language). Of these five courses in literature, at least three must be in three different centuries before the Nineteenth, and at least one must be in a major author (i.e., Chaucer, Shakespeare, Milton); the major author course may be counted toward the century requirement.

Students who intend to teach English in secondary school should normally enroll in the English-teaching major. For this major, students must meet the state certification requirements for teaching. (For requirements in education courses, see section entitled Preparation for Teaching.) They must also take the following courses, which must be passed with an average of 2.5 or better: English 501, 513, 514, 516, 705 or 706, 709 or 710, 711, 757, Speech 403, and one additional English literature course numbered above 700. (Speech 403 may also be used toward the fulfillment of University general education requirements in the category of arts, humanities, and social sciences.) Students who are interested in majoring in English should consult with the supervisor, Professor John Richardson.

### Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms. Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take advanced courses in mathematics and chemistry.

Students who major in entomology are expected to complete successfully courses offered by the department, to a total of 32 semester credits, with grades of C or better. Courses in other departments may be counted with the consent of the major supervisor.

Those contemplating a career in entomology are advised to consult with the Chairman of the Entomology Department.

### French

The Department of French and Italian offers at the present time a major in French only. The supervisor for majors is Professor Louis J. Hudon.

A major consists of a minimum of 36 credits. French 401-402, 503-504, 505-506, and 514 do not count toward a major. French 605-606 and 790 are required of majors. The student will be encouraged
to take courses in related fields, such as English, history, philosophy, music, and art.

A minor in French consists of 20 credits in French courses numbered 501 and above.

The Department also offers a junior year abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, French 685-686.

### General Physical Science

A student having broad interest in physical science, but no professional objective in any one of the recognized sciences in this field, may register as a General Physical Science major. Many students who have majored in General Physical Science have combined this specialization with courses in education leading to secondary-school teacher certification.

Students majoring in general physical science must complete the following courses and achieve in them an overall grade point average of 2.3 or better. Mathematics 425-426; Chemistry 403-404 and 521; Geology 401-402; Physics 401-402; and any four of the following: Geography 473, 570, Geology 501, Mathematics 420, and Physics 406.

Students who are interested in choosing General Physical Science as a major should consult with Professor Herbert Tischler, Department of Geology. It is recommended that students who select this program as a basis for teacher preparation elect courses in the biological sciences and physical sciences in addition to those required by the major. Professor Michael Andrew, Department of Education, will be available to assist students in selecting these courses.

### Geography

Geography satisfies man's ancient curiosity about distant places and, less exotically, his need for further knowledge of the home area. Modern geography is best defined as the discipline that describes and analyzes the variable character, from place to place, of the earth as the home of man. As such, geography is an integrating discipline, studying many types of phenomena, both human and natural, that are significant to understanding the character of areas or the spatial organization of the world.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography is an excellent core discipline for a liberal education. Thus, students who have a primary interest in the spatial organization or the regional character of the world and who also desire a liberal education can attain these goals by majoring in geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their course work in geography and closely related fields, and should plan to go on to graduate study after completing an undergraduate major in geography.

Today, as in the past, most professional geographers hold positions in educational institutions, and the demand for personnel in this field is increasing greatly. Revival of interest in geography in primary and secondary schools also suggests increased opportunity for persons educated in geography. In addition, many geographers now find employment for their skills in various branches of federal and state governments, in regional and urban planning, and in market research and plant location services for business and industry.

Students who major in geography are required to take Geography 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits.
with grades of C or better. The seven courses should include Geography 571, 572; 581, 582; 797; and two additional intermediate level courses in geography.

Students who are interested in majoring in geography should consult with the supervisor, Professor William H. Wallace.

Geology

The geological sciences aim to reconstruct the physical and biological history of the earth by the study of the formative processes acting on the earth. Geology includes a study of the constituents that make up the earth, an understanding of the evolution of the earth's structural framework and surface features, an interpretation of changes in life, and interrelations of the physical and biological environment through time.

The need for men trained in the earth sciences has been emphasized by the search for essential mineral resources, the expansion of geological research especially in the marine sciences and in extraterrestrial geology, and by the demand for teachers of earth science in the secondary schools throughout the country. (See major in Earth Science.)

Positions as mining geologists, petroleum geologists, marine geologists, federal and state survey geologists, and university and college professors have been successfully filled by graduates of the University who have majored in geology. Other former major students are teaching in high schools or are in business where their geologic preparation has proved to be very useful.

Majors in geology are required to take 32 credits in geology or related fields with grades of C or better. Although the courses of each major program are selected to meet the needs of the individual student as determined by the student and his departmental adviser, the 32 credits should include Geology 401-402, 613-614, and at least two courses (8 credits) each from Groups D and E (See course descriptions). Students who are expecting to major in geology are strongly advised to complete, as early as possible, a year of chemistry, physics, and calculus.

Students who wish to major in Geology should consult with the Chairman, Professor Herbert Tischler.

German

The Department of German and Russian offers a major in German only. This program is designed to be of interest to the following group of students:

1. Those who have a special interest in the German language and literature and are free to pursue it.
2. Those who intend to enter professions in which a background in foreign languages and literatures is desirable. An example of such a profession is library science. Most library schools require training in two foreign languages.
3. Those who plan to teach the German language in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject.
4. Those who intend to go on to graduate study in the field of Germanic linguistics and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

The department offers a junior year abroad at the University of Marburg. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, German 685-686.

A major must comprise a minimum of 32 credits in German language and literature, German 401-402 do not fulfill part
of the requirements for a major. The following courses are compulsory for German majors: German 777-778, German 781.

Greek

(See Spanish and Classics)

History

History, as a field in which to major, may be of interest to the following groups of students:

1. Those who wish to pursue a career as a college teacher of history. Graduate study is indispensable, but preparation may be made by a certain amount of undergraduate specialization.

2. Those who plan to teach history in secondary schools. For such a position, training in other social studies is highly desirable, if not absolutely necessary. The student is therefore advised to consult with the Department of Education and with the Department of History, with a view to satisfying teaching certification standards.

3. Those who intend to enter other professional fields in which a considerable amount of historical knowledge is desirable. Such a field, for example, might be that of library training, in which a historical preparation would rank with study in literature as a background, or the increasingly important profession of archivist.

4. Any students who feel free to plan the college program without too specific reference to a vocation, and who have a special interest in history.

Students majoring in history must complete 32 credits in history with grades of C or better. These courses should include a minimum of two semester courses each from Group I, Group II, and Group III (see the description of courses offered by the department); and at least four semester courses of the total should be courses numbered 600 or above. In addition every senior student majoring in history is required to complete with the grade of C or better the course, History 697, Colloquia for Senior History Majors. This course is in the nature of an undergraduate seminar, and will treat broad topics or problems of American, European, and Afro-Asian history. The specific subject of the course will change from semester to semester. History majors should register with the Department for a particular section of this course at some time shortly before the beginning of their senior year.

Students intending to major in history should consult with the Chairman of the Department, Professor William R. Jones.

Latin

(See Spanish and Classics)

Mathematics

Career opportunities in mathematics include teaching at both secondary and college levels and scientific research and consulting work in business, industry, and government. Many positions are open to holders of the B.A. degree with a major in mathematics. Most such positions require a solid foundation in basic mathematics and provide on-the-job training in any specialties involved. On the other hand, the number of positions in mathematics that require graduate work is steadily increasing. Fortunately, the program required for admission to a graduate school in mathematics is similar to the program required by most industrial employers. The following mathematics courses are designed to meet these ends: 425-426, 527, 528, 640, 763, 767-768, and three additional mathematics courses.
While most secondary-school teachers do graduate work, most of them begin their teaching careers on the basis of the B.A. degree. Thus, the undergraduate program of the prospective secondary-school mathematics teacher should include adequate preparation for the position. Current trends in secondary mathematics curricula demand a high level of specialized training for the teacher. The following courses are designed to meet these demands: Mathematics 425-426, 640, 657, 658, 698, 763, two additional mathematics courses, and Education 481 and 657. In addition to these requirements the student in this program must complete the practice teaching block (Education 658, 659, 694; Mathematics 791) or take two additional mathematics courses.

A student who majors in mathematics must complete one or the other of these sequences.

Prospective mathematics majors are advised to include calculus in their freshman year programs and to consult as early as possible with the Chairman of the Mathematics Department, Professor M. Evans Munroe.

Microbiology

Students interested in the study of microorganisms, including the bacteria, rickettsiae, and viruses, should register as majors in microbiology. Such students may prepare themselves for a career in city, state, or federal government service, or a position with universities, research institutes, or industrial organizations. Opportunities are available in the areas of general microbiology; medical, public-health, or veterinary microbiology; environmental microbiology; and industrial microbiology.

Students who major in microbiology are expected to complete courses offered by the department, and by related departments, to a total of 32 semester credits, with grades of C or better. A course in organic chemistry is required of microbiology majors. It is strongly recommended that students also take a year's work in mathematics and physics, and a semester of biochemistry. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor.

Students interested in majoring in microbiology are advised to consult with Professor William R. Chesbro.

Music

Musical creativity occurs on many levels of participation—the theory and composition of music, performance, historical research, the teaching of musical skills to others, as well as the intelligent understanding of music by listeners—all contribute to the total art.

The Music Department offers programs of instruction in all these areas. The programs are designed to equip the student for professional careers and to provide the foundation and stimulus for graduate study. The broad scope of training in the department enables students to develop musicianship, the ability to perform, and the capacity to teach, supplemented by the full liberal arts education offered by the University.

Students pursuing a Bachelor of Arts degree in theory, performance, or music history may choose from a wide variety of courses throughout the University. The Bachelor of Music candidate undergoes more specialized training in theory, composition, or performance, providing for a greater concentration of effort within the field of music. In addition, a Bachelor of Science degree program offers training for future music educators.

Academic course work is given through class instruction; while instrumental and vocal studies take place in individual, private sessions with professional musicians. Student recitals and performing
organizations, such as the University of New Hampshire Symphony, Symphonic Wind Ensemble, Concert Choir, and glee clubs afford laboratory and concert experience in a variety of performance settings.

Students who major in music must earn grades of C or better in all required music courses. During the senior year all major students must pass a comprehensive examination which will be concerned with music history and theory. Music majors must also perform in a senior recital. For performance majors, this should be a full solo recital.

A Bachelor of Arts degree is offered with three options. (The Bachelor of Science in music education and the Bachelor of Music programs are described in separate sections). All students must complete the requirements of the basic theory courses, 471, 472 and 571, 572, and the basic history-literature course, 501, 502. In addition, the specific requirements for each option are given below.

Option I. Music History: advanced theory (4 credits); advanced history and literature (12 credits); Music 542 and/or Music 540 (8 credits).

Option II. Performance Study: qualified students may major in voice, piano, strings, woodwind, or brass. A student must pass a performance examination before the Department of Music staff prior to admission to this option; advanced theory or literature (4 credits); and performance study (16 credits—2 credits per semester). Voice majors must take two of the following languages to graduate in this program: Italian 401; German 401; French 401. (Competence in all three languages is highly desirable.)

Option III. Theory: emphasis on musical composition; advanced theory (12 credits); advanced history (4 credits); and Music 540 (8 credits).

The Department of Music is a member of the National Association of Schools of Music. Prospective majors in music are advised to consult with Professor Donald Steele, adviser to music majors.

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**Philosophy**

The Greeks understood philosophy to be the love of wisdom, that ardent desire to know, which Aristotle thought was as natural to the mind as sight to the eye. Philosophy seeks to embrace and assess the many special fields of inquiry to which this generic impulse has given rise. Beyond this, philosophy seeks a completely comprehensive view, illuminating the entirety of what is. Finally, as the quest for the True, the Good, and the Beautiful, philosophy aspires to be relevant to life.

Generally speaking, 400-level courses acquaint the beginning student with the nature of philosophic concerns. A number of the 500- and 600-level courses (570, 572, 573, 603, 604) provide that foundation in the history of philosophy which is a prerequisite of all serious philosophic work. The other 500 courses (and 600 and 630) provide opportunity for philosophical exploration of such special fields as art, politics, religion, and psychology, usually without presupposing prior courses in philosophy. Other 600 courses and all 700 courses are for majors and others willing to acquire the necessary background.

A student majoring in philosophy will work out a major program in consultation with his faculty adviser. The Department requires that every major program include the following courses: 412, 512, or 550 (Logic); 570 (Ancient Philosophy); 572 (Modern Rationalism); 573 (Modern Empiricism); 603 (19th Century Idealism, Materialism, Existentalism); 604 (19th Century Phenomenalism and Naturalism); 699 (Senior Thesis); and one 700-level course other than 795-796 (Independent Study).

A student majoring in philosophy will present to the department a paper on a
subject chosen in consultation with the department (Philosophy 699: Senior Thesis). Before beginning work on his senior paper, each student will have a formal conference with the department.

A student who does superior work in Philosophy and writes a superior Senior Thesis will receive a Letter of Commendation for his file.

Students interested in majoring in philosophy should consult with the Administrative Officer for the Department.

**Physics**

Students who wish to major in physics will find a program which will prepare them for further study or for careers in teaching and research in this exciting field. The department offers a group of intermediate courses which, with parallel work in mathematics, are part of every physicist's background. Laboratory work forms an important portion of each year's program and there are opportunities for students to become associated, if they wish, with one of the research programs being actively pursued by the department.

Graduates who have followed this program can find wide opportunities in industry and government laboratories or in secondary-school teaching. If they have done well, they can continue their professional training in graduate school which will prepare them for the more responsible positions in the field. Even without more advanced work, graduates find this curriculum an admirable foundation for further study in other fields.

Students are required to complete four courses in physics in addition to Physics 505-506. If possible, Physics 505-506 should be selected in the Sophomore year. If Physics 401-402 is elected in the freshman year, a student may be placed in Physics 408 upon consent of the department. Since proper preparation in mathematics is essential, the student should elect Mathematics 425-426 in the freshman year, if possible, in order to have the prerequisites for the courses that follow. If Mathematics 420 has been passed with a grade of B or higher, students in the College of Liberal Arts may be admitted to Physics 407 with the specific approval of the Department of Physics. Liberal Arts students who wish to register for advanced courses in physics should discuss the mathematical prerequisites with the Department of Physics.

Seniors are strongly urged to participate in the department colloquia.

The department is able to furnish the preparation necessary for teaching physics in secondary schools. As few positions are available for teaching physics only, a student should consider a program of study which will qualify him for teaching physics and another science, such as mathematics, biology, or chemistry (see the Chemistry-Physics Program). The student interested in such a program should consult with Education and Physics department chairmen.

The Department of Physics strongly encourages students to discuss with the department their plans for a major either in physics, in a teaching major, or in the Chemistry-Physics Program. The department also welcomes the opportunity to give students tours of the research and laboratory facilities.

**Political Science**

The courses offered by the Department of Political Science are designed to provide a knowledge of the nature, functions, and problems of government and politics at the local, state, regional, national, and international levels. The departmental offerings are also designed to contribute toward the liberal education of both majors and non-majors and to provide a background for graduate education, professional work, and informed citizenship.
College of Liberal Arts

The major in political science consists of the following: the introductory courses, Political Science 401, 402; at least 6 courses (24 credits), but no more than 8 courses (32 credits), in political science beyond 401, 402—one course (4 credits) may be from the list of cognate courses available from the student's adviser or from the departmental office; at least one course from 3 of the 5 fields established in the department (American politics, comparative politics, international relations, political thought, and scope and methods of political science) as part of the above program.

In addition, majors planning graduate or professional study are expected to take at least one independent study offering, involving a research paper. Independent study listings are available to all majors, but no major may take more than two independent study courses in political science without special permission.

Students planning a major in political science are assigned to departmental advisers who will regularly consult with them about their programs. Departmental bulletins and the departmental newsletter periodically supply information on course offerings for the particular semester and on other matters of interest to faculty and students in the department.

Students who expect to major in political science are advised to register for Political Science 401, 402 in their freshman or sophomore year. It is strongly recommended that 401, 402 be taken in sequence by majors. All courses in the major program must be passed with grades of C or higher.

Majors planning to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Students who are preparing to teach government courses in secondary schools should coordinate their programs with the Department of Education. Majors interested in direct practical experience in public affairs during their undergraduate study may enroll in Social Science 681 and work as an intern in a public agency, with the approval of the Department Chairman and the Director of the Public Administration Service, affiliated with the Department. Departmental colloquia and other special programs involving public affairs work are sponsored from time to time.

Students majoring in political science should also be aware of dual major options outside the department and the international relations option within the department. Majors may designate the international relations option within the department upon approval of the chairman and the coordinator of the option. This program will normally require a minimum of five and a maximum of seven courses from the list of related courses for the option. Since this emphasis will require considerable coursework outside the department, the candidate should carefully review his preparation and program with the coordinator before making application.

The political science major serves students who plan to undertake graduate study in political science or law; to enter public service, including the foreign service; to teach social studies; or to enter other employment and maintain an active interest in public affairs. Governments, educational institutions, consulting firms, the news media, business, labor, and others, seek graduates of political science programs.

Psychology

A primary function of the Department of Psychology is to provide an academic major that will contribute to the liberal education of the undergraduate student. The experiences provided by the major are intended to help develop the broad viewpoint that characterizes the liberal arts graduate. By majoring in psychology, the student will develop an appreciation of the scientific study of behavior, and at the same time achieve a better
understanding of the behavior of men and animals.

Some students may wish to major in psychology in order to prepare themselves for later graduate study. With an advanced degree in psychology, a student may develop a career in a number of fields, among which are college teaching and research; clinical practice; counseling and guidance in secondary schools and colleges; full-time research with private or government agencies; personnel work in industry or government; and psychological testing and supervision in mental hospitals, juvenile courts, public schools, or child guidance clinics. For non-majors, the study of psychology is particularly helpful for those who are preparing for careers in teaching, nursing, social work, business or industrial management, and professions such as medicine or law in which the understanding of human relations is of great importance.

Students majoring in psychology are required to complete 32 credits in a sequence of courses that meet the following criteria. Each course that is to be counted toward fulfilling major or minor requirements must be passed with a grade of C or better. Specific requirements are:

1. Psychology 401; 2. Psychology 601; 3. four courses, selected from among the following: Psychology 602, 751, 752, 758, 778, 794; 4. one additional psychology course, chosen from the following options: Psychology 789, 795, 545 or 575, or any course not chosen from among those listed to fulfill Requirement 3 above; 5. one course chosen from offerings outside the department that is not used to fulfill College or University requirements, and is specifically approved by the student’s major adviser; and 6. each psychology major must take the ETS Undergraduate Record Examination during his senior year.

Any psychology major planning to go on to graduate work should include Psychology 602 among the courses he selects.

Students wishing to minor in psychology must register with the department during their junior year. Psychology minors must complete 20 credits in courses offered by the department that count for a major.

Students who wish to major in psychology should consult with the assistant chairman, Professor Gordon A. Haaland.

Social Service

A major in social service has as its purposes: 1. to contribute to the liberal education of students; 2. to enhance the employability of those students seeking employment in the field of social welfare immediately after graduation, and 3. to prepare students more adequately for admission to graduate schools of social work or for graduate professional education in one of the other human service professions.

Social service majors will be concerned with specialized subject matter dealing with the origin, development, and organization of health and welfare institutions. In addition, the social work profession and its relationship to social problems will be emphasized. To give the student an understanding of social welfare through observation and participation, majors are required to work in a social welfare setting for a number of weeks as part of their undergraduate study. Usually this is done the summer preceding the senior year.

For full recognition in social service, it is important for the student to complete graduate work, usually involving two years of professional study at a school of social work. There is a continuing shortage of qualified people in nearly all branches of social work. For this reason, a number of students who complete the social service major find employment each year in areas such as public welfare, child welfare services, vocational rehabilitation, etc.
Social service majors are required to take: Sociology 400, 500, 520, 621, 622, 631, 701, 702, 703, and Psychology 401 and 545. At least 32 credits of this work must be completed with grades of C or better in each course.

Interested students are advised to consult with the supervisor, Professor Pauline Soukaris, Department of Sociology.

Sociology

The major in sociology is: for students who desire a liberal education with emphasis on study of the organization and differentiation of society, including study of the research methods developed in recent years for a better understanding of social phenomena; and for students who intend to do graduate work in sociology; or students who plan to attend a graduate school of social work but prefer a choice of undergraduate electives different from that permitted the social service major.

Students who wish to teach sociology in secondary schools are advised that such teachers usually have to teach related social studies. Students with this vocational aim should consult with the chairman of the Department of Education.

It is recommended that majors in sociology take Sociology 400 during their freshman or sophomore years. They must complete a minimum of 32 semester credits with grades of C or higher in sociology (or in any related course approved by the supervisor). Sociology 400, 600, 697, 701, 702, 711, 712 are required. During the second semester of the senior year majors must pass a written comprehensive examination.

Students who are interested in choosing sociology as a major should consult with the chairman of the Departmental Committee for Undergraduate Studies.

Spanish and Classics

The Department of Spanish and Classics offers four majors: Greek, Latin, Classics, and Spanish. The supervisor for majors in Greek, Latin, and Classics is Professor John C. Rouman; the supervisor for majors in Spanish is Professor Charles H. Leighton.

The minimum requirements for each major are as follows:

- Greek: 32 credits in Greek including Greek 401-402.
- Latin: 32 credits in Latin, excluding Latin 401-402.
- Classics: 40 credits offered by the Classics Section, excluding Latin 401-402.
  Twenty-four of these must be in courses in Greek and Latin.
- Spanish: 32 credits in Spanish, excluding Spanish 401-402.

The department also offers honors programs in classics and Spanish. Participation in these programs entails completion of the regular major requirements plus a senior research project and paper (Classics 695-696, Spanish 695-696).

Speech and Drama

The Department of Speech and Drama offers a major with three options: communications, theater, and communication disorders.

The major option in communications emphasizes a broad integrative approach to the theories and practices of verbal and nonverbal communication. Interdepartmental course work, reasonable course substitution on an individual basis, proficiency exemption, and field or laboratory work are encouraged to meet individual communications needs or goals. Communications course work can be readily related to social sciences, humanities, etc. and provides a preprofessional preparation for vocations such
as law, public relations, personnel work, mass communications, cinema, etc.

The major option in theater stresses a broad background in the arts within their social framework. The student interested in the creative aspects of speech communication will find an opportunity for personal and pre-professional growth in theater and its drama, with opportunity for independent study of basic theories and personal involvement in active laboratory situations. Theater as a composite art, reflecting life, is closely related to painting, sculpture, music, dance, literature, and philosophy. As a public event, theater can be viewed through social science perspectives. Some of the fields of interest to graduates are children's theater and creative dramatics; public recreation, television, cinema; acting, direction, and design on all levels of theater; and teaching.

The major option in communications disorders provides a study of normal speech and hearing processes contrasted with basic courses in the pathologies of communication and their treatment. It emphasizes a broad, liberal education as essential preparation for successful study of communications disorders on a graduate level. A study of human utterance involves, psychology and sociology, as well as basic linguistics, anatomy, physics, etc., providing an integration of many traditional academic disciplines. The certification of the American Speech and Hearing Association requires a master's degree or its equivalent.

The required curriculum for majors in the communications option consists of:

- Communications I (402); Communications II (403); Introduction to Mass Communications (555); Persuasion (506); Seminar in Criticism of Contemporary Communications (671); one course in the area of Field or Laboratory Experience (691), including Debate Workshop (501); demonstrated basic proficiency in theater arts and speech science or appropriate course work; Senior Seminar I (697) and II (698).

Substitution of appropriate courses in other departments is possible on a basis of individual goals with approval of the major department.

The required curriculum for majors in the theater option consists of:

- Communications I (402); Theater and Its Drama I (435); either Theater and Its Drama II (436) or Theater and Its Drama III (438); Rehearsal and Performance I (551), Rehearsal and Performance II (552), Rehearsal and Performance III (657), Scenic Arts I (459); Scenic Arts IV (652); one full course or its equivalent from Performance Project (654) and Scenic Arts Project (655)—both may be repeated; Senior Seminar I (697), Senior Seminar II (698).

The required curriculum for majors in the communications disorders option consists of:

- Communications I (402); Applied Phonetics of American English (524); Speech and Hearing Science (521); Speech Pathology I (631); Speech Pathology II (632); Audiology (704); Clinical Practice in Speech Pathology (634); Special Problems in Communication Disorders (602) to the extent of 4 credits (one full course); Senior Seminar I (697) and II (698).

Students interested in majoring in the Department of Speech and Drama should consult with the chairman.

Zoology

The zoology major is designed to prepare students for admission to graduate work, at least two years of which is considered minimal for undertaking professional work in pure or applied zoology. Other students may elect the major, but there will be no reduction in requirements. The University's location on tidewater and near the open ocean provides an unusual opportunity for study of marine zoology and marine ecology.
College of Liberal Arts

Music Education 791 are required to be eligible for the student teaching block (see Senior Year, Semester II below).

Public school music teachers must maintain a satisfactory standing musically with other professional musicians in the community and should be able to play and sing acceptably. For this reason 13 semester credits in performance studies are required before graduation. Students will be encouraged to accumulate up to 8 semester credits in one instrument or voice. In addition, all candidates are required to meet minimum standards of performance in piano, voice, a woodwind instrument, a brass instrument, a string instrument, and percussion. Candidates are expected to meet the piano and voice requirements by the end of their junior year. The minimum instrumental requirements may be met by special examination, or may be demonstrated during the time the candidate is registered for performance study on these instruments. Details of minimum standards of performance may be obtained from the supervisor of the music education curriculum.

To complete degree requirements in four years, the student is allowed very little flexibility in choice of courses. The candidate might well consider spending more than eight semesters to complete the curriculum, gaining a broad general education background while preparing for the professional degree. This may be accomplished by electing the student teaching block as the ninth semester, or by spreading course work over nine semesters and placing the student teaching block in the tenth semester. The outstanding student should also consider a four-year Bachelor of Arts degree in Music, followed by a fifth year of professional work in music education leading to the Master of Arts in Teaching degree.

Students who are interested should consult with the supervisor, Professor John B. Whitlock.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
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<tr>
<td>General Education Requirement</td>
<td>4 8</td>
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<tr>
<td>Music 471-472 Theory I</td>
<td>4 4</td>
</tr>
<tr>
<td>Performance Study*</td>
<td>2 2</td>
</tr>
<tr>
<td>Music Laboratory</td>
<td>2 2</td>
</tr>
<tr>
<td>Physical Education Requirement</td>
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<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
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<tbody>
<tr>
<td>General Education Requirement</td>
<td>4 6 or 8</td>
</tr>
<tr>
<td>Music 571-572 Theory II</td>
<td>4 4</td>
</tr>
<tr>
<td>Music 501-502 Music History</td>
<td>4 4</td>
</tr>
<tr>
<td>Performance Study* I</td>
<td>2 1</td>
</tr>
<tr>
<td>Music Laboratory I</td>
<td>2 1</td>
</tr>
<tr>
<td></td>
<td>16 16 or 18</td>
</tr>
</tbody>
</table>

* A minimum of 13 credits in performance study must be taken to fulfill curriculum requirements.
Bachelor of Music Curriculum

This professional degree is offered to students who wish to major in performance or composition and who wish to develop their talent in these areas to a high professional standard. Standards of performance are maintained which are equivalent to those offered by conservatories of music. To be admitted to this program candidates must demonstrate a gift for performance or a significant creative ability, and, in the case of performance, students must have reached a high degree of competence prior to admission. An audition or examination is required for admission to this program.

* Four techniques courses (2 credits each) fulfill minimum curriculum requirements.
### Freshman Year

**All Options:**

- **English 401, Freshman English**  
- **General Education Requirement**  
  - selected science  
  - selected social science  
- **Music 471-472, Theory I**

**Physical Education Requirement**

- **Option 1.** Music 542, Piano (8 credits).
- **Option 2.** Music 544, Organ (8 credits).
- **Option 3.** Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory—Choral, (2 credits).
- **Option 4.** Performance Study—major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory—instrumental, (2 credits).
- **Option 5.** Music 542, Piano (2 credits); Performance Study—brass, (1 credit); Performance Study—woodwind, (1 credit).

### Sophomore Year

**All Options:**

- **General Education Requirements**  
  - selected social science  
  - selected humanities  
- **Music 571-572, Theory II**  

**Option 1.** Music 542, Piano (8 credits).
- **Option 2.** Music 544, Organ (8 credits).
- **Option 3.** Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory—choral, (2 credits).
- **Option 4.** Performance Study—major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory—instrumental, (2 credits).
- **Option 5.** Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); Performance Study—strings, (1 credit).

### Junior Year

**All Options:**

- **Electives (Foreign language recommended)**  
- **Option 1.** Music 542, Piano (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 455 (455), Piano Ensemble (2 credits).
- **Option 2.** Music 544, Organ (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 465, Voice Class for Beginners (2 credits); Music Education 741, Techniques and Methods in Choral Music (2 credits).
- **Option 3.** Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); a second foreign language—German, French or Italian (8 credits); Music Laboratory—choral and/or opera workshop, (4 credits).
- **Option 4.** Performance Study—major instrument, (8 credits); Music 501-502, Music History (8 credits); Music 575-576, Conducting (4 credits); Ensemble, (2 credits); Music Laboratory—instrumental, (2 credits).
- **Option 5.** Music 771-772, Counterpoint (4 credits); Music 775-776, Composition (4 credits); Music 779, Orchestration (4 credits); Music 781, Form and Analysis (4 credits); Music 542, Piano (2 credits).
Bachelor of Music Curriculum

**SENIOR YEAR**

**Option 1.** Music 542, Piano (8 credits); Music 455 (455), Piano Ensemble (2 credits); Music 735-736, Pianoforte Literature (8 credits); two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.

**Option 2.** Music 544, Organ (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.

**Option 3.** Music 541, Voice (8 credits); Music 542, Piano (2 credits); a third foreign language—French, German or Italian (8 credits); two 4-credit courses in music literature and/or advanced theory; Music Laboratory—choral, ensemble, and/or opera workshop, (4 credits).

**Option 4.** Performance Study—major instrument, (8 credits); two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory—instrumental, (2 credits); ensemble, (2 credits).

**Option 5.** Music 773, Canon and Fugue (2 credits); Music 777-778, Advanced Composition (8 credits); Music 542, Piano (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.
College of Technology

Richard S. Davis, Dean
Tenho S. Kauppinen, Assistant Dean

Departments
Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Mathematics
Mechanical Engineering
Physics

Programs of Study

Bachelor of Science:
Engineering:
  Chemical Engineering
  Civil Engineering
  Electrical Engineering
  Mechanical Engineering
Science and Mathematics:
  Chemistry
  Mathematics
  Physics
General Information

The College of Technology offers its students a vigorous professional education in engineering, the physical sciences, and mathematics. All programs require study in the humanities and social sciences in addition to a thorough grounding in the basic aspects of mathematics, the physical sciences, and specialized studies of the chosen professional area. This pattern of undergraduate work is designed to provide a base either for a successful career in industry or for advanced study at the graduate level.

Since modern technology has drawn engineering applications and their scientific bases more closely together, the engineering curricula are oriented to emphasize the theoretical-scientific aspects of engineering. The importance of the role and responsibility of the engineer or scientist in modern society is emphasized through study in the humanistic-social areas.

Degrees

The College of Technology offers the Bachelor of Science degree in each of its departments.

For information concerning advanced degrees, see the Graduate School catalog.

Curricula

Each candidate for a degree must satisfy all general University requirements for graduation, complete at least 128 semester credits, including the courses required in one of the four-year curricula and achieve a minimum grade-point average of 2. Graduation credit requirements as established by departments may range from 128 to 138.

Curricula of the various departments in the College of Technology are revised and modified as required to reflect the patterns of their professional areas and to provide an effective base for the future professional growth of their graduates. Entering students may anticipate that a program as presented, or as subsequently modified, will permit their graduation in four years, assuming normal loads and progress.

If a break in attendance occurs, or other than normal progress is made, the requirements which must ordinarily be satisfied will be those which are in effect at the time of graduation. Specific programs accomplishing this will be prepared by the student and his adviser for approval by the Executive Committee of the College.

The University general education requirements are a part of each curriculum. A maximum of six credits in ROTC courses may be applied to the total required for graduation in each curriculum. The ROTC courses may satisfy the third group of general education requirements which includes all courses in the University or unspecified electives outside the general education requirements.

Honors Program

The College of Technology, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities beyond those offered in the regular curricula. Admission to honors status is by invitation of the department concerned and with the approval of the Dean of the College. It is limited to those students entering the junior year with at least a 3.0 average.

The program permits the student, with approval of his departmental adviser and the Dean, to develop an individualized plan of study which, within the framework of his chosen professional area, may include appropriate courses from any of the colleges in the University in lieu of, and/or in addition to, those courses normally prescribed.
Dual Degree Programs

Students may formally combine studies in a professional curriculum in the College of Technology with studies in other curricula of the University. The College of Liberal Arts offers a broad liberal educational experience in a number of major areas, or specific curricula in the Whittemore School or the College of Agriculture may be jointly pursued as the basis of preparation for an interdisciplinary career. Normally these joint programs will involve attendance for five years and two bachelor's degrees will be awarded upon satisfactory completion of the requirements of both areas.

If a student is approved for a dual degree program, initial registration will be in the College of Technology, but an adviser will be assigned from both areas so that an integrated program of study may be planned from the outset in order to accomplish the student's objectives in the most efficient and academically-sound manner.

Reserve Officer Training Programs

Provision is made in each departmental curriculum for students electing to enroll in basic Air Force or Army ROTC. The basic Air Force program requires enrollment in each semester of the freshman and sophomore years. One credit per semester is earned. The basic Army program requires enrollment in Semester I of the freshman year for two credits, Semester II, zero credit, and both semesters of the sophomore year for two credits each. The student should consult his adviser for optimum course arrangements to include ROTC program requirements.

Chemical Engineering

O. T. Zimmerman, Chairman

Chemical engineering is that branch of engineering which involves the application of chemistry, physics, mathematics, and fundamental engineering principles to the design, construction, and operation of equipment for carrying out chemical processes on an industrial scale at the lowest possible cost. The chemical engineering curriculum, therefore, provides the student basic training in the physical sciences, engineering principles, and economics.

Although chemical engineering is a distinct profession, chemical engineers are also considered to be members of the chemical profession and a considerable portion of the chemical engineering curriculum is devoted to the science of chemistry. However, emphasis is placed upon the large-scale manufacture of chemical products instead of the laboratory phase of chemistry.

A minimum of 128 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering. There are 11 electives in the chemical engineering curriculum in addition to the mathematics elective. Six of these are for arts and humanities and social science requirements. Among the remaining five electives, at least one must be chosen from chemical engineering courses.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 425-426</td>
<td>Calculus I and II</td>
</tr>
<tr>
<td>Phys. 407-408</td>
<td>General Physics I and II</td>
</tr>
<tr>
<td>Chem. 405</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>English 401</td>
<td></td>
</tr>
<tr>
<td>Electives (2)</td>
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<tr>
<td>Phys. Ed. 301</td>
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</tbody>
</table>

16 16

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## Technology Curriculum in Chemistry

**A. R. Amell, Chairman**

This curriculum is intended to prepare the student for the career of a professional chemist in industry and to provide a strong foundation for graduate study leading to original and independent research.

Instruction is given by lectures, recitations, and carefully supervised laboratory work. The laboratory study is largely individual and the course work of each student is planned to furnish a broad knowledge of chemical science. The student may elect either German or Russian to enable him to read chemical literature, and he receives a grounding in mathematics and physics necessary for the advanced courses in chemistry. In the senior year, an independent research project is undertaken, permitting the student to use the reference library and chemical periodicals throughout the course of a laboratory investigation.

A minimum of 132 credits is required for graduation with the degree of Bachelor of Science in Chemistry. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses.

### College of Technology

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Chem. 683-684</td>
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<td>Chem. 685-686</td>
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<td>Math. 527</td>
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<td>Phys. 505</td>
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<td>Ch.E. 502</td>
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<td>Math Elective</td>
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<td>Electives (2)</td>
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#### Junior Year

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Chem. 547-548</td>
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<tr>
<td>Ch.E. 601-602</td>
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<tr>
<td>Ch.E. 603</td>
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<td>Ch.E. 604</td>
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<td>Electives (2)</td>
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#### Senior Year

<table>
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<tr>
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<td>Ch.E. 608</td>
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<td>Electives (5)</td>
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<td>Approved Elective</td>
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<td>Math. 425-426</td>
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<td>Electives (2)</td>
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<td>Phys. Ed. 301</td>
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<tr>
<td>Chem. 547-548</td>
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<tr>
<td>German or Russian 401-402</td>
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<td>Physics 408, 505</td>
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<td>Math. 527</td>
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<td>Chem. 762</td>
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<td>Chem. 775</td>
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Civil Engineering

Louis H. Klotz, Acting Chairman

The profession of civil engineering is the parent stem from which the other branches of engineering have diverged. Civil engineering embraces the functions of planning, design, and construction of facilities such as bridges, buildings, dams, transportation projects, and public works in general; it is often defined as the engineering of constructed facilities. Although civil engineering is the oldest of the major branches of engineering, it has undergone continuous and dramatic change and growth in order to solve the problems of a contemporary society.

The Department of Civil Engineering offers a curriculum designed to give the student both a broad educational back-
ground and a truly professional educational base, which are essential to modern professional civil engineering practice. Since civil engineering deals with man as well as his environment, the first three years are spent in a broad base of studies not only in the physical sciences but also in the social sciences, the humanities, and the engineering sciences. Instruction in computers begins in the freshman year in order that the student may make full and effective use of this tool's capabilities in planning, design, and analysis. The fourth year is spent in the civil engineering arts and sciences of upper-level or specialization calibre. The curriculum is, therefore, planned to give a basic training that will enable the graduate to begin a career in the various fields of practice in civil engineering and also to provide an integrated scientific and engineering foundation on which the engineer can build after his formal college education is completed. This basic training and fundamental background in civil engineering together with the scientific and mathematical subjects basic to all engineering should well prepare the student to respond to the changes that will occur in civil engineering over the next decade and to continue on to graduate school.

A minimum of 138 credits is required for graduation with the degree of Bachelor of Science in Civil Engineering. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses which averages 17 credit hours per semester.

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<thead>
<tr>
<th>FRESHMAN YEAR</th>
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<tbody>
<tr>
<td>Chem. 403 (or 405)</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>C.E. 401-402</td>
<td>Engineering Statics and Computer Programming</td>
</tr>
<tr>
<td>Engl. 401</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Math. 425-426</td>
<td>Calculus I and II</td>
</tr>
<tr>
<td>Electives (arts, humanities, or social science—4)</td>
<td>8</td>
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<tr>
<td>Phys. Ed. 301</td>
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<tbody>
<tr>
<td>C.E. 503</td>
<td>Dynamics</td>
</tr>
<tr>
<td>C.E. 505</td>
<td>Surveying</td>
</tr>
<tr>
<td>C.E. 506</td>
<td>Strength of Structural Materials</td>
</tr>
<tr>
<td>C.E. 508</td>
<td>Engineering Graphics</td>
</tr>
<tr>
<td>Math. 527</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>Math Elective (or Tech 601)</td>
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<tr>
<td>Phys. 407-408</td>
<td>General Physics I and II</td>
</tr>
<tr>
<td>Electives (arts, humanities or social science—2)</td>
<td>4</td>
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<tr>
<td>C.E. 621</td>
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<td>C.E. 622</td>
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<td>C.E. 642</td>
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<td>Soil Mechanics</td>
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<td>C.E. 681</td>
<td>Structural Analysis I</td>
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<tr>
<td>C.E. 682</td>
<td>Structural Design Concepts</td>
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<td>E.E. 533</td>
<td>Electrical Engineering Fundamentals</td>
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<td>Electives (any department except civil engineering—2)</td>
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</table>
Electrical engineers seek to provide solutions to real problems involving man's needs for the processing of information and for the utilization of electrical energy. By conversion of information in various forms into electrical signals we are able to transmit it over large distances, amplify it, store it, recover it rapidly, perform calculations with extreme precision and speed, and to provide automatic devices for controlling complex operations. By the generation, transmission, distribution, and efficient utilization of electrical power, we are able to provide mankind with his most versatile form of energy.

The essence of engineering is design—the art of economically applying theory and judgment to produce devices, components, and engineering systems. Most design tasks make extensive use of mathematics and basic science, which are emphasized in the first two years of the electrical engineering curriculum. In the third year the student concentrates on engineering science courses. In the fourth year the emphasis is on application courses which develop experience in the practice of measurement, analysis, and design of electrical devices and systems. In keeping with the spirit of the University's 4R program, the last two weeks of each electrical engineering course are for independent reading or projects.

Because electrical engineering has been applied so widely to other fields of learning, medicine and business, for example, it is particularly well suited to the dual degree programs described on page 117.

The electrical engineering curriculum is intended to prepare the student for further and more specialized studies at the formal or informal graduate level and for immediate employment as an engineer-in-training.

A minimum of 131 credits is required for graduation after June 1969, with the degree of Bachelor of Science in Electrical Engineering. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses.
College of Technology

**SOPHOMORE YEAR**

<table>
<thead>
<tr>
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**JUNIOR YEAR**

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<td>E.E. 505-510</td>
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**SENIOR YEAR**

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<th>Course</th>
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<tr>
<td>E.E. 611</td>
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**Technology Curriculum in Mathematics**

M. E. Munroe, Chairman

The technology curriculum in mathematics consists of a thorough grounding in calculus, followed by advanced work in algebra, analysis, applied mathematics, and geometry. Such a program meets the requirements currently set by graduate schools for admission to graduate study in mathematics. It also furnishes the basic mathematical training required of mathematicians in industry and government.

Modern science continues to increase its demands on the undergraduate mathematics program, and the technology mathematics curriculum is subject to continual scrutiny and revision in an effort to keep up with these demands. Every effort is made to give the student of mathematics the most up-to-date possible presentation of the basic subject matter in this field.

A minimum of 128 credits is required for graduation, with the degree of Bachelor of Science in Mathematics. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses.

The courses and general education groups listed in the curriculum are required and what follows is a typical program. However, the order in which these requirements are met may be altered in any manner that course prerequisites will permit.

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*At least two electives in the senior year will be technical courses and at least one of these will be a 7000-level electrical engineering course.*

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Mechanical Engineering

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 425-426</td>
<td>Calculus I and II</td>
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</tr>
<tr>
<td>Phys. 407-408</td>
<td>General Physics I and II</td>
<td>4</td>
</tr>
<tr>
<td>Lang. 401 or 501*</td>
<td>Foreign Language</td>
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</tr>
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<td>Engl. 401</td>
<td>Freshman English</td>
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**SOPHOMORE YEAR**

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<td>Math 527</td>
<td>Differential Equations</td>
<td>4</td>
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<tr>
<td>Math 528</td>
<td>Multidimensional Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Math 640</td>
<td>Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>Math 410</td>
<td>Computer Systems</td>
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**JUNIOR YEAR**

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<tr>
<td>Math 763</td>
<td>Abstract Algebra</td>
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**SENIOR YEAR**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Semester Credits</th>
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</thead>
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<tr>
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<td>Topology</td>
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</tr>
<tr>
<td>Math 698</td>
<td>Senior Seminar</td>
<td>4</td>
</tr>
<tr>
<td>Math 788</td>
<td>Complex Analysis</td>
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<td>Approved Math Elective</td>
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<tr>
<td>General Education electives (2)</td>
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</tr>
<tr>
<td>Electives (2)</td>
<td></td>
<td><strong>Total</strong> 4</td>
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</table>

**Total** 16 16

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Mechanical Engineering

R. W. Corell, Chairman

Mechanical engineering is a challenging profession encompassing a broad spectrum of activity. It contributes to the research; design; development; and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and general consumer and industrial products. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The curriculum in mechanical engineering is designed to prepare the prospective graduate either for more advanced studies or for beginning a professional engineering career. To accomplish these objectives, the program of

*The language chosen should be French, German, or Russian. If the foreign language is taken at the 500 level, it may be applied toward the arts, humanities, and social science general education requirement.*

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College of Technology

study provides a foundation in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Flexibility in the curriculum enables the student to gain additional competence in any of these areas, developing his abilities in analysis, experimentation, and engineering design. The curricula includes elective courses in the arts, the humanities, and the social sciences to provide a liberal education.

The program in mechanical engineering is further designed to develop the student's creative potential to enable him to meet the increasingly complex needs of industry, government, and education, while appreciating the role of technology in a modern society.

The student, with the assistance of his adviser, should plan his program based on the following distribution of courses which average 16 credit hours per semester but totaling not less than 130 credits.

The outline which follows is to be considered as being typical only in terms of format. Within the constraints of satisfying all of the requirements and having all necessary prerequisites, an individual student's schedule may vary from the following. Such variation will in general be caused by scheduling needs or student preference.

All elective courses will be chosen, in consultation with a departmental adviser, from courses which will lead to a balanced program in the student's chosen area of interest. The free electives are entirely the student's own choice and are without constraint.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
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<tbody>
<tr>
<td>Chem. 405</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Math 425-426</td>
<td>Calculus I and II</td>
</tr>
<tr>
<td>Eng. 401*</td>
<td>Freshman English (or &quot;Free&quot; elective)</td>
</tr>
<tr>
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<td>General Physics I and II</td>
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<td>M.E. 441</td>
<td>Engineering Graphics and Computer Programming</td>
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<tr>
<td>Elective (1)</td>
<td>Arts and Humanities or Social Science</td>
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<tr>
<td>Phys. Ed. 301</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Math 528</td>
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<td>Mathematics Elective</td>
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<td>M.E. 501-502</td>
<td>Linear Systems I and II</td>
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<td>M.E. 515-516</td>
<td>Systems Laboratory I and II</td>
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<td>M.E. 523-524</td>
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* A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a written English proficiency examination.
Technology Curriculum in Physics

**JUNIOR YEAR**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
</tr>
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**SENIOR YEAR**

<table>
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<th>Course Title</th>
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**FRESHMAN YEAR**

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<td>Engl. 401*</td>
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<tr>
<td>Math 425-426</td>
<td>Calculus A1 and A2</td>
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<td>Phys. 407-408</td>
<td>General Physics I and II</td>
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<td>Elective or Chem. 404 or 406</td>
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* A second semester of English must be elected during one of the succeeding semesters unless exempted by examination or advanced placement.

**SENIOR YEAR**

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<th>Course Title</th>
<th>Credits</th>
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<td>Technical Electives (5)</td>
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<tr>
<td>Elective (1)</td>
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Technology Curriculum In Physics

Lyman Mower, Chairman

The technology curriculum in physics offers basic training in fundamentals, supplemented by laboratory work in the various branches of physics. Opportunity is given in the senior year for experimental investigation in some of the fields of physics under the guidance of staff members. Such a curriculum prepares its graduates for basic research in industry, the various government research organizations, or for continued academic study toward advanced degrees. The diversified opportunities in physics necessitate a flexible curriculum, enabling the student to supplement his studies in physics with other science and engineering courses.

A minimum of 12 courses in physics is required for graduation with a Bachelor of Science degree. For those students intending to pursue graduate study, it is advisable to elect physics and mathematics courses beyond the minimum requirements, and German or Russian as a foreign language. A student interested in applied physics should elect courses in electrical and mechanical engineering and chemistry. Departmental advisers should be consulted on specific programs accomplishing this purpose.

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**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>General Chemistry</td>
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<td>Math 425-426</td>
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<td>General Physics I and II</td>
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**SENIOR YEAR**

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"A second semester of English must be elected during one of the succeeding semesters unless exempted by examination or advanced placement."
# College of Technology

<table>
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<tr>
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<td></td>
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<tr>
<td>Math 527-528</td>
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<td><strong>JUNIOR YEAR</strong></td>
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<tr>
<td>Phys. 601</td>
<td>Classical Mechanics</td>
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<td>Statistical Mechanics</td>
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<td><strong>SENIOR YEAR</strong></td>
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<tr>
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<tr>
<td><strong>Total</strong></td>
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* Recommended mathematics electives to best suit the student's projected goals in physics, and Mathematics 635, 640, 753, 754, 765, 766.
Whittemore School of Business and Economics

Jan E. Clee, Dean
Richard L. Mills, Assistant Dean

Curricula
Administration
Economics
Hotel Administration

Programs of Study
BACHELOR OF ARTS:
Economics

BACHELOR OF SCIENCE:
Administration
Hotel Administration
General Information

The Whittemore School of Business and Economics was established as a separate degree-granting school July 1, 1962.

The basic purpose of the School in its undergraduate curricula is to provide a broad academic background, with professional training in one of the disciplines of administration, economics, or hotel administration. Undergraduate students are required to take a substantial part of their course work in other colleges of the University. In particular, students will be encouraged to elect courses in the social sciences, mathematics, the natural sciences, the arts, and the humanities. The student who pursues study in the relatively broad curricula of administration or economics will also find that he is prepared for advanced study at the graduate level in these and related disciplines.

Requirements for Degrees

The Whittemore School offers the degrees of Bachelor of Arts and Bachelor of Science. Students concentrating in economics will be candidates for the Bachelor of Arts degree, and students concentrating in the other curricula will be candidates for the degree of Bachelor of Science. Each candidate for a degree must: satisfy the general education requirements and all other University requirements for graduation; earn at least 128 semester credits, including the courses required in one of the four-year curricula described below; achieve a minimum grade-point average of 2.0; and achieve a minimum grade-point average in his curriculum as prescribed for that program.

The several curricula in the Whittemore School are subject to revision and modification from year to year. Students are subject to and responsible for such changes as they may be introduced. Entering students may anticipate, however, that a curriculum as presented, or as subsequently modified, will permit their graduation in four years, assuming that normal academic loads are carried and normal progress is made.

An undergraduate student entering the school will be required to declare his major not later than the end of his sophomore year. The new catalog becomes effective on July 1 of each year. For information concerning advanced degrees, see the Graduate School catalog.

Independent Study

A junior or senior student in the Whittemore School of Business and Economics may elect to take advantage of the opportunity for independent study. The credits allowed range from 6 semester hours for juniors to 12 semester hours for seniors. To be eligible the student must have a cumulative academic average of 3.0 or better and submit, at least 60 days in advance of registration, a plan for his independent study that has the approval of his adviser, the instructor involved, and the School Executive Committee. The student pursuing an independent-study program must meet all general School requirements. He may petition to substitute independent-study credits in whole or in part for required-course credits in the economics curriculum or for elective credits in the Hotel Administration curriculum.

A student with a superior academic record who pursues an independent-study program for a significant portion of a semester's work may petition to be designated "Whittemore Scholar".

The student taking an independent study program will be assigned a member of the faculty of his major area of concentration as his adviser. It is expected that his program will normally take the form of an independent research paper, although programs calling for another form will be considered. The result of a student's activity under this plan will be judged by three members of the faculty selected by his adviser and the Dean.
Minor Program

A minor is not required in the economics, administration, and hotel administration curricula. A student in any one of these curricula may, however, apply for permission to pursue a minor program of study in any discipline in which sufficient courses are offered at the University. Permission to participate in a minor program may be granted only by the Executive Committee of the School with the concurrence of the particular department involved. Consideration shall be given to the student's major area of concentration and proposed minor before granting such permission. Successful completion of such a program is recorded on a student's academic transcript.

A minor shall comprise at least 16 semester hours in the minor department with grades of C or better in courses which count for major credit. No more than 8 credits used to satisfy area of concentration requirements shall be used for a minor. Courses counting toward a minor may not be taken on a pass-fail basis.

Dual Degree Program

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, college, scholastic, and other requirements. Anyone interested in such a program of study should confer with the deans of the colleges in which he intends to earn degrees as early in his academic career as possible and, if approved for the program, should expect to work closely with faculty advisers from the colleges involved.

Administration Program

The purpose of the Administration Program is to provide the student with the basic managerial capabilities requisite to a society characterized by rapid change. The Administration Program has been designed as an integrated program for upperclassmen. The first year of the program presents the core material and the second year offers options for concentration. The intent of the Administration Program is to provide the student with a good foundation in liberal arts and sciences followed by a broad professional education in basic principles, concepts, and analytical tools for a career in management. To emphasize the importance of a good foundation in the liberal arts and sciences in the development of managerial capabilities, the Program permits the student to elect one course outside the area of Administration in each semester of the two-year professional program.

Enrollment in the Whittemore School Program in Administration shall be made upon application to the Dean. Applicants must normally have completed two full years of study in the University and be in good standing. Applicants normally should have completed college work in mathematics and economics. For example, Mathematics 415 and Economics 401, 402 are sufficient.

The required courses in the Program will build upon those that precede, and the regular cycle of the program will begin each September. Students must plan to maintain the prescribed course schedule. Applications for enrollment in the Administration Program should be submitted at least two weeks prior to pre-registration during the second semester of the student’s sophomore year.

Individual students not enrolled in the program may take specific courses in the program, but permission of the instructor will be necessary and junior year standing will normally be required.

To qualify for graduation, students admitted to the Administration Program must obtain a cumulative academic average of C or better in the courses required by this program and the student must have earned a B or better in at least three of these required courses.
All students in the Administration Program are required to pursue the following courses in their junior year. (Second semester sophomores in the fall semester should petition to start the Program in the fall.) A senior student must pursue one of the three options listed below.

<table>
<thead>
<tr>
<th>JUNIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Admin. 605-606</td>
<td>Quantitative Analysis I &amp; II 4 2</td>
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<tr>
<td>Admin. 611</td>
<td>Organizational Behavior 4</td>
</tr>
<tr>
<td>Admin. 617-618</td>
<td>Financial Reporting, Accounting, &amp; Control I &amp; II 4 2</td>
</tr>
<tr>
<td>Admin. 602</td>
<td>Values in a Managerial Society 4</td>
</tr>
<tr>
<td>Admin. 614</td>
<td>Organizational Theory 4</td>
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<tr>
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<td></td>
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<table>
<thead>
<tr>
<th>SENIOR YEAR</th>
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<tbody>
<tr>
<td>Business Administration Option</td>
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<tr>
<td>Admin. 651</td>
<td>Marketing 4</td>
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<tr>
<td>Admin. 653</td>
<td>Financial Management 4</td>
</tr>
<tr>
<td>Admin. 650</td>
<td>Operations Management 4</td>
</tr>
<tr>
<td>Admin. 700</td>
<td>Management Policy 4</td>
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<tr>
<td>Electives (4)</td>
<td></td>
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<td></td>
<td><strong>16</strong> <strong>16</strong></td>
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</table>

| General Administration Option         |                     |
| Admin. 650                            | Administration Seminar 4 |
|                                       | Operations Management 4 |
| Special Electives (to be selected from a list of recommended electives) 8 |
| Admin. 700                            | Management Policy 4 |
| Electives (3)                         |                     |
|                                       | **16** **16**       |

| Supervised Internship Option          |                     |
| Either of the above first semester senior options, 16 |
| Supervised Internship and/or Management Policy and/or Electives 16 |

## Economics

Students concentrating in economics will be expected to fulfill the basic requirements set down for general liberal arts students, such as the modern language and science requirements. In addition, within their area of concentration they will be able to take, among others, such advanced courses as national income analysis, intermediate economic theory, money and banking, international economics, statistics, and comparative economic systems.

It should be borne in mind, however, that undergraduate training in economics by no means qualifies a student as a professional economist. Those students who intend to become professional economists should plan a minimum of three years of graduate work in the discipline after they have obtained their bachelor’s degree. Nevertheless, undergraduate training in economics does provide an ex-
cellent background for graduate training not only in that discipline but in other related disciplines, such as government and law. If a student plans to receive only the bachelor's degree, he will find that his work in economics will qualify him for many positions in business and government service.

Students planning to pursue graduate study in economics should consult with their advisers early in their academic program. This consultation should facilitate entrance into graduate programs.

Students in this curriculum are required to complete seven full courses in economics with a cumulative academic average of 2.0 or better. Major credit toward required courses will be approved in the case of transfer students only if such courses have been taken as upper division courses, i.e., in the junior or senior year. In addition, at least five of the required economics courses shall be earned at this University.

Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of economics majors. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completing one of the 401-402 series in any foreign language sequence at the University of New Hampshire. Students having studied a foreign language for two or three years in high school should be able to achieve a satisfactory score on the College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
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<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 301</td>
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<td>Engl. 401</td>
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<tr>
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<tr>
<td>Econ. 401, 402</td>
<td>Principles of Economics</td>
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<td>Electives (GER)</td>
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<tr>
<td>Elective (1)</td>
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<tbody>
<tr>
<td>Econ. 605</td>
<td>Intermediate Economic Analysis</td>
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<td>Econ. 611</td>
<td>National Income Analysis</td>
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<td>Econ. 525</td>
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<td>Elective (1)</td>
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<tr>
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<tr>
<td>Electives (6)</td>
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<td>12</td>
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</table>
Whittemore School of Business and Economics

Hotel Administration

Students pursuing the hotel administration program will experience a broad general education. Approximately two-thirds of the courses explore the cultures so necessary for an appreciation of the social and technical aspects of life. This foundation is supplemented by basic administration and economics courses integrated with courses related specifically to the lodging and feeding segments of the rapidly expanding services sector of the worldwide economy.

This Bachelor of Science program is intended primarily for those who wish to become managers and executives, not immediately upon graduation but after gaining sufficient experience and acquiring those techniques of decision making that can come only with maturity and exposure. To ensure that students are knowledgeable in the interdependence of the basic skills required and in the organizational behavior in the customers' presence, two summers or the equivalent of approved on-the-job experience must be completed.

Students in the hotel administration program must obtain a cumulative academic average of 2.0 or better in the required courses given in the Whittemore School. A graduate of this program, who is qualified for and interested in further allied studies, is well prepared to enter an advanced degree program in business or institutional administration.

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>P.E. 301</td>
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<tr>
<td>Engl. 401</td>
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<td>H.A. 403</td>
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<td>Math. 415</td>
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<td>H.A. 410</td>
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**SEMESTER CREDITS**

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<td>Physical Education</td>
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<td>Freshman English</td>
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<tr>
<td>Elements of Institutional Administration</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics for Business &amp; Economics (GER)</td>
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<tr>
<td>Workshop for Public Services Management</td>
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<td>Social Sciences or Arts &amp; Humanities</td>
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<td>Non-Major</td>
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16 16.5

**SOPHOMORE YEAR**

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<tr>
<td>H.A. 509</td>
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<td>Admin. 517</td>
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<td>H.A. 412</td>
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**SEMESTER CREDITS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>Financial Analysis &amp; Controls</td>
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<td>Financial Accounting</td>
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16 16.5
## Hotel Administration

### Junior Year

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<tr>
<td>H.A. 655</td>
<td>Management for Transient, Leisure, &amp; Indigent Services</td>
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<tr>
<td>Econ. 525</td>
<td>Introduction to Economic Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Admin.</td>
<td>Admin. Electives, 600 or above</td>
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</tr>
<tr>
<td>H.A. 656</td>
<td>Management of Physical Structures</td>
<td>4</td>
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<tr>
<td>H.A. 614</td>
<td>Workshop for Public Services Management</td>
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<tr>
<td>Electives (3)</td>
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### Senior Year

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<tr>
<th>Course</th>
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<th>Credits</th>
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<tr>
<td>H.A. 667</td>
<td>Functional Management</td>
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</tr>
<tr>
<td>H.A. 606</td>
<td>Markets &amp; Promotion of Public Services</td>
<td>4</td>
</tr>
<tr>
<td>H.A. 616</td>
<td>Workshop for Public Services Management</td>
<td>0.5</td>
</tr>
<tr>
<td>Electives (5)</td>
<td>Workshop for Public Services Management</td>
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</table>
School of Health Studies

Lawrence W. Slanetz, Dean
Robert Kertzer, Assistant to the Dean

Departments
Nursing
Occupational Therapy
Physical Education for Men
Physical Education for Women

Programs of Study
BACHELOR OF SCIENCE:
Medical Technology
Nursing
Occupational Therapy
Physical Education for Men
Physical Education for Women
Recreation and Parks
The School of Health Studies was established by the University of New Hampshire in 1969. In its undergraduate curricula, the basic purpose of the school is to provide a liberal and professional education in health-related disciplines. Currently the following professional curricula leading to the Bachelor of Science degree are offered: medical technology, nursing, occupational therapy, physical education for men, physical education for women, and recreation and parks. In these programs the undergraduate student is required to take a portion of his course work in the College of Liberal Arts and other colleges of the University.

The University requirement in physical education, applicable to all undergraduate students, is administered by the Departments of Physical Education within the school.

Degree Requirements

Each candidate for a degree must satisfy all general University requirements for graduation as listed on page 71, earn at least 128 credits, including the courses required in one of the curricula described below, achieve a minimum cumulative grade-point average of 2.2, and achieve a minimum grade-point average in his curriculum as prescribed. Generally, courses are to be completed in the sequence in which they are arranged.

The several curricula in the School of Health Studies are subject to modification and revision from year to year.

An undergraduate student may select his major upon entering the school or declare a major in the school not later than the end of his sophomore year.

Minor Option

A minor may be earned in other undergraduate disciplines in the University contingent upon approval of both the major and minor departments. A minor consists of 18 credits, with C or better, in courses which the adviser in the minor discipline approves. No more than 6 credits used by the student to satisfy curriculum requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year. Successful completion of such a program is recorded on the student's transcript.

Dual Degree Programs

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, scholastic, and other requirements for each degree. Students desiring to earn more than one undergraduate degree should make their plans known to their adviser and the College Deans concerned, preferably no later than the end of the freshman year.

Medical Technology

There is a large and increasing demand for medical technologists. Public health and medicine depend more and more upon the laboratory. Professional technicians are needed to perform various laboratory techniques and tests, such as blood typing, blood counts, tissue sections, urinalyses, and bacteriological and serological tests. Positions in this field are available in hospital laboratories, physicians' and surgeons' clinics, and in health department laboratories. Medical technologists also aid in the conduct of research in many medical centers.

Students who are interested in this field should register in the curriculum in medical technology. In this program students will take their freshman, sophomore, and junior years' work at the University and their last year's work at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. After satisfactorily completing the courses at the School of
Medical Technology (Medical Technology 761-762), the student is awarded 32 credits toward the Bachelor of Science degree.

This program also qualifies the student for the examination for the medical technologist's certificate administered by the Registry of Medical Technologists of American Society of Clinical Pathologists. Thus a student can obtain the B.S. degree from the University and the M.T. certificate in a four-year period. Students who complete this curriculum are well qualified for work in any hospital or medical laboratory.

At the present time, the fees for the senior year include a University tuition fee of $50 for New Hampshire residents and $120 for non-residents and a maintenance fee of $800 (including room and board) at the Mary Hitchcock Memorial Hospital School of Medical Technology. The latter institution has a stipend program which provides $600 for students meeting the requirements of this program.

Students in the medical technology curriculum must obtain grades of C or better in 24 semester credits from the following courses: Zoology 507-508; Microbiology 503, 702, 705; Chemistry 517, 545; and Biochemistry 656.

Students interested in the curriculum in medical technology are advised to consult with Professor Theodore G. Metcalf, chairman of the program.

<table>
<thead>
<tr>
<th>SEMESTER CREDITS</th>
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<tr>
<th>FRESHMAN YEAR</th>
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<tbody>
<tr>
<td>P.E. 301</td>
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<td>Bot. 411</td>
<td>General Botany</td>
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<td>Zool. 412</td>
<td>Principles of Zoology</td>
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<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
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<td>Freshman English</td>
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<tr>
<td>Math 420</td>
<td>Fundamental Mathematics</td>
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<tbody>
<tr>
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<td>Chem. 517</td>
<td>Introductory Quantitative Analysis</td>
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<tr>
<td>Chem. 545</td>
<td>Organic Chemistry</td>
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<tr>
<td>Bio. Ch. 656</td>
<td>Physiological Chemistry and Nutrition</td>
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<tr>
<td>Microb. 705</td>
<td>Immunology and Serology</td>
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<tr>
<td>Zool. 507-508</td>
<td>Human Anatomy and Physiology</td>
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<tr>
<th>SENIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Med. Tech. 761-762</td>
<td>Clinical Laboratory Methods†</td>
</tr>
</tbody>
</table>

* Student must select courses to satisfy the University general education requirements.
† This course starts about June 20 at the Mary Hitchcock Memorial Hospital School of Medical Technology and includes lecture and laboratory work in microbiology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. The credits are awarded in time for graduation in June of the following year after receipt of an official transcript of the grades obtained at the School of Medical Technology and certification by the director of this school and the supervisor of the curriculum that the work has been successfully completed.
Nursing

The need for more and better nursing care for all people and for more well qualified nurses to give such care is urgent and immediate. More nurses must be educated in colleges and universities if we are to meet our nation's nursing needs. The student interested in nursing as a career is encouraged to consider majoring in nursing. Graduates of the baccalaureate program in nursing receive preparation in general professional education with an emphasis on the social, physical, biological, and nursing sciences. They receive a Bachelor of Science degree and are eligible to take State Board examinations to become a registered nurse.

Nursing is a professional process which recognizes the individuality of man. It is committed to caring for the whole person in a variety of settings, aiding him in illness or in promotion and maintenance of health. The nursing curriculum progresses from the simple to the complex; from understanding of self as an individual, to understanding as a member of a family in a community, and ultimately to understanding as a member of a changing society.

The nursing faculty of the University is responsible for the nursing courses.

Learning experiences (nursing laboratories) are arranged in hospitals in the area, a medical center, and community health and other health agencies. During one semester of the junior or senior year it is necessary for the student to live off campus.

Additional expenses for students of Nursing are: uniform ($20 approximately) purchased at the end of the freshman year; transportation costs of about $20 in sophomore year; during the junior and senior years nursing students are responsible for their own transportation to nursing laboratories.

Students in the nursing program should obtain a grade-point average of 2.0 or better for the nursing courses by the end of the first semester of the junior year. It is expected that the total cumulative average of nursing courses will be 2.2 or better by the senior year. This curriculum requires 128 credits for graduation.

Special scholarships and loans are available for the students.

Students interested in the program are encouraged to talk with the Chairman of the Department of Nursing, Professor Mary Louise Fernald.

All freshmen will meet with the faculty of the Department to plan a schedule.

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<tr>
<td>Psych. 401</td>
<td>4</td>
</tr>
<tr>
<td>Electives (2)</td>
<td>8</td>
</tr>
<tr>
<td>Phys. Ed. 301</td>
<td></td>
</tr>
</tbody>
</table>

Total: 16  16
Occupational Therapy

Occupational therapy uses purposeful activity as treatment in the rehabilitation of people with emotional or physical disabilities. The media employed in treatment by the occupational therapist include manual and creative arts, activities of daily living, work, and avocational skills. The occupational therapist works as a member of the rehabilitation team in consultation with physician, nurse, physical therapist, psychologist, social worker, vocational counselor, and others. Community agencies, special schools for handicapped and retarded children, outpatient centers, and hospitals and rehabilitation centers offer positions working with patients of all ages. In addition to working as a clinician, the registered therapist will find challenging opportunities in consultation, administration, teaching, and research.

The occupational therapy curriculum was fully accredited in 1964 by the Council on Education of the American Medical Association and the American Occupational Therapy Association. It is designed to meet the requirements of these accrediting bodies, and to provide a four-year course leading to the Bachelor of Science degree. The program includes theoretical studies in biological and medical sciences, in psycho-social science, in the evaluation of patient and activity, in the planning and administration of treatment, as well as the development of practical skills in a wide range of therapeutic media and evaluative and treatment procedures. Pre-clinical observation and guided practice of patient treatment in local clinical situations are incorporated in the course requirements and reading periods.

Both men and women with physical vitality and emotional stability, who are interested in working with people, enjoy using their hands, and show proficiency in biological and psychological sciences, may be admitted to the program. Each student entering the program should take the OT aptitude tests. Once on campus the department will schedule test times for each student.
High school students considering this major should take 3 units of a laboratory science including biology for entrance into this program in the freshman year. Students who do not enter as freshmen in this program may declare OT as a major at the end of the freshman year following an interview with the department committee.

Students seeking to transfer into the program from other accredited colleges must do so through the Admissions Office. It is possible to enter the program in either the sophomore or junior year depending on the courses and credits accepted for transfer. Consultation with the department chairman prior to admission to the curriculum is required in order that the applicant may be fully aware of any problems or delays involved in completing the requirements for the degree.

Graduation requirements include a 2.2 cumulative average, a grade of C or better in Zoology 508; Pathology; Physical Education for Men 652; Neurology; Child Development; Occupational Therapy 411, 524, 584, 526, and Occupational Therapy 627; and pre-clinical experience in three reading periods.

Following completion of the four-year degree program the student will spend a minimum of nine months in student affiliations in American Hospital Association hospitals or in service under the direction of a registered occupational therapist. These are selected from centers approved for this curriculum and divided as follows: Occupational Therapy 711, General Medicine, Surgery, and Pediatrics—three months; 712, Psychiatry—three months; 713, Physical Disabilities and Rehabilitation—three months.

When affiliation positions are available students will be expected to take the first affiliation in the summer between junior and senior years. After receiving his B.S. the student is expected to complete the affiliation assignments as scheduled. Due to a scarcity of affiliation opportunities the University can accept responsibility for scheduling affiliations only once for each student. A student affiliation fee of $95 for residents of New England and $200 for non-residents is payable in advance to the University by those students who enter the clinical affiliation program.

Students should be prepared to provide uniforms as required and to meet all of their living and travelling expenses during the affiliation period. The University cannot guarantee maintenance though it may be available at times. The American Medical Association requires a physical examination including a tuberculin test prior to hospital affiliation.

On completion of the nine-month affiliation period and with approval of the curriculum director, the student is entitled to a certificate of occupational therapy. This certificate and certification of the curriculum director qualify the student to take the examination for registry in the American Occupational Therapy Association. The standard examination is sent out by the association and administered by the University. A fee of $30 is charged by the association for each examination. The present demand for qualified therapists is far in excess of the supply. There are only limited opportunities for those who have not become registered by the American Occupational Therapy Association.

Students interested in the opportunities offered by this program are encouraged to consult the Chairman of the Department, Professor Virginia Bell and to register for Occupational Therapy 400, An Exploration of Occupational Therapy, 0 credit.
## Occupational Therapy

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engl. 401</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Psych. 401</td>
<td>Introductory Psychology</td>
</tr>
<tr>
<td>Psych. 575</td>
<td>Child Development</td>
</tr>
<tr>
<td>Electives (GER) (5)</td>
<td></td>
</tr>
<tr>
<td>Phys. Ed. 301</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soc. 500*</td>
<td>Social Problems</td>
</tr>
<tr>
<td>Zoo. 507-508†</td>
<td>Anatomy and Physiology</td>
</tr>
<tr>
<td>O.T. 411</td>
<td>Occupational Therapy Theory I</td>
</tr>
<tr>
<td>O.T. 581</td>
<td>Group Process</td>
</tr>
<tr>
<td>O.T. 422</td>
<td>Needlecraft</td>
</tr>
<tr>
<td>Arts 425</td>
<td>Woodworking</td>
</tr>
<tr>
<td>Art. 419</td>
<td>Weaving</td>
</tr>
<tr>
<td>O.T. 580</td>
<td>Pathology</td>
</tr>
<tr>
<td>Psych. 545</td>
<td>Clinical Methods</td>
</tr>
<tr>
<td></td>
<td>Pre-Clinical†</td>
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</table>

<table>
<thead>
<tr>
<th>JUNIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>O.T. 515</td>
<td>Treatment Media I—Crafts</td>
</tr>
<tr>
<td>O.T. 583</td>
<td>Medical Lectures I—Psychiatry</td>
</tr>
<tr>
<td>P.E.M. 652</td>
<td>Kinesiology</td>
</tr>
<tr>
<td>Elective (GER) (1)</td>
<td></td>
</tr>
<tr>
<td>O.T. 524</td>
<td>Occupational Therapy Theory II—Psycho-Social</td>
</tr>
<tr>
<td>O.T. 526</td>
<td>Occupational Therapy Theory III</td>
</tr>
<tr>
<td>O.T. 584</td>
<td>Medical Lectures II—Physical Dysfunction</td>
</tr>
<tr>
<td>O.T. 520</td>
<td>Treatment Media II</td>
</tr>
<tr>
<td></td>
<td>Pre-Clinical†</td>
</tr>
<tr>
<td>Zoo. 606</td>
<td>Neurology</td>
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<table>
<thead>
<tr>
<th>JUNE 1—AUGUST 30</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>O.T. 711 or 712</td>
<td>First Affiliation</td>
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<table>
<thead>
<tr>
<th>SENIOR YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>O.T. 627</td>
<td>Occupational Therapy Theory IV—Advanced Physical Dysfunction</td>
</tr>
<tr>
<td>O.T. 650§</td>
<td>Senior Seminar</td>
</tr>
<tr>
<td>Electives (GER) (5)</td>
<td></td>
</tr>
</tbody>
</table>

* This course or its equivalent is required by the American Medical Association.
† Students with a strong biology background may elect this course in the freshman year.
‡ Reading period project of one- or two-week duration. Facility arranged with student.
§ Course extends over two semesters—grade being assigned at the end of the second semester.
School of Health Studies

CLINICAL AFFILIATIONS
O.T. 711 or O.T. 712
General Medicine, Surgery, and Pediatrics
Psychiatry
Physical Disabilities and Rehabilitation
American Occupational Therapy Association
Registration Examination Last Friday of June.

Physical Education for Men

The Physical Education curriculum is offered for students who are interested in preparing themselves for positions in the fields of health and physical education and as coaches of athletic teams. Freshmen who are interested in this curriculum should register for Physical Education 441-442 in lieu of Physical Education 301 and should elect Physical Education 453. Students also may elect and are encouraged to choose courses to broaden their educational scope. Those planning to enter graduate work in this field should elect additional foundation science courses and a foreign language. A cumulative grade-point average of 2.2 or better and a major-subject grade-point average of 2.5 or better are required to be eligible for Education 694, Supervised Teaching of Physical Education.

Students interested in majoring in physical education should consult the Chairman of the Department, Professor Gavin H. Carter.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 441, 442</td>
<td>Physical Education</td>
</tr>
<tr>
<td>Chem. 401-402</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Engl. 401</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Soc. 400</td>
<td>Introductory Sociology</td>
</tr>
<tr>
<td>Psych. 401</td>
<td>General Psychology</td>
</tr>
<tr>
<td>P.E. 453</td>
<td>Principles of Physical Education</td>
</tr>
<tr>
<td>Electives (2)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 443, 444, 445</td>
<td>Physical Education</td>
</tr>
<tr>
<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
</tr>
<tr>
<td>Educ. 481</td>
<td>An Educational Psychology of Development</td>
</tr>
<tr>
<td>P.E. 582</td>
<td>Personal and Community Health</td>
</tr>
<tr>
<td>P.E. 510</td>
<td>Medical Aspects of Sports and Physical Education</td>
</tr>
<tr>
<td>P.E. 522; 523; 524; 529; 530*</td>
<td>(Select one)</td>
</tr>
<tr>
<td>Electives (2)</td>
<td></td>
</tr>
</tbody>
</table>

* Students in the physical education curriculum must complete four courses in the theory of coaching area.
Physical Education for Women

For women students who plan to prepare themselves for positions as teachers of physical education, the University offers the Physical Education Curriculum for Women. The program is based on the demand for teachers possessing specialized professional background, broad general education, and the qualities of leadership necessary to effective teaching and the development of sound physical education programs. Furthermore, students have the opportunity, if they so desire, to prepare themselves to teach in a subject-matter field as well as in physical education. The curriculum is open to women who have been approved by the Department of Physical Education for Women for admission to that field of concentration. It provides an opportunity for students to teach physical education under supervision in nearby schools.

A cumulative grade-point average of 2.2 and a grade-point average of 2.5 in all physical education courses are required to be eligible for the student teaching block program.

Under Physical Education 411, 412, 421, 422 (freshmen); 413, 414, 423, 424 (sophomores); and 415, 416, 425, 426 (juniors), physical-education-curriculum students take sections especially reserved for them. During the four years the student should show proficiency in the following: badminton, basketball, field hockey, folk and square dance, golf, gymnastics, lacrosse, modern dance, ac-

† Student teachers may register for practice teaching block in either Semester I or Semester II of the senior year.
School of Health Studies

Activities for children, swimming, soccer, tennis, track and field, and volleyball.

For those who are highly skilled in the activities mentioned above, substitutions are made with the approval of the adviser. Students will be encouraged to elect activities unfamiliar to them and to gain greater proficiency in previously experienced activities. Those planning to enter graduate study should elect a foreign language. Students are advised to choose non-professional electives whenever possible.

A student wishing to achieve certification for teaching in most states should follow the prescribed curriculum. Course substitutions may be made in consultation with the adviser, for students who do not desire certification for teaching and who plan to pursue graduate work.

Any student in this curriculum who is planning to teach in areas in addition to physical education must complete, with an average grade of C or better, a second teaching major of 18 semester credits in subjects taught in high schools.

Students interested in majoring in physical education should consult the Chairman of the Department, Professor Frances McPherson.

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 411, 412, 421, 422</td>
<td>Physical Education</td>
<td>1, 1</td>
</tr>
<tr>
<td>Engl. 401</td>
<td>Freshman English</td>
<td>1, 1</td>
</tr>
<tr>
<td>Psych. 401</td>
<td>General Psychology</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 453</td>
<td>Principles of Physical Education</td>
<td>4</td>
</tr>
<tr>
<td>Electives*</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

For the sophomore, junior, and senior years students wishing to obtain certification to teach physical education should complete the following requirements:

**Additional University Requirements**

| Electives* (8) | Eight courses | 32 |

**Core of Physical Education Major**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 620</td>
<td>Physiology of Exercise (Prerequisite: Zoology 508)</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 652</td>
<td>Kinesiology (Prerequisite: Zoology 507)</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 775</td>
<td>Perceptual Motor Learning</td>
<td>4</td>
</tr>
</tbody>
</table>

**Teacher Preparation Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 413, 414, 423, 424, 415, 416, 425, 426, 417</td>
<td>Physical Education Activity</td>
<td>9</td>
</tr>
<tr>
<td>P.E. 554</td>
<td>The Teaching of Dance</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 563, 564</td>
<td>The Teaching of Sports</td>
<td>4, 2-4</td>
</tr>
<tr>
<td>P.E. 625</td>
<td>Dynamics of Human Movement</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 655</td>
<td>Remedial Gymnastics</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 668</td>
<td>Measurement Procedures in Physical Education</td>
<td>4</td>
</tr>
</tbody>
</table>

**Education Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed. 481</td>
<td>An Educational Psychology of Development</td>
<td>4</td>
</tr>
<tr>
<td>Ed. 657</td>
<td>Principles of Human Learning</td>
<td>4</td>
</tr>
<tr>
<td>Ed. 659</td>
<td>Principles of Education</td>
<td>4</td>
</tr>
</tbody>
</table>

* These electives must be used to complete the University general education requirements, see page 71.
† May be required for certification to teach in some states.

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### Recreation and Parks

The need for professionally trained recreation and/or park leaders and administrators far outreaches the supply. The men and women graduates in this program will receive a Bachelor of Science degree after successfully completing the following listed requirements. Prior to registering for Physical Education 788, the student must have a cumulative grade-point average of 2.2. Permission to enter this curriculum must be obtained from the adviser for recreation and parks.

In addition to the curriculum requirements, the student is encouraged to seek summer or part-time employment with a recreation agency. Camp and playground work are specifically recommended. For further information, contact Professor Gus C. Zaso, chairman of the program.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 411, 412</td>
<td>Physical Education (Women) 1</td>
</tr>
<tr>
<td>P.E. 441, 442</td>
<td>Physical Education (Men) 1</td>
</tr>
<tr>
<td>Biol. 402</td>
<td>Man and His Environment 4</td>
</tr>
<tr>
<td>Engl. 401</td>
<td>Freshman English 4</td>
</tr>
<tr>
<td>Rec. 455</td>
<td>Introduction to Community Recreation 4</td>
</tr>
<tr>
<td>Rec. 454</td>
<td>Organized Camping 4</td>
</tr>
<tr>
<td>Elective (1)</td>
<td>4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 413, 414</td>
<td>Physical Education (Women) 1</td>
</tr>
<tr>
<td>P.E. 443, 444</td>
<td>Physical Education (Men) 1</td>
</tr>
<tr>
<td>Econ. 401</td>
<td>Principles of Economics 4</td>
</tr>
<tr>
<td>Rec. 460</td>
<td>Recreation Leadership 4</td>
</tr>
<tr>
<td>Psych. 401</td>
<td>Introduction to Psychology 4</td>
</tr>
<tr>
<td>Zool. 507-508</td>
<td>Human Anatomy and Physiology 4</td>
</tr>
<tr>
<td>Electives (3)</td>
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</tbody>
</table>

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Student Teaching Bloc

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 665</td>
<td>Administration of Physical Education in the Secondary School</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 792</td>
<td>Problems of Teaching Physical Education in the Elementary School</td>
<td>4</td>
</tr>
<tr>
<td>Ed. 794</td>
<td>Directed Teaching of Physical Education</td>
<td>6</td>
</tr>
</tbody>
</table>

The following additional courses may be elected by students in physical education and related fields.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 428</td>
<td>Water Safety Instructor's Course</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 431</td>
<td>Rhythmic Analysis</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 432</td>
<td>Labanotation</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 433, 434</td>
<td>Dance Composition</td>
<td>2-2</td>
</tr>
<tr>
<td>P.E. 454</td>
<td>Organized Camping</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 455</td>
<td>Introduction to Community Recreation</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 460</td>
<td>Recreation Leadership</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 561</td>
<td>Nature Recreation</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 582</td>
<td>Personal and Community Health</td>
<td>4</td>
</tr>
<tr>
<td>P.E. 656†</td>
<td>Problems of Health Education</td>
<td>2</td>
</tr>
</tbody>
</table>
## School of Health Studies

### Junior Year
- Administration 517
- Speech and Drama 403
- Speech and Drama 458
- Pol. Sci. 401
- Soc. 400
- Rec. 561
- Rec. 541
- Electives (2)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Administration 517</td>
<td>4</td>
</tr>
<tr>
<td>Speech and Drama 403</td>
<td>4</td>
</tr>
<tr>
<td>Speech and Drama 458</td>
<td>4</td>
</tr>
<tr>
<td>Pol. Sci. 401</td>
<td>4</td>
</tr>
<tr>
<td>Soc. 400</td>
<td>4</td>
</tr>
<tr>
<td>Rec. 561</td>
<td>4</td>
</tr>
<tr>
<td>Rec. 541</td>
<td>2</td>
</tr>
<tr>
<td>Electives (2)</td>
<td>4</td>
</tr>
</tbody>
</table>

### Senior Year
- Rec. 663
- Rec. 667
- Rec. 541
- Rec. 788
- Rec. 798
- Rec. 644
- Soc. (500)
- Electives (2)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Rec. 663</td>
<td>4</td>
</tr>
<tr>
<td>Rec. 667</td>
<td>4</td>
</tr>
<tr>
<td>Rec. 541</td>
<td>4</td>
</tr>
<tr>
<td>Rec. 788</td>
<td>6</td>
</tr>
<tr>
<td>Rec. 798</td>
<td>2</td>
</tr>
<tr>
<td>Rec. 644</td>
<td>4</td>
</tr>
<tr>
<td>Soc. (500)</td>
<td>4</td>
</tr>
<tr>
<td>Electives (2)</td>
<td>4</td>
</tr>
</tbody>
</table>

- Financial Accounting: 4
- Communications II: 4
- Scenic Arts I: 4
- Elements of Political Science: 4
- Introductory Sociology: 4
- Nature Recreation: 4
- Recreation Practicum: 2
- Recreation and Park Administration: 4
- Areas and Facilities Design for Recreation: 4
- Recreation Practicum: 1
- Recreation Field Work: 6
- Recreation Research Seminar: 2
- Outdoor Education: 4
- Social Psychology: 4
The Graduate School

Master of Science
Animal Sciences
Biochemistry
Biology
Botany
Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Entomology
Forest Resources
Genetics
Geology
Home Economics
Mathematics
Mechanical Engineering
Microbiology
Music Education
Physics
Plant Science
Resource Economics
Soil and Water Science
Zoology

Master of Arts
Economics
English
French
German
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Arts in Teaching
Department of Education

Master of Science for Teachers
Chemistry
English
French
German
Mathematics
Physics
Spanish

Master of Agricultural Education
Department of Agricultural Education

Master of Business Administration
Whittemore School of Business and Economics

Master of Education
Department of Education

Master of Public Administration
Department of Political Science

Doctor of Philosophy
Biochemistry
Botany
Chemistry
Engineering
English
Genetics
History
Mathematics
Microbiology
Physics
Plant Science
Psychology
Sociology
Zoology
The Graduate School

Graduate School

The Graduate School, which has offered instruction since 1903, has for its objective the bringing together of faculty and qualified students in a spirit of scholarship and research. The graduate student is given opportunity to specialize in some field of knowledge, and to develop a maturity of thought and attitude toward his professional field, so that both his professional and his cultural life are enhanced. The work of the Graduate School is under the general direction of the Graduate Faculty. The Dean of the Graduate School is responsible for the administration of the regulations and requirements pertaining to admission, conduct of work, the granting of advanced degrees, and other pertinent matters.

Assistantships, Scholarships, and Fellowships

Graduate teaching or research assistantships are available in most departments. These involve part-time work in research and teaching activities or some combination thereof. The University also sponsors tuition scholarships, a UNH Fellowship program available to Ph.D. candidates, the Alumni Fellowship program available to graduate students in the social sciences and the humanities, Martin Luther King scholarships to assist members of minority groups, and one-year Dissertation Fellowships. There are also a number of fellowship programs sponsored by outside agencies such as National Aeronautics and Space Administration, National Science Foundation, NDEA, U. S. Office of Education, and the U. S. Public Health Service.

Further Information

Detailed information about admission, requirements for degrees, courses, fellowships, scholarships, and assistantships are to be found in the Graduate School catalog which may be obtained by writing to the Dean of the Graduate School.
Experimental and Interdisciplinary Programs

Inter-College Courses

Inter-College 495, Life Studies, includes a number of workshops and seminars which together constitute an experimental and innovative educational program, designed specifically to deal with human issues of concern. Students and faculty are actively involved with decisions concerning the goals, substance, and processes of the overall program and the individual workshops. For example, several workshops have been offered on: Self Discovery; The Arts, Artists, and Society; New Politics: Political Power and Political Process; Science as Human Experience; Morality, Politics, and the Law; Experiences in Contemporary Drama; Utopian Thought and Communal Societies; The Mind of Film; The Established Order vs. the Forces of Change; and Science and Technology in Public Programs. 4 credits.

Inter-College 500, Contemporary Institutions and Their Values, is a critical examination of the values and disvalues of important contemporary American institutions which exert great influence on American society. Each offering of the course considers one of these institutions which is in the focus of public attention. One course, for example, was devoted to a consideration of the development and the present state of the American university. Other possible subjects are: business and non-profit corporations, the scientific community, the military, etc. The course is limited to 50 students who must have at least sophomore standing or permission of the instructors. 4 credits.

Inter-College 598, Independent Work- Study, has been organized by the Commission on Contemporary Issues. It allows the student to select the problem area in which he wishes to work, creating his own bibliography for reflection, and finding his own channels to actively pursue the problem. The student must write a proposal identifying the manner in which he intends to pursue the study and then obtain the sponsorship of a faculty member. 4 to 12 credits.

Pre-Professional Programs

Students who are planning graduate study in medicine, dentistry, or law will find opportunities in the College of Liberal Arts and the other Colleges of the University for pre-professional preparation in these areas. Descriptions of these programs will be found on page 90.

Computer Courses

The University's Computation Center operates IBM 1620 and IBM 360/50 com-
Experimental and Interdisciplinary Programs

Computers for teaching and research and for many of its business functions. The availability of these computers makes it possible to offer instruction in their operation. The Department of Mathematics lists a number of courses in the use of digital computers and in programming.

Marine Science and Technology

The University has a history of interest and activity in marine science dating from the 1930's. Marine interest has recently been intensified and broadened to include ocean engineering.

The nearby salt water of the ocean, together with the waters of the Great Bay estuary system, form a natural and versatile setting for research in geology, the life sciences, and engineering. The new Jackson Estuarine Laboratory serves as a center for the marine science program and estuarine and other marine research. The research vessel, "Jere A. Chase," is used for research in the estuary and nearby ocean. Plans are being made, through arrangements with state and other agencies, to develop marine educational facilities on the Atlantic shore and at the Isles of Shoals which are ten miles off the coast.

Marine Science

Students wishing to prepare themselves for careers in marine science should enroll in one of the standard science disciplines. They should consider the following courses which are available to undergraduates: (1) In Botany—Introduction to Biological Oceanography and Marine Ecology, and Marine Phycology; (2) In Geology—Introduction to Oceanography, Geological Oceanography, Physical Oceanography, Mineralogy of Clays, Principles of Geochemistry, Sedimentation-Stratigraphy, Estuarine and Marine Sedimentation; (3) In Microbiology—Public Health and Sanitation, General Microbiology, and Marine Microbiology; and (4) In Zoology—Biological Oceanography, Principles of Ecology, Comparative Endocrinology, Natural History of Cold-blooded Vertebrates, Marine Ecology, Invertebrate Zoology, Protozoology, the Host-parasite Relationship, Comparative Physiology, and Invertebrate Embryology.

Ocean Engineering

Study and research in the application of engineering to ocean exploration and exploitation are centered in the Engineering Design and Analysis Laboratory (EDAL). EDAL is an interdisciplinary faculty group, mainly from the College of Technology. Early in its history, this group chose to make ocean-oriented engineering its principal, but not exclusive, interest. The stated purpose of EDAL is to involve both faculty and students in realistic and challenging engineering projects. In projects, thus far accomplished, EDAL-associated faculty and students have participated in advanced ocean-oriented engineering.

Undergraduates have become involved in ocean work by associating themselves with professors or graduate students, by participating in summer research cruises, by acting as assistants in campus-based research projects during the academic year or summer months, and by participating in the senior engineering projects course.

Students who wish to join in EDAL activities should enroll in one of the standard engineering disciplines. Marine science courses in one of the other colleges may be elected by the student in consultation with his engineering department faculty adviser.
Description of Courses

IBM Key Codes

The following numbers are used extensively in machine-processed data to identify both undergraduate and graduate programs offered at the University. An asterisk preceding the number identifies those departments which offer graduate programs.

College of Liberal Arts
40 Liberal Arts non-departmental
41 Biological Sciences Division
42 Education Division
43 Humanities Division
44 Physical Sciences Division
45 Social Sciences Division
46 The Arts
*47 Microbiology
*48 Education
*49 English
50 Geography
*51 Geology
*52 Political Science
*53 History
55 Classics
*56 French
*57 German
58 Greek
59 Italian
60 Latin
61 Russian
*62 Spanish
*63 Music
64 Music Education
66 Philosophy
*67 Psychology
*68 Sociology
69 Speech and Drama
*70 Zoology

School of Health Studies
54 Nursing
65 Occupational Therapy
90 Men's Physical Education
91 Women's Physical Education
92 Medical Technology Program

College of Life Sciences and Agriculture
20 Agriculture non-departmental
*21 Resource Economics
*22 Agricultural and Extension Education
*23 Soil and Water Science
*25 Animal Science
*26 Biochemistry
*27 Botany
*29 Entomology
*30 Forestry
*31 Home Economics
*32 Plant Sciences

College of Technology
79 Technology non-departmental
*80 Chemical Engineering
*81 Chemistry
*82 Civil Engineering
*83 Electrical Engineering
*84 Mathematics
*85 Mechanical Engineering
*86 Physics

Whittemore School of Business and Economics
*71 Administration
*72 Economics
73 Secretarial Studies
74 Hotel Administration

Separate Departments and Programs
93 Inter College
*97 Genetics Program
98 Military Science
99 Aerospace Studies
Description of Courses

Explanation of Arrangement

The title, in capital letters, and the Arabic numeral designate the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses normally offered in the second semester. Numerals enclosed in parentheses indicate that course is repeated in the semester following. Thus, course 401 (401) is offered in the first semester and is repeated in the second semester. Parentheses are also used to designate courses out of semester sequence. For example, (404) indicates an even-numbered course offered in the first semester. The course description is followed by the prerequisites, if any, and the number of semester credits the course will count in the total required for graduation. Laboratory periods are usually two and one-half hours in length, lectures either 50 minutes or 80 minutes in length.

NLC following the description indicates that the course carries no letter grade, being marked “Cr” for credit, “F” for failure. All courses (unless otherwise marked) are open to students who have passed the prerequisites. An elective course may be given only when there is a minimum of five students registered.

If the course numerals are connected by a hyphen, the first semester, or its equivalent, is a prerequisite to the second semester. If the numerals are separated by a comma, properly qualified students may take the second semester without having had the first.

Students must register for the number of credits or within the range of credits shown in the catalog description of a course.

The system of numeric designation of courses is as follows:
- 200-299 Courses in the Thompson School of Applied Science.
- 300-399 Non-credit courses, e.g., Mathematics 301.
- 400-499 Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.
- 500-599 Intermediate-level courses for undergraduate credit only.
- 600-699 Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing. (Under some conditions these courses may be taken for graduate credit by non-majors only.)
- 700-799 Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)
- 800-899 Courses which carry graduate credit only. (Descriptions will be found in the Graduate School catalog.)
Administration (71)

PROFESSORS: Arthur W. Johnson, emeritus; John A. Beckett, Carroll M. Degler, Herman Gadon, Dwight R. Ladd, Donald C. Marschner, Samuel R. Reid, Herbert A. Shepard

ASSOCIATE PROFESSORS: Jan E. Clee, Stephen L. Fink, James O. Horrigan, Robin D. Willits


LECTURERS: Clyde R. Coolidge, Joseph E. Michael, Jr.

517. Financial Accounting
A general introduction to the objectives, theories, conventions, and processes for portraying and communicating the financial status and progress of the business enterprise. (Not open to students who have had Business Administration 401-402, 405, or 502.) 4 credits. Not open to administration majors.

602. Values in a Managerial Society
A critical examination of the values which appear to underlie our managerial society and of the processes by which such values are formed and modified. For example, such basically eighteenth-century ideas as pursuit of self-interest, desirability of material progress, and individualism, are attitudes which have loomed large among our American values. How these ideas relate to our present managerial society will be discussed, and some emerging alternatives to these long-accepted values will be considered. The course is based primarily on discussions of cases and readings. There are a few lectures. Prerequisite: Administration major or permission of instructor. 4 credits.

605-606. Quantitative Analysis I and II
The basic quantitative techniques for modern administrative analysis. The course will be concerned with models used in decision-making under conditions of certainty and uncertainty. Computer utilization will be integrated into the problem solving approach to these topics. Prerequisite: Mathematics 415 and Administration major, or permission of instructor. 4 credits.

611. Organizational Behavior
Designed to provide students with exposure to appropriate behavioral science concepts and the opportunity to apply them. It is based on the conviction that the student will learn best and most by using his knowledge as he acquires it. Students are expected to use their developing skills to take responsibility for the effect of their behavior on their learning environment. The focus is on the class as a real organization with attention to roles, norms, rewards, and leadership. In addition the student will be helped to locate outside organizations to which he can become an observer or consultant. Prerequisite: Administration major or permission of instructor. 4 credits.

614. Organizational Theory
An analysis of major theories of formal organization with particular stress on the relevance of these theories to the analysis and administration of various type organizations, e.g., business, schools, hospitals, social agencies. Participation in class discussions and individually written commentary on theoretical readings are required. Occasional field work should be anticipated. Prerequisite: Administration major or permission of instructor. 4 credits.

617. Financial Reporting, Accounting, and Control (FRAC)
An integrated view of accounting, control, and economic models applicable to organizations for purposes of reporting
performance, planning and reviewing operations, and making decisions. Prerequisite: Administration major or permission of instructor. 4 credits.

630. Investments
The problems of investment; investment characteristics of stocks and bonds; public utility, railroad, industrial, and government securities; protection of the investor; investment banking; and related problems. Prerequisite: Economics 402 and permission of instructor. 4 credits.

647. Commercial Law
The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Prerequisite: at least junior status and permission of instructor. 4 credits.

650. Operations Management
Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. Prerequisite: Administration major with senior status or permission of instructor. 4 credits.

651. Marketing
A study of the marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Attention is paid to the optimal blending of the ingredients in the "marketing mix," including product design, product line policies, packaging, branding, pricing, promotion, and selection of the channels of distribution. Prerequisite: Economics 402 and permission of instructor. Not open to students who have had Business Administration 525 or 625. 4 credits.

653. Financial Management
A study of the firm's uses and sources of funds with emphasis on working capital management, capital budgeting, and the administration of debt and equity. Prerequisite: Economics 402 and Administration major or permission of instructor. 4 credits.

695-696. Independent Study
Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

700. Business Policy
Administrative practice of business management; use of business tools; processes of integrating operations, administering business systems, selecting goals and objectives, and formulating policy. Prerequisite: Senior standing and permission of instructor. 4 credits.

705. Operations Research
Mathematical programming, game theory, inventory, queuing, and scheduling problems; dynamic programming. Prerequisite: permission of instructor. 4 credits.

711. Corporations
The role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combinations, and concentration. Prerequisite: Economics 402. 4 credits.

712. Organizational Change
Examination of the process of change in organizations. Consideration of change strategies, the role of the change agent, and his relation to the client system. The bases of resistance to change and the problems encountered by internal and external change agents. Readings include theoretical material on influence and attitude change as well as organizational change. Prerequisite: permission of instructor. 4 credits.

713. Interpersonal and Group Dynamics
Intensive, experiential study of the dynamics of small groups through the use of the class itself as a laboratory study group. Students review readings in
small group theory, role theory, and such group dynamics variables as communication patterns, norms, adaptation and coping mechanism, role conflict, and multi-group membership. Prerequisite: permission of instructor. 4 credits.

717. Advanced Financial Accounting
Accounting theory and practice as they contribute to the significance and limitations of the financial statements by which business communicates financial status to interested outsiders. Prerequisite: permission of instructor. 4 credits.

718. Cost and Management
The effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Topics considered include analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital expenditure analysis. Prerequisite: permission of instructor. 4 credits.

719. Control and Information Systems
The concepts of systems, their use in enterprise management, and the role and influence of on-line control systems; the nature and uses of information in management. The course includes materials intended to familiarize the student with information theory and technology. 4 credits.

730. Investments Analysis
An evaluation of capital markets and of analytical techniques useful for security appraisal. The following subjects will be covered: securities characteristics, market institutions, yield structures, price change patterns, intrinsic value analysis, investment timing, and portfolio management. Lectures, outside readings, and security analysis research projects are the main tools of the course. Prerequisite: Business Administration 502 or permission of instructor. 4 credits.

741. Transportation Economics
Competitive characteristics of the several modes of transport. National transportation policy. Limited consideration of transportation as a function of business. Prerequisite: Economics 402 or permission of instructor. 4 credits.

749. Federal Taxation
Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Prerequisite: permission of instructor. 4 credits.

751. Advertising and Promotion
How the modern firm employs advertising, personal selling, and other promotional tools to help solve marketing problems with special emphasis on advertising as a medium of communications and as a social-cultural force in the western world. Prerequisite: Administration 651 or permission of instructor. 4 credits.

752. Marketing Research
The search for and analysis of information relevant to the identification and solution of marketing problems. The study of the techniques used in this search—their strengths and limitations—together with the environment in which the search is conducted. The primary aim is to enable one to better understand the problems that arise in this search and to better evaluate the results of such research. Prerequisite: Administration 651 and 605 or their equivalent. 4 credits.

753. Comparative Marketing
In marketing the problems related to the acceptance of new products, new brands, and new services are becoming more and more important. The course deals with the diffusion of innovations. Factors governing the speed and ways in which products become accepted in different societies are treated and so are the related dynamic aspects of competition. Methods are presented for studying loyalty behavior, the acceptance process,
Agricultural Education

the role of innovators, and group influence. International examples are used and emphasis is placed on the implication for marketing policies. Prerequisite: Administration 651, Business Administration 625 or permission of instructor. 4 credits.

754. Consumer Behavior
The consumer-firm relationship studied in terms of concepts drawn from contemporary social science findings, particularly small group studies, as related to present and prospective marketing activities of a business organization. 4 credits.

755. Advanced Financial Management
A study of financial policy of the firm with emphasis on solutions to complex problems of capital, leverage, optimal capital structure, capital budgeting, and working capital management. Prerequisite: permission of instructor. 4 credits.

798. Seminar in Business Problems
Special topics in business administration. This course may be repeated. Prerequisite: consent of adviser and instructor. Credits to be arranged.

Agricultural Education (22)
Program Supervisor: William H. Annis

PROFESSOR: Samuel Hoitt
ASSOCIATE PROFESSORS: William H. Annis, Paul A. Gilman, Jesse James

402. Fabrication Technology
A study of welding, cold-metal working, sheet-metal working, wood working, and plastics as it relates to the building or repair of structures and machines. 2 recitations; 2 laboratories; 4 credits.

650. Principles of Agricultural Education
The technical and professional qualifications of teachers of agriculture, 4-H youth development agents, and county agricultural agents. The federal and state legislation affecting these programs at the local level. Two field trips to schools and/or extension meetings are required. 4 credits.

652. Methods of Teaching Agricultural Mechanics
The organization and presentation of the agricultural mechanics curriculum to meet individual and group needs. Project direction and supervision, and the preparation, and presentation of demonstrations. Required of those who wish to teach in the agricultural mechanics curriculum. 1 recitation; 1 laboratory; 2 credits.

783. Preparation for Conducting and Supervising Adult-Education Programs
The techniques of adult education in terms of identifying needs, program planning, methods of teaching, supervision, and evaluation. Prerequisite: Agricultural Education 650 or permission of instructor. 4 credits.

785. Advanced Methods and Materials of Instruction
The organization of instruction to meet individual and student needs; development and use of resource files and instructional materials. Evaluation in teaching vocational-technical education. Open to teachers of vocational-technical education and others by permission of instructor. 4 credits.

786. Concepts of Vocational-Technical Education
The development of vocational-technical education in the United States with emphasis on the socio-economic influences responsible for its establishment. The federal and state requirements for programs on the secondary and post-secondary schools will be discussed. Coordination of programs with general education and other vocational fields. 4 credits.
791. Planning for Teaching
The organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, the function of consulting committees, working with youth groups, and program evaluation. This course is scheduled concurrently with Education 658, 659, and 694. Prerequisite: Agricultural Education 650 or permission of instructor. 4 credits.

796. Investigation in (1) Vocational Education (2) Extension Education (3) Adult Education
An opportunity is provided for a student to study a special problem in one of the areas listed elective after consultation with the instructor. Hours to be arranged. 2 or 4 credits. May be repeated.

Animal Sciences (25)
Chairman: Winthrop C. Skoglund
(Animal, Dairy, Poultry, Pre-Veterinary)
ASSISTANT PROFESSORS: Thomas P. Fairchild, Eugene Fuller, Larry L. Stackhouse
LECTURER: Janet C. Briggs

400. Animals, Foods, and Man
Historical, biological, economic, social, and political role of animals, and foods derived from them, in the evolution of civilizations and societies composed of man as a biological entity. Open to all students. Staff. 3 lectures; 1 laboratory; 4 credits.

401. Introduction to the Animal Sciences
To acquaint the beginning student with the development, economic importance, and problems facing the livestock industry. The commercially important classes of farm animals are discussed with emphasis on dairy cattle, poultry, beef cattle, horses, sheep, and swine. The place of the biological sciences in the rapidly changing animal agriculture is stressed. The course is intended to be the introduction to subsequent specialized courses and gives the student an insight into opportunities in the animal agriculture field. Mr. G. L. Smith and staff. 3 lectures; 1 laboratory; 4 credits.

402 (402). Horsemanship
Instruction in riding using University-owned Morgans under supervision of a riding instructor. A limited number of students may stable their horses at the University. This course can also be taken as an elective in physical education. Three hours of riding per week for which a fee of $35 per quarter is charged. Mrs. Briggs. 1 credit.

501. Animal Anatomy and Physiology
The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 lectures; 1 laboratory; 4 credits.

502. Fundamentals of Animal Health
The prevention, control, and treatment of the bacterial and parasite diseases of domestic animals. Mr. Allen. Prerequisite: Animal Sciences 501 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

504. Meat and Its Products
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry. Trips are taken to wholesale and retail meat outlets. Mr. G. L. Smith. 3 lectures; 1 laboratory; 4 credits.
506. Fundamentals of Animal Nutrition
Scientific principles of nutrition in both ruminants and non-ruminants. Mr. Ringrose. 3 lectures; 1 laboratory; 4 credits.

507 (507). The Scientific Approach to Equine Discipline
The physiological development, control, and education—stressing bitting, longeing, and collection. Mrs. Briggs. Prerequisite: Animal Science 402 or equivalent and permission of instructor. 1 lecture; 1 laboratory; 2 credits.

508. Milk and Its Products
The composition and properties of milk, both chemical and bacteriological. The producing, making, handling, and marketing of milk and its products. Mr. Moore. 3 lectures; 1 laboratory; 4 credits.

601-602. Animal Selection
601-1 Livestock: Mr. Smith; 602-2 Dairy: Mr. Boynton; 602-3 Poultry: Mr. Collins. The principles of selection based on production performance, pedigree, and type evaluation. Elective only after consultation with instructor in charge. The student may repeat the course and select any or all of the specialized areas listed above. 1 lecture; 1 laboratory; 2 credits.

603. Applied Animal Nutrition
Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Mr. G. L. Smith and other staff members. 3 lectures; 1 laboratory; 4 credits.

605. Equine Diseases and Parasites
A study of hygienic practices that relate to the control of many common bacterial, viral, and parasitic diseases of the horse. Mr. O'Connor. 3 lectures; 1 laboratory; 4 credits.

612. Avian Health and Sanitation
A survey of the diseases of domestic fowl. Emphasizes the fundamentals of disease control including bacterial, fungus, helminths and protozoan parasites, and avian diseases caused by virus entities. Serological tests, virus isolation, and propagation in avian embryos and tissue culture will be conducted in the laboratory. Mr. Corbett and Mr. Strout. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered in 1970-71.)

614. Diseases and Parasites of Wildlife
A survey of the diseases and parasites of fishes, birds and game, and fur-bearing animals. Discusses control of diseases as influenced by management practices, the effect of pesticides on wildlife, and the relationship of wildlife diseases to human health. Autopsy techniques, the proper handling of specimens, and the use of state laboratory facilities will be stressed in laboratory. Mr. Strout and other staff members. Permission of instructor necessary. 3 lectures; 1 laboratory; 4 credits.

616. Equine Podology
The structure and function of the appendicular skeleton will be studied with particular emphasis placed upon the conformation of each segment of normal and abnormal limbs. Mr. O'Connor. 3 lectures; 1 laboratory; 4 credits.

617-618. Light Horse Clinic
The theory and practice of bandaging and restraint as used in modern light horse management will be taught. Actual clinical problems in the University herd will be selected for discussion. May be elected for two semesters. Mr. O'Connor. 1 lecture; 1 laboratory; 2 credits.

651-652. Management of the Domestic Animals
651-1 Light Horses: Mr. O'Connor; 651-2 Dairy: Mr. Fairchild; 652-3 Livestock: Mr. G. L. Smith; 652-4 Poultry: Mr. Skoglund.
A study of the economic and management factors involved in the production of the various species of domestic animals. The student can select any or all of the specialized areas listed above. Elective only after consultation with the
instructor in charge. 3 lectures; 1 laboratory; 4 credits.

653-654. Principles of Teaching Equitation
The techniques and procedures of teaching equitation. Application of the theories of riding and training with emphasis on dressage instruction. Opportunity will be given to teach riding theory and techniques to college students under the supervision of the head instructor. Must be taken for both semesters. Prerequisite: Animal Science 402, 507, and 651-1. Permission of instructor required. Mrs. Briggs. 3 lectures; 1 laboratory; 4 credits.

697 (697). Animal Science Seminar
A survey of recent literature and research in the animal sciences. Staff. 2 credits.

701. Physiology of Reproduction
A study of physiology, embryology, endocrinology, reproduction, and lactation in domestic animals. Mr. Fuller. 3 lectures; 1 laboratory; 4 credits.

702. Physiology of Milk Secretion
A study of the anatomical, physiological, and biochemical aspects of lactation including their interrelationships as they are involved in the normal and abnormal development, maintenance, and functioning of the mammary gland. Consideration will be given to environmental and physiological factors affecting lactation and to the ontogeny and phylogeny of the mammary gland. Staff. 3 lectures; 1 laboratory; 4 credits.

708. Animal Genetics
Mendelian and quantitative inheritance in animals and principles and systems of selection. Prerequisite: 4 credits of genetics or permission of instructor. Mr. Collins. 3 lectures; 1 laboratory; 4 credits.

709. Monogastric Nutrition
Feeding of monogastric farm animals with emphasis upon nutrient requirements, feedstuffs composition, feed formulation, and feed utilization. Nutrition as related to management systems will also be considered. Staff. 3 lectures; 1 laboratory; 4 credits. (Not offered in 1970-71.)

710. Ruminant Nutrition
Feeding and management of dairy animals, calf feeding, raising young stock, and feeding for economical milk production. Mr. Holter. 3 lectures; 1 laboratory; 4 credits.

795-796. Investigations in Dairy, Livestock, Poultry
1. Genetics: Mr. G. L. Smith, Mr. Collins, Mr. Boynton.
2. Nutrition: Mr. G. L. Smith, Mr. Ringrose, Mr. Colovos, Mr. Holter.
3. Management: Mr. G. L. Smith, Mr. Skoglund, Mr. Boynton, Mr. O’Connor.
4. Diseases: Mr. Allen, Mr. Corbett, Mr. Dunlop, Mr. Strout, Mr. S. C. Smith, Mr. Stackhouse.
5. Products: Mr. G. L. Smith, Mr. Moore.
6. Light Horsemanship; Mr. O’Connor, Mrs. Briggs.
7. Physiology: Mr. Fuller.
An opportunity is given for the student to select a special problem in any of the fields listed under the guidance of the instructor. Elective only after consultation with the instructor in charge. 2 credits. May be repeated.
The Department of The Arts presents a series of changing exhibitions in the galleries in Paul Creative Arts Center and the Exhibition Corridor in Hewitt Hall. Within a convenient radius of Durham are located a number of the country's important collections of art which students are encouraged to visit. Among these are: the Addison Gallery of American Art, the Currier Gallery of Art, the DeCordova and Dana Museum, the LaMont Gallery, several excellent museums and galleries in Boston, including the Museum of Fine Arts, the Gardner Museum, the Fogg Museum of Harvard University, and the Institute of Contemporary Art.

The Student Workshop is an unstructured creative activity, located in Hewitt Hall and open to the university community during the two academic semesters. This shop is well equipped and provides a wide variety of experiences with wood and wood related media. The underlying philosophy of the Student Workshop is to provide a means for solving problems, whether they be pragmatic or aesthetic. In those art courses where the student retains the finished work, he pays the cost of materials and supplies used. The University reserves the right to choose to exhibit a student's work for a period of not more than two years.

Crafts

401. Ceramics, Introduction to Hand-Building Construction

Exploration of stoneware clay as material for building coil and slab construction. The course includes experimentation with three dimensional forms, glaze application and techniques for decoration, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission. 1 four-hour laboratory; 8 hours unscheduled in laboratory; 4 credits. Course fee for materials, $12.

403. Ceramics, Introduction to the Potter's Wheel

Stoneware clay used for the introduction to the traditional usage of the potter's wheel. The course includes experimentation with functional container forms, introduction to materials for clay and glazes, glaze application and techniques for decoration, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission. 1 four-hour laboratory; 8 hours unscheduled in laboratory; 4 credits. Course fee for materials, $12.

407. Crafts

Structural and decorative design and construction of objects using paper, wood, fabric, yarn, metal, leather, etc., which may be related to elementary and secondary art programs. For art education students. Mrs. Shaw. Elective by permission. 2 laboratories; 4 credits. Course fee for materials, $10.
413-414. Jewelry and Metalsmithing
Structural and decorative design and construction of jewelry, flatware, and hollow ware. Soldering, polishing, chasing, casting, raising, forging, fabrication and enameling metal (sterling silver, copper, brass, pewter) are included. Mrs. Shaw. Elective by permission. 2 laboratories; 4 credits. Course fee for materials, $10.

419-420. Weaving
An introductory course in hand weaving using 2-, 4-, or 8-harness loom and tapestry frame. Traditional patterns studied. Design and weaving of fabrics, table linens, rugs, and hangings. Mrs. Shaw. Elective by permission. 2 laboratories; 4 credits. This course may be elected by Occupational Therapy majors for 2 credits. Course fee for materials, $10.

425-426. Woodworking
A basic course in wood, integrating drawing and design work, woodworking techniques and theory, and the execution of a series of the students' own designs. Mr. Valenza. Elective by permission. 1 lecture; 2 laboratories; 4 credits. Course fee for materials, $10.

Methods of hand construction used to develop personal creative expression in stoneware clay with specific projects recommended on an individual basis. Included will be glaze calculation to develop glaze color and textural effects on stoneware and porcelain. Extensive decoration techniques will be explored and individual responsibility for stacking and firing of kilns required. Mr. Potter. Prerequisite: Arts 401. Elective by permission. 1 4-hour laboratory; 8 hours unscheduled in laboratory; 4 credits. Course fee for materials, $12.

503-504. Ceramics, Intermediate Potter's Wheel
Advanced problems assigned to develop an individual philosophy regarding the forming of functional and non-functional vessels. Included will be glaze calculation to develop glaze color and textural effects on stoneware and porcelain. Extensive decoration techniques will be explored, and individual responsibility for firing and stacking of kilns is required. Mr. Potter. Prerequisite: Arts 403. Elective by permission. 1 4-hour laboratory; 8 hours unscheduled in laboratory; 4 credits. Course fee for materials, $12.

513-514. Intermediate Jewelry and Metalsmithing
Structural and decorative design and construction of jewelry and/or flatware and hollow ware as the student desires. Casting, stone setting and simple production methods emphasized. Mrs. Shaw. Elective by permission. 2 laboratories; 4 credits. Course fee for materials, $10.

525-526. Intermediate Woodworking and Furniture Design
Exploration in the design and construction of major furniture forms. Development of a portfolio of finished work, and investigations leading to a limited thesis. Mr. Valenza. Prerequisite: Arts 425-426. Elective by permission. 1 lecture; 2 laboratories; 4 credits. Course fee for materials, $15.

795. Independent Study — Crafts
Students in (1) ceramics, (2) jewelry and metalsmithing, (3) weaving, or (4) woodworking may select one of these areas for advanced studio work. Mrs. Shaw, Mr. Valenza, Mr. Potter. Permission required. Laboratories as arranged. 8 credits maximum. Course fee for materials varies. Hours to be arranged.
mission from department office. 2 laboratories; 4 credits. Course fee for materials, $3.

432. Drawing
An introduction to drawing. Elective by permission from department office. 2 laboratories; 4 credits. Course fee for materials, $1.

434. Introduction to Three-Dimensional Design
An introductory course for all students planning to concentrate in 3-dimensional design, i.e., sculpture, ceramics, furniture design and jewelry. Various materials will be explored to discover and develop an understanding of the oneness that occurs when form and material are properly integrated. No prerequisite. One 4-hour laboratory; 4 credits. Course fee for materials, $10.

451. Introduction to Photography
The basic theory and practice of photography, covering equipment and materials, camera operation, developing, and printing. Creative solutions are sought to problems designed to increase the students perception. Mr. Merritt. Elective by permission. 1 lecture; 1 laboratory; 4 credits. Course fee for materials will be approximately $16.

455. Drafting and Architectural Design
Basic drafting procedures, including lettering. Study of architectural symbols and interpretation of architectural plans. Problems of architectural design with emphasis on space utilization and space planning. Mr. Thomas. Elective by permission. 1 lecture; 2 laboratories; 4 credits.

457. Sculpture
Experimentation with three-dimensional forms in wood, stone, metal, and mixed-media. The use of carving chisels, pneumatic tools, and welding torch to either cut down or build up compositions. The development of form, of volume, and of rhythm in space. Mr. Balderacchi. Elective by permission. 2 laboratories; 4 credits. Course fee for materials, $15.

536. Graphic Arts
Expression and experimentation in a variety of graphic techniques, i.e., linoleum and wood blocks, etching, lithography, etc., in black and white and color. Mr. Laurent. Prerequisite: Arts 432 and elective by permission. 2 laboratories; 4 credits. Course fee for materials, $12.

538. Graphic Design and Illustration
Design problems in various media and techniques emphasizing the fundamentals of typography, the conception and execution of illustrations, and printing processes and methods of reproduction. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $10.

541. Intermediate Drawing
An extensive course in drawing in studio and from nature; still life and figure drawing in pencil, pen and ink, chalk and charcoal, etc. Objective drawing as a means of seeing and expressive use of the media will be stressed. Mr. Hatch, Mr. Laurent. Prerequisite: Arts 432 and elective by permission. 2 laboratories, 4 credits.

542. Beginning Oil Painting
An introductory studio course in oil painting. Use of the media, color, and composition are studied in still life, figure, landscape, and conceptual assignments. Normally this course follows and continues the experience of Arts 541. Mr. Hatch, Mr. Laurent. Prerequisite: Arts 431, Arts 432 and elective by permission. 2 laboratories, 4 credits.

543. Drawing III
A studio drawing course concentrating on the figure with assigned drawing projects. Prerequisite: Arts 541. Mr. Hatch. Elective by permission. 2 laboratories; 4 credits.
544. Water Media
A studio course dealing with various water media, transparent and opaque, with emphasis on watercolor and inks. Tempera and polyvinal will also be introduced. Mr. Hatch. Prerequisite: Arts 432 and elective by permission. 2 laboratories; 4 credits.

545. Water Media II
A continuation and development of the various water media experiences of Arts 544 with the introduction of Egg Tempera and mixed Media. Prerequisite: Arts 544. Mr. Hatch. Elective by permission. 2 laboratories; 4 credits.

551. Intermediate Photography
Introduction to the basic theory and practice of color photography. Discussions and demonstrations of special camera and laboratory controls for creative photography. Projects may be executed in black and white or color. A portfolio of photographs and a term paper will be required at the end of the semester. Mr. Merritt. Prerequisite: Arts 451 and elective by permission. 1 laboratory; 4 credits. Course fee for materials will be approximately $20.

558. Intermediate Sculpture
A continuation of Arts 457 with special emphasis in producing sculpture in non-ferrous metals through direct metal and cast-metal techniques. Independent experimentation and study. An inquiry into the origins of sculpture and an investigation of contemporary sculpture. Mr. Balderacchi. Prerequisite: Arts 457, and elective by permission. 2 laboratories; 4 credits. Course fee for materials, $20.

643, 644. Advanced Painting
An advanced studio course in which the student is expected to work independently in various media on assigned projects and with individual criticism. This course may be taken a second time with emphasis on the particular need of the individual. Mr. Laurent. Prerequisite: Previous painting experience and elective by permission. Laboratories arranged; 4 credits per semester. Course fee for materials varies.

796. Problems in the Visual Arts
Advanced students may select a special problem in one of the visual arts i.e., (1) Photography, (2) Sculpture, (3) Drawing, (4) Painting, (5) Graphics, (6) Water Media, (7) Drafting and Architectural Design, in which they have exhibited proficiency, to be developed by means of conferences and studio work. Prerequisite: Permission of department chairman. Credits to be arranged. This course may be repeated to a total of not more than 8 credits. Hours to be arranged.

History of Art
475, 476. Introduction to The Arts
A broad historical survey of man's creative efforts in their relation to contemporary cultural and social movements, presented as a background for interpreting the place of the arts in individual and community life of today. Illustrated lectures with assigned readings. Prehistoric through Gothic, first semester; Gothic through Twentieth Century, second semester. 4 credits. Not open to freshmen.

577. 19th Century Painting and Sculpture
The History of painting and sculpture from the French Revolution to the late nineteenth century. Areas covered: (1) The seventeenth and eighteenth century background of modern art; (2) Painting and sculpture of the Neoclassical and Napoleonic periods; (3) Romantic figure painting and sculpture; (4) Romantic landscape painting; (5) Realism; (6) Impressionism; (7) Post-Impressionism. Mr. Moak. 4 credits.

578. 20th Century Painting and Sculpture
The History of painting and sculpture in the twentieth century. (1) Post-Impressionism as the forerunner of twenti-
The Arts

eth century painting and sculpture; (2) Matisse, Picasso, and early twentieth century painting and sculpture; (3) The rise of Cubism; (4) The international influence of Cubism; (5) The rise of Abstract art; (6) Dada and Surrealism; (7) The rise of American art, Abstract Expressionism; (8) Post-Expressionism. Mr. Moak. 4 credits.

582. Classical Art
A survey of the monuments in Greece and Rome covering the following periods: archaic, classical and Hellenistic in Greece, and the area influenced by Greek culture; late Republican and Imperial Rome. Significant works from about the mid-eighteenth century B.C. to the second and third centuries A.D. are analyzed chronologically. A comprehensive picture of the classical achievement, primarily in architecture and sculpture, and modern debts to the past. 4 credits. (Alternate years.) (Formerly 682.)

583. Primitive and Oriental Art
An inquiry into the origins of art in pre-history, an investigation of the art of selected primitive cultures, and a study of Oriental art concentrating on the pictorial development of China and Japan. This course is primarily concerned with the evolution of pictorial and sculptural images essentially foreign to the classic western tradition. Mr. Hatch. 4 credits. (Alternate years.)

584. The Art of the Renaissance
A historic survey of the achievements of Western civilization in sculpture, painting, and architecture from the Gothic cathedral to the eighteenth century drawing room. Illustrated lectures with assigned readings. Mr. Fasanelli. 4 credits. (Alternate years.) (Formerly 685.)

585. American Architecture
A chronological survey of architecture in the United States from earliest Colonial times to the present. Architectural field trips in New Hampshire, Massachusetts, and Maine. Mr. Thomas. 4 credits. (Alternate years.)

586. American Art
A chronological survey of painting and sculpture in the United States from the Colonial period to the present, with particular attention to works from collections in New Hampshire and Massachusetts. Mr. Moak. 4 credits.

587. Baroque Art
An advanced course surveying architecture, sculpture, and paintings in the countries of western Europe in the seventeenth and eighteenth centuries. The problem of the "Baroque" and the difficulty of defining an international style at a moment when national identities are strong. It is a companion to Arts 584, but is oriented differently. 4 credits. (Alternate years.) (Formerly 687.)

591-592. History and Theory of the Film
A survey of film from its beginning in the 1890's to the present, and the literature, both critical and theoretical, that has grown up about the film. Although not exhaustive, this course covers documentary, feature, and experimental film. Historically oriented, this course will stress the relationship between film and the history of art. The first semester will survey film from the silent era to the beginnings of sound. The second semester will cover the development of the documentary film both here and in Europe, its impact upon the feature film made in Hollywood, and post-World War II developments. As in the first semester the films of Flaherty will be focused upon and his chronological development will be the historical framework for the course in the second semester. Although each semester can be taken by itself the course is conceived of as a unit covering a year's work. Mr. Fasanelli. 1 lecture; 2 recitations; 4 credits. Course fee, $10.
684. Medieval Art
A survey of the vast material of the Middle Ages, from the first and second centuries A.D. to the fourteenth century, covering architecture, sculpture, mosaics, manuscripts, and the minor arts. The transitional character of this vast period will be stressed, as well as its dependence upon the antique past. Architecture and the more minor arts will be accentuated. 4 credits. (Alternate years.)

686. Northern Painting
The development of painting in Flanders, France, and Germany from the late fourteenth to the early fifteenth century. French manuscripts, Flemish painting in the fifteenth century, extant French monumental painting, German painting in the fifteenth century, and the dependence of this body of material on Flemish developments, as well as Italian. Mr. Fasanelli. 4 credits. (Alternate years.)

(797). Seminar in Art History
Students electing a program in art history must take this course at least once. The prerequisite is the completion of some work in any one of the survey courses offered in the option in the history of art. The seminar's aims are to direct further work in some area already studied. Introduction to advanced problems of a bibliographical, critical, and iconographical nature. The results of research are required in a formal paper. 4 credits.

Art Education
Art-Education 493. An Introduction to Art Education
An introductory course designed to provide the student interested in the teaching of art with an understanding of the philosophies, the problems, and the organization of an art program in the schools. Lecture, discussion, and studio. Prerequisite: Arts 431, Arts 432, and elective by permission. 2 credits. Course fee for materials, $5.

Biochemistry (26)
Chairman: Edward J. Herbst

PROFESSORS: Thomas G. Phillips, emeritus; Stanley R. Shimer, emeritus; Edward J. Herbst, Arthur E. Teeri, Miyoshi Ikawa, Donald M. Green
ASSOCIATE PROFESSORS: Douglas G. Routley, Samuel C. Smith
ASSISTANT PROFESSORS: Gerald L. Klippenstein, James A. Stewart

501. Biological Chemistry
An introduction to biological chemistry. Mr. Teeri. Prerequisite: Chemistry 402 or 404. 3 lectures; 1 laboratory; 4 credits.

656. Physiological Chemistry and Nutrition
An introductory biochemistry course with emphasis on human physiological chemistry and nutrition. The laboratory includes a study of procedures basic to chemical methods used in medical diagnostic work. Mr. Teeri. Prerequisite: satisfactory preparation in organic chemistry. 3 lectures; 1 laboratory; 4 credits.
699 (699). Senior Thesis
Participation in research in biochemistry. For seniors majoring in biochemistry who have completed Biochemistry 751. Staff. 2 credits.

751. Principles of Biochemistry
The fundamental principles of biochemistry with emphasis on the chemical properties, metabolic pathways and functions of carbohydrates, lipids, and nitrogenous compounds. Mr. Herbst, Mr. Ikawa, and staff. Prerequisite: one year of organic chemistry or permission of instructor. 4 lectures; 1 laboratory; 4 credits.

752. Topics in Biochemistry
A detailed consideration of metabolism and of current developments in biochemistry. Staff and guest lecturers. Prerequisite: Biochemistry 751. 2 lectures; 2 credits.

762. Plant Metabolism
The function, occurrence, synthesis, and degradation of plant constituents. Emphasis is placed on respiration and photosynthesis and the metabolism of nitrogenous and aromatic compounds. Biochemical mechanisms such as those involved in seed dormancy, fruit ripening, and disease resistance are discussed in relation to their roles in plant survival. Mr. Routley. Prerequisite: Biochemistry 656 or 751. 2 or 4 credits.

770. Biochemical Genetics
The biochemical mechanisms of storage, replication, transmission, recombination, mutation, and expression of genetic information by cells and viruses. Mr. Green. Prerequisite: Biochemistry 751 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

795, 796. Investigations in Biochemistry
Staff. Prerequisite: permission of instructor. Subject matter and hours to be arranged. 2 credits.

Biology (41)
Program Supervisor: Paul E. Schaefer

401. Human Biology: Elementary Physiology
Human anatomy and physiology, excluding reproduction and endocrines. Mr. Lavoie. 4 credits. No credit toward a major or minor.

(402), 402. Man and His Environment
Elementary ecological considerations, exploring the impact of man on his living and non-living world; man's modification of his environment and its consequences. Mr. Milne. 4 credits. No credit toward a major or minor.

404. Heredity and Man
The genetic basis for variation, with emphasis on human inheritance. Topics include normal and abnormal chromosome complements; the mutable nature of the gene and its relation to expression, including genetic diseases; the distribution of genes in populations; and the role of this distribution and that of chromosomes to evolution and selection. Mr. Hoornbeek. 4 credits. No credits toward a major or minor.

(407). Concepts in Cell Biology
An historical and experimental approach to selected topics in cell biology. Emphasis will be placed on those cell structures which play an important role in the development of the adult organism from the egg. Within this context, the philosophy and practical limitations of research in biology will be considered. Mr. Foret. 4 credits. No credits toward a major or minor.

409, (409). Human Reproductive Biology and Endocrinology
Consideration of all aspects of human sexuality from anatomical, physiological, and a variety of other view points. Emphasis on those aspects of greatest concern to college-age students. Mr. Wright.
4 credits. No credits toward a major or minor.

641, (641). General Ecology
Interrelationships between organisms and their physical environment, population growth, structure, and species interactions; introduction to the ecosystem: energetics, succession, and structure, with intensive study of selected examples. Staff of Botany and Zoology Departments. Prerequisite: one course in biology. 4 credits.

791. Problems in the Teaching of High-School Biology
Objectives and methods of teaching. The selection and organization of materials, preparation of visual aids, setting up of aquaria and other projects. The use of the field trip as a tool in teaching high-school biology. Mr. Schaefer. Prerequisite: two years of biological science and permission of instructor. 4 credits.

Botany (27)

Chairman: Richard W. Schreiber


ASSOCIATE PROFESSORS: Thomas E. Furman, Arthur C. Mathieson

ADJUNCT ASSOCIATE PROFESSOR: Alex L. Shigo

ASSISTANT PROFESSOR EMERITA: Marion E. Mills

ASSISTANT PROFESSOR: May Moss

INSTRUCTOR: William H. Pawuk

411. General Botany
An introduction to plant science. The evolution of structure and function of plant parts. Miss Nast. Prerequisite: 1 semester of biological science. 2 lectures; 2 laboratories; 4 credits.

566. Systematic Botany
The scientific basis of plant taxonomy and the identification and classification of our native trees, shrubs, and wild flowers. Mr. Hodgdon. Prerequisite: 1 semester of biological science. 2 laboratories; 4 credits.

567. Aquatic Plants
A survey of flowering plants, fern relatives, and Bryophytes found in and about bodies of water in northeastern United States. Extensive field work, preparation techniques, representative collections, herbarium work, lectures, and discussions. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture; 1 colloquium; 1 half day laboratory; 4 credits. (Alternate years; offered in 1970-71.)

706. Plant Physiology
Structure and properties of cells, tissues, and organs; absorption and movement of water; metabolism; growth and irritability. Mrs. Moss. Prerequisite: Botany 411 or 503 and one year of chemistry. 2 lectures; 2 laboratories; 4 credits.

721. Freshwater Phycology
Identification, classification, ecology, and life histories of the major groups of freshwater algae. Periodic field trips will be scheduled throughout the semester. Mr. Mathieson. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits. (Alternate years; offered in 1970-71.)

722. Marine Phycology
Identification, classification, ecology, and life histories of the major groups of marine algae. Particular emphasis will be placed upon the benthonic, marine algae of New England. Laboratories will include field trips during the latter portion of the course. Mr. Mathieson. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits.
Botany

723. Introduction to Biological Oceanography and Marine Ecology
The distribution, abundance, and growth of marine plants in relation to their environment (chemical, physical, and biological). The students will be expected to attend regular planned field trips and to conduct an independent research project. Mr. Mathieson. Prerequisite: Botany 722, Zoology 715, or permission of instructor. 2 lectures; 1 laboratory; field trips; 4 credits. (Alternate years; offered in 1970-71.)

732. Cytology
The structure, physiological behavior, and development of cells. The cellular basis of heredity. Mr. Schreiber. Prerequisite: one year each of the biological sciences and of chemistry. 3 lectures; 1 seminar; 4 credits.

741. Plant Autecology
The interaction of the individual plant with its environment, including such factors as earth, air, fire, and water, and the resultant processes of symbiosis, adaptation, and evolution. Mr. Furman. Prerequisite: Botany 706 or permission of instructor. 1 lecture; 1 colloquium; 1 laboratory; 4 credits. (Alternate years, offered in 1970-71.)

742. Plant Synecology
The structure, development, and causes of distribution of plant communities. Methods of analysis and interpretation of field data. Laboratories include field trips on shared cost basis. Mr. Furman. Prerequisite: Botany 566 (or taken concurrently) or Forestry 425. 2 lectures; 1 outdoor laboratory; 4 credits.

747. Aquatic Higher Plants
A survey of flowering plants, fern relatives, and Bryophytes found in and about bodies of water in northeastern United States. Extensive field work, preparation techniques, representative collections, herbarium work, lectures, and discussions. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture; 1 colloquium; 1 half day laboratory; 4 credits. (Alternate years; offered in 1970-71.)

751. Plant Pathology
The nature of disease in plants; the symptomatology, etiology, and classification of plant diseases. Mr. Rich. Prerequisite: Botany 411 or 503 or equivalent. 2 lectures; 2 laboratories; 4 credits.

752. Mycology
Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Mr. Richards. 1 lecture; 2 laboratories; 4 credits.

753. Forest Pathology
Forest and shade tree diseases: principles, etiology, epidemiology, and control. Mr. Pawuk. Prerequisite: Botany 411 or 503 or equivalent. 2 lectures; 2 laboratories; 4 credits.

754. Principles of Plant Disease Control
Exclusion, eradication, protection, immunization, and the specific practical methods used to control plant diseases. Mr. Rich. Prerequisite: Botany 751 or 753. 1 lecture; 2 laboratories; 4 credits. (Alternate years; not offered in 1970-71.)

758. Plant Anatomy
The anatomy of vascular plants with special emphasis upon tissue development and structure. Miss Nast. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits.

762. Morphology of the Vascular Plants
The life histories and evolution of the extinct and living vascular plants, including comparisons of general structure and sexual organs. Miss Nast. Prerequisite: Botany 411 or 503. 2 lectures; 2 laboratories; 4 credits.

764. Microtechnique
A methods course in embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Miss Nast. Prerequisite: Botany 411 or 503 and per-
mission of instructor. 2 lectures; 4 hours of laboratory; 4 credits.

767. Advanced Systematic Botany
The principles and rules of plant classification and nomenclature, study of plant families, field, and herbarium work. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture; 1 colloquium; 1 laboratory (full afternoon), 4 credits. (Alternate years; not offered in 1970-71.)

797. Botany Seminar
Presentation and discussion of oral reports on research with practice in use of visual aids. Participation by all resident departmental majors. Botany Club in charge. 1 hourly session per week, 0 credit.

799 (799). Investigations in:
Individual projects under faculty guidance. Elective only by permission of the appropriate instructor. Hours to be arranged. 2 or 4 credits, each semester.

Chemical Engineering (80)
Chairman: Oswald T. Zimmerman

PROFESSORS: Irvin Lavine, emeritus; Oswald T. Zimmerman
ASSOCIATE PROFESSOR: Stephen S. T. Fan
ASSISTANT PROFESSORS: Henry M. Gerhardt, Charles B. Schriver
ADJUNCT ASSOCIATE PROFESSOR: Yin-Chao Yen

502. Chemical Engineering Principles I
The presentation and interpretation of engineering data; an introduction to systems of units, dimensional analysis, and heat and material balances. A study of chemical equilibrium and heats of reaction needed to describe systems undergoing chemical change; an intensive treatment of heat and material balances on complex systems. 4 credits.

601. Chemical Engineering Principles II
Transport phenomenon and stage operations. The equations of change as a basis for the study of molecular and turbulent transport of momentum, energy and mass, with emphasis upon the relation between the transport mechanism and the mathematical expression. Design principles and procedures for stagewise operations in various co-current and counter-current arrangements, based upon the ideal stage concept. Problems in both steady state and non-steady state operations. 3 lectures; 1 laboratory; regular lectures during reading period; 4 credits.

602. Chemical Engineering Principles III
Analysis of unit operations. Study of chemical engineering systems, with emphasis on the unit operations involved. Extension of previous studies of unit operations, and treatment of operations not previously considered. 3 lectures; 1 laboratory; 4 credits.

603. Chemical Engineering Principles IV
Mathematical techniques in chemical engineering applications; problem set-up emphasized; analytical, numerical and statistical methods; digital and analog computations of complex chemical engineering problems. 3 lectures; 1 laboratory; 4 credits.

604. Chemical Engineering Thermodynamics
The thermal properties of matter; the first law; the second law; useful thermodynamic functions; behavior of ideal and real gases and liquids; volumetric and phase behavior; cycles; steady flow
Chemical Engineering

processes; compression of gases; refrigeration and liquefaction of gases. 3 lectures; 1 recitation; 4 credits.

605. Chemical Engineering Principles V
Correlated with 601-602, this course presents a unified theoretical treatment of momentum, heat, and mass transfer. 3 lectures; 1 recitation; 4 credits.

606. Chemical Engineering Kinetics
Chemical kinetics, catalysis, and introduction to reactor design. Study of types of kinetic behavior in chemical processes; prediction of reaction rates in batch and flow reactors with and without catalysis; and application to reactor design. 3 lectures; 1 laboratory; 4 credits.

607. Physical Metallurgy
An introductory study of the nature of metals, emphasizing the quantum mechanical description of the solid state and including atomic structure, bonding, historical development of metal theories, elementary zone or band theory, and X-ray diffraction. The microscopic metal system, thermodynamics of metallurgical processes, defects and dislocations, phase relations of pure metals and alloys, microstructure, and physical and thermal treatment of metals. Study of some nonmetals. 3 lectures; 1 laboratory; 4 credits.

608. Chemical Engineering Design
The principles of cost engineering, including estimation of plant investment, working capital, operating costs, labor requirements, payout time and profitability, value of money, capitalized costs, simple and compound interest, depreciation, taxes and insurance, overhead, financing of chemical enterprises, design of equipment and plants for minimum cost, plant location, transportation, sales cost, equipment cost, and cost indexes. Each class selects one or more problems involving the complete design of a chemical plant. For each problem, the most desirable process must be determined, the site selected, the equipment and plant designed, calculations made for all costs, profitability and payout time, and a complete report prepared, including the drawings of equipment and plant layout. 1 lecture; 3 laboratories; 4 credits.

695. Chemical Engineering Project
Each student selects a research problem which he carries out independently under faculty supervision. Intensive study in both the library and the laboratory and a satisfactory report upon completion of the work are required. 2-4 credits.

696. Independent Study
Individual study projects in various areas of chemical engineering as determined to be of particular interest and value to the student. Permission of the student’s adviser and department chairman are required. Permission will be granted only to those students who have proved their ability by superior scholastic achievement. 1-4 credits.

701. High Polymers
Principles and practice of high polymer manufacture, including industrial polymerization methods and equipment design. Laboratory work includes typical polymerization reactions and the physical and chemical testing of various types of plastics and synthetic fibers. 3 lectures; 1 laboratory; 4 credits.

712. Introduction to Nuclear Engineering
The scientific and engineering development of nuclear reactors, including basic binding energy physics, nuclear stability, radioactivity, the elements of nuclear reactor theory, and the engineering problems of heat transfer, fluid flow, materials selection, and shielding. 4 credits.

713. Nuclear Chemical Technology
The design, construction, and operation of nuclear process equipment, including reactors and associated chemical processing facilities, and isotope separations plants. The technology of applied radiation chemistry. 3 credits.
752. Process Dynamics
A basic treatment of process dynamics, including a study of first and second order linear processes and their response to step and sinusoidal driving functions. Graphical analysis of the entire control system is included with special emphasis on the optimum design of a stable system. 4 credits.

762. Introduction to Optimization
Optimization techniques applied to functions not described analytically. Search techniques include Fibonacci search, golden section search, method of steepest ascent, method of contour tangents, and the method of parallel tangents. Stochastic schemes are considered. Advanced techniques for the optimization of objective functions are considered from a qualitative viewpoint. 3 credits.

Chemistry (81)
Chairman: Alexander R. Amell

PROFESSORS: Harold A. Iddles, emeritus; Alexander R. Amell, Albert F. Daggett, Helmut M. Haendler, Robert E. Lyle, Jr., Paul R. Jones, Frank L. Pilar


ASSISTANT PROFESSORS: Charles V. Berney, Colin D. Hubbard, John E. Phelps

401-402. General Chemistry
Elementary chemistry with lecture demonstrations and laboratory practice. Topics of interest to the professional student and of general interest are presented. For agriculture and home economics students and as an elective. 3 lectures; 1 laboratory; 4 credits. Cannot be used as prerequisite for other chemistry courses without permission.

403-404. General Chemistry
The fundamental laws and conceptions of chemistry, including a study of the non-metals and metals and their compounds. The theoretical principles are illustrated by lecture demonstrations and the applications of chemistry in the professions are explained. For students who plan to take further courses in the Department of Chemistry. 3 lectures; 1 laboratory; 4 credits.

405. Introductory Chemistry
A discussion of the basic principles of chemistry, including atomic structure, bonding, equilibria, and thermodynamics, as the first course for chemistry majors. Presupposes secondary-school chemistry. 3 lectures; 2 laboratories; 4 credits.

406. Quantitative Analysis
A systematic treatment of the theory and techniques of volumetric and gravimetric analysis. The course is designed for those with a professional interest in chemistry. Normally this course will be followed by an advanced course in instrumental methods of chemical analysis. (This course was formerly Chemistry 661.) Prerequisite: Chemistry 405 or 404. 3 lectures; 2 laboratories; 4 credits.

407-408. Background of Chemical Ideas
The development of present-day chemical theories in their historical and philosophical context, and their relationships to other fields of human thought. The emphasis is on class discussion and concentrated study of topics of interest to the individual student. Cannot be used as prerequisite for other Chemistry courses. 3 lectures; 4 credits.

517. Quantitative Analysis
An introductory course in quantitative analysis, including gravimetric, volumetric, and instrumental methods, for those students desiring a brief terminal course in analytical chemistry. Prerequisite: Chemistry 404. 2 lectures; 2 laboratories; 4 credits.
521. Semimicro Qualitative Analysis
The application of basic solution theory to ionic equilibrium and to the reactions of qualitative analysis. Problem work is required. The laboratory work provides experience in the application of theory to the analysis of simple and complex inorganic substances. Prerequisite: Chemistry 404. 2 lectures; 2 laboratories; 4 credits.

545. Organic Chemistry
An introductory but comprehensive study of the chemistry of carbon compounds with emphasis on the particular phases of the subject needed by students preparing to be technicians, nurses, majors in biological sciences, and others, where a brief course is desired. Prerequisite: Chemistry 404 or 406. Elective for medical technology, nursing, and pre-dental students, and majors in botany. 3 lectures; 2 laboratories; 4 credits. Students receiving credit for Chemistry 545 may not receive credit for Chemistry 547-548 or for Chemistry 651-652.

547-548. Organic Chemistry
The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. The use of group reactions for the identification of organic substances in a systematic scheme of qualitative organic analysis. Mr. Jones, Mr. Andersen, and assistants. Prerequisite: Chemistry 404 or 406 or permission of instructor. 3 lectures; 2 laboratories; 4 credits. Students receiving credit for Chemistry 547-548 may not receive credit for either Chemistry 545 or Chemistry 651-652.

663. Introductory Radiochemical Techniques
Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radiochemical operations. Prerequisite: general inorganic chemistry and general physics. 3 lectures; 1 laboratory; 4 credits.

683-684. Physical Chemistry I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Prerequisite: Mathematics 426 and physics. Undergraduates must register for Chemistry 683-684 concurrently. 3 lectures; 2 credits.

685-686. Physical Chemistry Laboratory
Experimental work illustrating the principles of chemistry. Emphasis is upon the measurement of thermodynamic properties, chemical kinetics and methods of determining the structure of matter. Prerequisite: Mathematics 426 and physics. Must be taken concurrently with Chemistry 683-684. 2 laboratories; 2 credits.

696. Independent Study
With the consent of the adviser and the departmental chairman, an exceptional student may enroll in a course of independent study. This may consist of individual reading, writing, or laboratory work, which will be carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry, with approval of the adviser and department chairman. Credits to be arranged.
697. Chemical Literature
The use of the chemical library as a research tool. Prerequisite: Chemistry 548 or 652. 1 credit.

698. Seminar
Student reports on topics of interest. Prerequisite: Chemistry 548 or 652 and 684. 1 credit.

699. Thesis
The related background and experimental observation of the year's investigation in some selected subject is required. Members of the staff. For seniors in chemistry who have completed Chemistry 548, 762, 684, and having a grade point average of 2.5, or permission of adviser and department chairman. 5 laboratories; 4 credits. NLG

708. Research Techniques
Lectures and laboratory to show experimental methods and interpretation of results. Topics include gas liquid chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, and X-ray. Staff. 1-3 credits.

755. Advanced Organic Chemistry
An advanced survey of methods of synthesis and determination of structure, including stereochemistry, of complex organic compounds. Structural determination will be based on chemical and spectroscopic properties, emphasis being placed on the solution of assigned problems. The laboratory will be devoted to the synthesis and structural determination of complex organic compounds, techniques for the separation and determination of purity of unknown compounds, and the identification of these unknowns by spectroscopy and chemical means. 3 lectures; 1 laboratory; 4 credits.

762. Instrumental Analysis
A treatment of the theory of instrumentation, and application of electrical, optical, and other instrumental methods of chemical analysis, including emission spectrography, atomic absorption, spectrophotometry (visible, ultra violet, infrared), coulometry, potentiometry, polarography, conductimetry, electrophoresis, and gas chromatography. Prerequisite: Chemistry 406 or 661 and Chemistry 684 or concurrent registration or by permission of instructor. 3 lectures; 2 laboratories; 4 credits.

775. Inorganic Chemistry
The relationship between chemical reactions and modern concepts of inorganic chemistry on a moderate level. The applicability and limitations of the newer ideas. Mr. Haendler or Mr. Weber. Prerequisite: Chemistry 683-684 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

776. Physical Chemistry III
Introduction to quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prerequisite: Chemistry 683. 4 credits.
Civil Engineering

making plane and topographic surveys. Use of surveys as a basis for deeds, maps, construction, design, and reports involving the use of land or other natural resources. No prerequisite. 2 lectures; 2 laboratories; 4 credits.

503. Dynamic Systems
Formulation and application of equations of motion of particles and rigid body systems. 2 lectures; 2 credits.

505. Surveying
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its application to state plane coordinate systems. 2 lectures; 2 laboratories; 4 credits.

506. Strength of Structural Materials
An examination of stress and deformation theories applicable to structural materials with emphasis on elastic and plastic stress, strain, and failure phenomena. 4 lectures; 4 credits.

508. Engineering Graphics
Concepts and practice in orthographic projection and fundamentals of descriptive geometry. 2 laboratories; 2 credits.

621. Highway Engineering I
Principles of modern highway design, including traffic surveys, operations, geometric design, pavement design, performance, and maintenance. 4 lectures; 4 credits.

622. Engineering Materials
The structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. An introduction to the micro-structure and properties of common metals, plastics, and ceramics. 3 lectures; 1 laboratory; 4 credits.

642. Fluid Mechanics
Properties of fluids, fluid statics, flow of incompressible and compressible ideal fluids, flow of real fluids, and measurement of fluid properties. 3 lectures; 1 laboratory; 4 credits.

643. Sanitary Engineering I
The sources, quantity, quality, and sanitary aspects of public water supplies, including methods of purification and distribution systems; and the theory and problems of sewerage, methods of sewage treatment, and disposal of wastes. 4 lectures; 4 credits.

665. Soil Mechanics
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the principles underlying the behavior of soils subjected to various loading conditions. 3 lectures; 1 laboratory; 4 credits.

681. Structural Analysis I
The analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. 3 lectures; 1 design period; 4 credits.

682. Structural Design Concepts
The basic elements of design of structural members and their connections in steel and concrete. 3 lectures; 1 design period; 4 credits.

685. Indeterminate Structures
The analysis of indeterminate structures, including non-prismatic members subject to static and moving loads. Solutions by classical, numerical, and computer applied methods. 3 lectures; 1 design period; 4 credits.

701. Advanced Surveying
Principles of instrumental and analytical photogrammetry. Theory of conformal mapping and its application to the state plane coordinate systems. Geodetic surveying. Error theory and its applica-
tion to the planning and adjustment of surveys. Application of electronic computers to surveying calculations. 3 lectures; 1 laboratory; 4 credits.

711. Community Planning
An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable community planning programs—including purpose and scope, preliminary survey, elements of land planning, the master plan, transportation and circulation systems, street patterns and traffic, motor vehicle parking, airport sites, public building sites, parks and recreational facilities, zoning, control of land subdivision, neighborhood and shopping centers, housing, legal, financial and economic problems, and redevelopment of blighted areas. Mr. Dawson. Prerequisite: permission of the instructor. 4 lectures; 4 credits.

714. Contracts, Specifications, and Professional Relations
The essential elements and legal requirements of engineering contracts; the purposes and content of specifications; professional conduct, relations, registration, and ethics. Construction planning and management; cost analysis based on quantity surveys and unit cost methods. Mr. Dawson. Prerequisite: permission of instructor. 4 lectures; 4 credits.

721. Highway Engineering II
Design of flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prerequisite: Civil Engineering 620 and 665. 3 lectures; 1 laboratory; 4 credits.

731. Network Planning and Scheduling
The application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. 2 lectures; 2 credits.

732. Systems Analysis
An analysis of engineering projects encompassing social and economic criteria as well as engineering feasibility studies. 2 lectures; 2 credits.

744. Sanitary Engineering II
An advanced treatment of water supply and waste water disposal. 4 lectures; 4 credits.

745. Hydrology and Hydraulics
The occurrence and physical effects of water on the earth, including meteorology, ground water runoff and stream flow routing, open channel flow, reservoirs, control works, hydroelectric power, irrigation, drainage, and multipurpose projects. 4 lectures; 4 credits.

765. Applied Soil Mechanics
Application of the principles of soil mechanics to selection of the type of substructure; determination of allowable soil bearing capacities based on rupture and settlement theories; determination of active and passive earth pressures; and foundation construction methods. Computations by classical, numerical, and computer applied methods. 4 lectures; 4 credits.

782. Timber Design
Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members, and connections in beams, columns, and trusses, and glued laminates of wood. Prerequisite: Civil Engineering 682 and permission of instructor. 1 lecture; 1 design period; 2 credits.

784. Introduction to Matrix and Numerical Methods
Presentation of a unifying concept of basic structural analysis theories, introduction to matrix and numerical methods of analysis, and their application by linear graph concepts using computers. 3 lectures; 1 design period; 4 credits.
793, 794. Advanced Structural Design I and II

The design in steel by elastic and plastic theories and in reinforced concrete by the working stress and ultimate strength methods for structural elements and connections using the appropriate controlling specifications. 3 lectures; 1 design period; 4 credits.

795-796. Independent Study

A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigations. 2-4 credits.

Classics

(See Spanish and Classics)

Economics (72)

PROFESSORS: Arthur W. Johnson, emeritus; Ruth J. Woodruff, emeritus; Robert F. Barlow, Carroll M. Degler, John A. Hogan, Manley R. Irwin, John J. Korbel, Sam Rosen, Kenneth J. Rothwell

ASSOCIATE PROFESSORS: George W. Betz, Allan J. Braff, James H. Schulz, Dwayne Wrightman


INSTRUCTORS: John R. Haskell, Heidemarie Sherman

401. Principles of Economics (Macro)

An introduction to the basic functions of the United States economy viewed as a whole, together with policies designed to affect its performance. The problem of economic scarcity, an introduction to supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and issues concerning economic growth. No prerequisites. (Honors section available by invitation only.) 4 credits.

402. Principles of Economics (Micro)

An introduction to the functions of the component units of the economy and their interrelations. The units of analysis are the individual consumer, the firm, and the industry. The theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, the demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. No prerequisites. (Honors sections available by invitation only.) 4 credits.

415. Economic History of the United States

The development of the United States economy from Colonial times to the present. Models of economic development and their applicability to the United States at various times. The role of social, political, and cultural factors in shaping the economy. Development and influence of economic institutions. Cannot be taken by students who have taken Economics 403. No prerequisite. 4 credits.

525. Introduction to Economic Statistics

Statistical techniques as an aid in decision-making. Includes methods of collection, analysis and presentation of statistical data, introduction to probability theory, statistical inference, regression analysis, index numbers, and time series analysis. 4 credits.

605. Intermediate Economic Analysis

Analysis of supply and demand. The determination of prices, production, and the distribution of income in non-competitive situations as well as in the purely competitive model. General equi-
Economics

611. National Income Analysis
Macro-economic measurement, theory, and public policy determination. Prerequisite: Economics 401-402. 4 credits.

615. History of Economic Thought
The evolution of economic thought, including the work of contemporary economists. Examination and critical appraisal of the work of major economists and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prerequisite: Economics 401-402. 4 credits.

621. Economic Development
An analysis of the problems and available solutions confronting the underdeveloped areas of the world. Prerequisite: Economics 401-402. 4 credits.

630. Comparative Study of Economic Systems
An examination of socialism, communism, capitalism, and modifications of these economic systems, particularly as exemplified by the Soviet Union, China, Yugoslavia, France, the United Kingdom, and the United States. Prerequisite: Economics 401-402. 4 credits.

635. Money and Banking
An analysis of money, its supply, demand, impact on the economy, and control by the central bank. Prerequisite: Economics 401-402. 4 credits.

641. Public Finance
Problems and policies of expenditure, revenue, and debt of the public sector. Economic analysis and evaluation of tax systems and governmental fiscal programs. Prerequisite: Economics 401-402. 4 credits.

645. International Trade and Finance
Theory of international trade, foreign exchange, balance of payments, tariffs, and protection. The economic aspects of international relations, with particular reference to recent policies. Prerequisite: Economics 402. 4 credits.

651. Government Regulation of Business
The role of government in economic affairs, with emphasis on mergers, competition, monopoly, and the regulated industries. No prerequisites. 4 credits.

655. Trade Unions and Industrial Management
Trade union history, philosophy, and policies. Historical development of management attitudes and the attitudes of law and legislation toward unions. Collective bargaining: its nature, purpose, and public policy considerations. Prerequisite: Economics 401-402. 4 credits.

656. Labor Economics
Application of the tools of economic analysis to the market for labor. Wage determination and wage policy under union and non-union conditions. The determination of factor shares of the national income with particular emphasis on labor's share. Prerequisite: Economics 402. 4 credits.

695-696. Independent Study
Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

711. Economic Fluctuations
The study of recurrent movements of prosperity and depression, with emphasis upon causes and public implications. Prerequisites: Economics 611, formerly 675; or permission of instructor. 4 credits.

720. U. S. Economic History
The development of the United States economy from Colonial times to the present. Presentation and application of
Education

721. European Economic History
The development of Western European and Mediterranean economics from medieval times to the Common Market. Presentation and application of economic models and interpretation of data are stressed. Attention is centered on capital accumulation, technology, trade, industrialization, monetary factors, and the role of government, but the influence of non-economic factors is discussed where relevant. Prerequisite: Economics 605, formerly 673; 611, formerly 675; or consent of the instructor. 4 credits.

725. Statistical Theory
The theoretical basis of statistical methods, probability, probability distributions, statistical inference, and decisions. Prerequisite: permission of instructor. 4 credits.

726. Mathematical Economics
An introduction to the principal mathematical techniques and their application in economics. Prerequisite: permission of instructor. 4 credits.

727. Introduction to Econometrics
The application of statistics and mathematics to economic problems. The formulation of economic models, their measurement, and verification. Prerequisite permission of instructor. 4 credits.

728. Statistical Decision Making
The application of probability and statistics to decision problems. Special emphasis on the Bayesian approach to decisions under uncertainty. Prerequisite: permission of instructor. 4 credits.

735. Advanced Money and Banking
Emphasis on central banking, monetary policy, and monetary theory. Study of current problems and developments in banking. 4 credits.

750. Imperfect Competition
Extensive survey of firm behavior in imperfectly competitive market forms, such as monopoly and oligopoly. The implications for price and research performance under such market forms are examined and the relevance of the theoretical arguments are assessed by recourse to appropriate empirical studies. Prerequisite: Economics 673 or permission of the instructor. 4 credits.

757. Public Policy in Social and Labor Legislation
American social and labor legislation of the recent decades and the way in which American economic and human values have been implemented and modified by law. Legislation and private industry programs in social security, re-employment, unemployment insurances, health services, training and retraining, and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prerequisite: one year’s work in economics or sociology. Mr. McConnell. 4 credits. (This course is the same as Sociology 727.)

Education (48)
Chairman: Roland B. Kimball

PROFESSORS: Wayne S. Koch, emeritus; Everett B. Sackett, emeritus; Roland B. Kimball, Thomas O. Marshall, Carlton P. Menge, Angelo V. Boy

ADJUNCT PROFESSOR: Walter N. Durost


ASSISTANT PROFESSORS: Michael D. Andrew, Charles H. Ashley, Gilbert R. Austin, Jason E. Boynton, John R.
Cavanaugh, Ronald P. Curcio, Albert R. Elwell, Hubert A. Hardy, David D. Hebert, Judith A. Meagher, James W. Mittelstadt, Philip E. Northway, Marvin Seperson, Philip M. Smith, Deborah E. Stone, W. Dwight Webb

INSTRUCTORS: John D. Bardwell, Joan Curry, John R. Loughlin, Mary Pine, Claire Wright

ASSOCIATE PROFESSORS: William H. Annis, (Agricultural-Education); Paul E. Schaefer, (Biology-Education); Lewis C. Coffe, (English-Education); William R. Jones, (History-Education); John B. Whitlock, (Music-Education); Barbara Newman, (Physical-Education)

ASSISTANT PROFESSORS: Albert A. Bennett, (Mathematics-Education); Thomas Barstow, (Physical Education)

INSTRUCTORS: Brian Jefferson, (Art-Education); Mary Priscilla Royal, (Home Economics-Education); Isabel Irwin, (Spanish-Education); Ronald Lewis, (French-Education)


RESIDENT SUPERVISORS: Robert Burke, Robert Dodge, Ronald Jeffords, Richard Pecunies, E. Waldo Sanders

481. An Educational Psychology of Development

The philosophical and psychological principles underlying the process of education. Through a critical examination of human behavior, the student gains
Education

self-knowledge and an understanding of principles that affect all men. An analysis of popular novels, autobiographical reports, and technical studies constitute the basis for group thinking and discussion. The reading period will encourage "reading the self" through human encounter, creative action, disclosure, analysis, and self-restructuring. 4 credits. (Not open to freshmen.)

610. Teaching Elementary School Language Arts

Investigation of the processes of oral and written language. Evaluation of abilities and individualization of instruction. Comparison of current procedures and materials for teaching listening, speaking, and writing. (Offered in Division of Continuing Education only.) 4 credits.

611. Teaching Elementary School Social Studies

The objectives, content, methods, and materials for instructing elementary school children in the social studies. (Offered in Division of Continuing Education only.) 4 credits.

612. Teaching Elementary School Mathematics

The objectives, content, methods, and materials for instructing elementary school children in mathematics. (Offered in Division of Continuing Education only.) 4 credits.

613. Teaching Elementary School Science

Involvement strategies for elementary science instruction. Inquiry and discovery approaches will be compared with more conventional methods. Selection and justification of goals for science instruction will also be treated. A brief survey of resources available for science teachers, including analysis of current curriculum projects. (Offered in Division of Continuing Education only.) 4 credits.

614. Teaching Elementary School Reading

Investigation of the reading process. Evaluation of abilities and individualization of instruction. Comparison of current procedures and materials for teaching reading. (Offered in Division of Continuing Education only.) 4 credits.

657. Psychology of Human Learning

Analysis of the learner and the learning process based on theory and research in learning, personality, and social psychology, as a foundation for instructional theory, methodology, and technology. Concepts and processes will be illustrated and applied through discussion, simulation, observation, and laboratory experiences. 4 credits.

658. Principles of Teaching

Application of theories of learning studied in Education 657, with emphasis on process selection, content goals, organization of learning materials, planning learning experiences, and evaluation procedures. Prerequisite: Education 657. 4 credits.

659. Principles of Education

An introductory study of the major historical and sociological factors that have influenced public education in the United States, the conflicts of educational philosophy, and selected contemporary educational problems of national significance. Prerequisite: Education 658 and permission of the instructor. 4 credits.

691. Science Curriculum and Instruction

A course to introduce prospective secondary teachers of physics, chemistry, earth science, or general science to modern curricula and methods in the sciences. A survey of some of the contemporary programs of national interest in secondary school science. A variety of goals and methods for teaching science. Prerequisite: Education 658 or taken concurrently.
694. Courses in Supervised Teaching
See page 91 for description of secondary school teacher preparation program.
Supervised Teaching of Physical Education. 6 credits.
Supervised Teaching of Agriculture. 6 credits.
Supervised Teaching of Art. 6 credits.
Supervised Teaching of English. 6 credits.
Supervised Teaching of Social Studies. 6 credits.
Supervised Teaching of Home Economics. 6 credits.
Supervised Teaching of Foreign Language. 6 credits.
Supervised Teaching of Mathematics. 6 credits.
Supervised Teaching of Music. 6 credits.
Supervised Teaching of Sciences. 6 credits.

734. Children’s Literature
A consideration of children’s books and methods of using them, with emphasis given to intermediate grades. Practical demonstrations of how to correlate children’s books with various special projects. 4 credits.

741-742. Elementary School Teacher Preparation
A block program, including observation; psychology of learning; principles of teaching reading, language arts, social studies, mathematics, science and other elementary school subjects; student teaching; and a synthesizing seminar. Prerequisite: permission of the department. 16 credits per semester.

763. Instructional Media
To help improve ability to communicate ideas through materials and equipment commonly available in a school audio-visual center. Educational films, bulletin board design, the role of language labs, educational television, programmed learning, and media research. A laboratory period of one hour each week is required in addition to the regular class period. Prerequisite: Education 657. 4 credits.

764. School Library Materials and Services
Background and development of the school library, including functions, objectives, and standards. Relationship of library services to the curriculum, classroom teacher, and students, and to the public library. 4 credits.

765. Reference Materials in the School Library I
The selection and evaluation of basic reference materials common to all libraries. Introduction to school library informational and research techniques. Prerequisite: Education 764. 4 credits.

766. Technical Processes in the School Library I
Ordering, processing, and organizing school library materials. Special emphasis on classification and cataloging systems. Prerequisite: Education 764. 4 credits.

767. Materials Selection for School Libraries
Techniques for building the school library collection in all subjects. Analysis of books for children and young people. Practice in compilation of bibliographies for selected levels and interests. Prerequisite: Education 764 and 765. 4 credits.

785. Educational Tests and Measurements
An introduction to the theory and practice of educational evaluation. Emphasis given to uses of test results in classroom teaching and student counseling. Introductory statistical techniques. Prerequisite: Education 657. 4 credits.

795, 796. Independent Study
Open to juniors and seniors only. Must be approved by appropriate faculty member. 2 or 4 credits.
Electrical Engineering (83)

Chairman: Joseph B. Murdoch

PROFESSORS: Leon W. Hitchcock, emeritus; Joseph B. Murdoch, Alden L. Winn, Robert N. Faiman, John B. Hraba, Albert D. Frost, Fletcher A. Blanchard

ASSOCIATE PROFESSORS: Kerwin C. Stotz, Donald W. Melvin, Ronald R. Clark, H. Richard Skutt

ASSISTANT PROFESSORS: Robert W. Goodrich, Filson H. Glanz, Glen C. Gerhard, John L. Pokoski, Harold F. Wochholz, Sudhindranath Pyati

VISITING ASSISTANT PROFESSOR: Kondagunta Sivaprasad

INSTRUCTORS: Pierre Catala, Ernest E. Nichols, Roger B. Fell

402. Introduction to Electrical Engineering
A course designed to develop an understanding of the nature of electrical engineering education and practice and to expose the students to ways in which electrical technology can make meaningful contributions to a better society. Elements of electrical science, computer logic, and computer programming are provided as background for the solution of problems selected and simplified from real life situations. Instruction is by conferences and group discussions and laboratory work. Prerequisites: Mathematics 425 and Physics 407. Required of Electrical Engineering freshmen. Open to others by permission of instructor. 2 conferences; 1 laboratory or seminar; 4 credits.

502. Dynamic Linear Systems I
503. Dynamic Linear Systems II
Dynamics of electrical and mechanical linear systems, mathematical modeling, linear system transient and steady-state analysis, Laplace transforms and convolution, Fourier series and spectra, state variables and equations. Prerequisites: Mathematics 426 and Physics 408. 2 lectures; 2 recitations; 4 credits.

503. Electrical Circuit Theory

505. Electronic Properties of Materials and Devices
The nature of the electron, duality, single crystals, energy levels, and band theory. Electronic transport properties of semiconductors and metals, dielectric and magnetic properties, semiconductor PN junctions. Prerequisites: Physics 408, Chemistry 405, and Mathematics 527; Electrical Engineering 509 taken concurrently. 4 recitations; 4 credits.

509. Electromagnetic Fields
Static and dynamic electric, magnetic and electromagnetic fields. Maxwell's equations, wave equations, plane waves. Prerequisites: Mathematics 527, Mathematics 528, Physics 408. 4 recitations; 4 credits.

510. Linear Electronic Circuits
Theory of operation, analysis, and design of active circuits containing electronic devices. Prerequisite: Electrical Engineering 505. 4 credits.

515-516. Systems Laboratory I and II
Introductory experiments with electrical and electro-mechanical systems. To be taken concurrently with Electrical Engineering 501-502. 1 credit each.

517. Electrical Laboratory I
Operation and application of instruments used in electrical engineering. Prerequisite: Electrical Engineering 503 taken concurrently and Electrical Engineering 516. 1 laboratory; 1 credit.
518. Electrical Laboratory II
Experimental investigations in the principles of electrical engineering as applied to electrical devices and systems. Prerequisite: Electrical Engineering 510, 520 taken concurrently and Electrical Engineering 517. 2 lectures; 2 laboratories; 4 credits.

520. Electromechanical Energy Conversion
Theory and analysis of transformers and electromechanical energy converters. Prerequisites: Electrical Engineering 502 and 509. 4 credits.

522. Electrical Laboratory for Mechanical Engineers
This course is an electronic laboratory designed for those mechanical engineering students who elect Electrical Engineering 510. Prerequisite: Electrical Engineering 510 taken concurrently. 1 laboratory; 1 credit.

533. Fundamentals of Electrical Engineering
Direct and alternating current circuits. This course is designed for non-electrical engineering majors. 2 recitations; 2 credits.

535. Electrical Engineering Fundamentals
Selected topics in network analysis and an introduction to electronic devices and circuits. This course is designed for non-electrical engineering majors. Prerequisite: Electrical Engineering 501-502. 4 recitations; 4 credits.

611. Nonlinear Electronic Circuits
Active electronic non-linear circuits in the switching mode. Treats analysis and design of both discrete component and integrated circuits. Use is made of ECAP transient analysis computer programming. Prerequisite: Electrical Engineering 510. 3 lectures; 1 laboratory; 4 credits.

620. Electronics and Instrumentation
A service course for those students not in engineering or physics. No attempt is made to cover the topics in mathematical or engineering detail. Emphasis is placed on making the student aware of problems which he is most likely to encounter when using electronic equipment. Proper technique for using electronic instruments is pointed out in classroom demonstrations and laboratory experiments. Topics covered include D.C. and A.C. circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. No prerequisites except junior standing. 3 recitations; 1 laboratory; 4 credits.

641. Electronic Fundamentals
Physical electronics, electronic circuits with emphasis on instrumentation. Prerequisite: Electrical Engineering 533. 3 recitations; 1 laboratory; 4 credits.

695. Electrical Engineering Projects
A laboratory or advanced study course. Each student will either join one of the department research projects or engage in a project which is in one of the areas of current staff interest. Admission to the course will be limited to those accepted by a staff member. 1-4 conferences or 1-2 laboratories; variable credit.

701. Applied Electromagnetic Fields
Introduction to Maxwell's equations; boundary value problems in electrostatics and magnetostatics; plane wave propagation; reflection and refraction in isotropic media; guided wave propagation; rectangular and cylindrical wave guides; simple resonators; elements of microwave circuits, linear antennas; aperture antennas, arrays of dipoles; receiving antennas and reciprocity. Prerequisite: Electrical Engineering 509, or equivalent. 3 recitations; 1 laboratory; 4 credits.

706. Advanced Network Theory
Matrices, linear graph theory and the topological analysis of active and passive networks; concepts of natural frequencies and state; formulation and solution of state equations; application of linear
graph and state techniques to real-world system problems. Prerequisite: Electrical Engineering 503. 4 credits.

711. Digital Systems
Generalized, systematic, and practical approach to the logical design of digital systems encompassing circuit components, binary arithmetic, Boolean algebra, simplification methods and derivation of application and input equations in accordance with current digital system strategies. Practical combination circuits and logical arrays are emphasized in both synchronous and asynchronous applications. Logical equivalents are formulated together with the system aspects of interfacing digital communication systems, wiring and reliability considerations. Prerequisite: senior status or above within the College of Technology or approval of instructor. 3 recitations; 1 laboratory; 4 credits.

712. Logical Design of Digital Computers
Extension of Electrical Engineering 711 to the design of both general and special purpose digital computers. The design parameters of input-output, memory, peripheral arithmetic, and control units are established together with complete design equations for representative digital computers. Analog and hybrid methods are presented together with error free techniques, and a survey of research trends applicable to present and next generation computers. Prerequisite: Electrical Engineering 711 or approval of instructor. 3 recitations; 1 laboratory; 4 credits.

725. Advanced Analysis of Machinery
Theory and analysis of electromechanical energy converters with emphasis on the effect of the machine parameters on its static and dynamic performance. Prerequisite: Electrical Engineering 520 or permission of instructor. 3 recitations; 4 credits.

727. Power Systems
An introduction to the modeling and planning of electric power transmission systems. Prerequisite: Electrical Engineering 503. 4 credits.

730. Direct Energy Conversion
Principles of operation and applications of direct energy conversion devices. Devices studied will include fuel cells, thermoelectric and thermionic generators and magnetohydrodynamic generators and propulsion devices. Prerequisite: Mechanical Engineering 503 or equivalent. 4 credits.

741. Fundamentals of Acoustics
The development of the acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics of acoustical sources; measurement of acoustic sources; microphones; measurement of sound level; properties of acoustical materials, ultrasound, architectural acoustics. Prerequisites: Physics 408, Mathematics 527. 3 recitations; 1 laboratory; 4 credits.

757. Fundamentals of Communications
Introduction to communications systems, Fourier analysis of signals, amplitude and frequency modulation, detection, digital and sampled-data signals, noise in electrical circuits. Prerequisite: permission of instructor. 3 recitations; 1 laboratory; 4 credits.

758. Communication Systems
Fundamentals of the design of high frequency communication systems. RF amplification, modulators for amplitude and frequency modulation systems, receiving techniques, antennas, free space propagation, propagation characteristics of the ionosphere. Prerequisite: Electrical Engineering 509, 757 or equivalent. 3 recitations; 1 laboratory; 4 credits.

762. Illumination
Radiation; color and spectra; physics of light production; sources of ultraviolet, visible, and infrared energy; lamp
circuitry; control of light; illumination design. The course will be conducted on a seminar basis with each student researching and discussing the above topics and doing a project in the application of visible or near-visible energy in business and industry, education, the ocean, agriculture, medicine, or other areas. 2 or 4 credits.

770. Integrated Circuit Design and Technology
An introduction to the principles of operation, design, processing, and technology of linear and nonlinear integrated circuits. Bipolar and unipolar structures, including surface-controlled devices, will be considered. Related topics will include thin-film hybrid circuit techniques, vacuum technology, opto-electronic devices, and microwave active circuits. Prerequisites: Electrical Engineering 505 and 510. 2 recitations; 2 laboratories; 4 credits.

781. Instrumentation
Analysis and design of instrumentation systems, sensors, circuits and devices for electrical measurement and control, techniques of sampled data, telemetry, display, storage, and processing of information. Prerequisite: senior standing. 3 recitations; 1 laboratory; 4 credits.

782. Control Systems
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Prerequisite: permission of instructor. 3 recitations; 1 laboratory; 4 credits.

784. Bioelectronics
A study of topics in bioelectronics including biotelemetry, physiological transducers, and modeling. Animal systems such as the nervous system, circulatory system, the ear, and the eye will be studied from an engineering point of view. Prerequisite: Electrical Engineering 510 or equivalent. 4 credits.

785. Underwater Acoustics
An introduction to the field of underwater acoustics including vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small and large signal considerations. Prerequisite: senior and graduate students with permission of instructor. 4 credits.

786. Introduction to Radio Astronomy
Characteristics of electromagnetic radiation, propagation. Positional astronomy and the radio sky, discrete radio sources, source structure distribution, the sun as a radio source, flare and burst activity, planetary emissions, galactic background, line emissions (Hydrogen, Hydroxyl), quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prerequisite: senior or graduate status within College of Technology. 4 credits.

796. Special Topics in Electrical Engineering
New or specialized courses are presented under this listing, on sufficient demand. Independent study can be given under this course title. Prerequisite: permission of instructor. 2 or 4 credits.

301. Improvement in Writing*
Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 3 recitations; no credit; NLG.

302. Improvement in Reading*
Intensive drill in reading skills for six weeks. 3 recitations; no credit; NLG.

303. English as a Second Language
For students to whom English is a foreign language, a course of instruction in speaking, reading, and writing. No credit; NLG.

401 (401). Freshman English
Training to write more correctly and with more force and to read with more appreciation and discernment. The staff of the department under the direction of Mrs. Deane. 4 credits.

402 (402). Freshman Seminars—Approaches to Literature
Intensive study of a specific literary topic, a theme, a genre, a major figure, or a specific period of English or American literature. 4 credits.

501 (501). Expository Writing
The discipline of non-fiction writing. Weekly papers and frequent conferences required. Prerequisite: English 401. 4 credits.

513, 514. A Survey of English Literature
513: From the Old English period to 1800. 514: From 1800 to the present. Prerequisite: English 401. 4 credits.

515, 516. A Survey of American Literature
515: From the beginning of American literature to Whitman. 516: From Whitman to the present. Prerequisite: English 401. 4 credits.

517. An Introduction to Literary Genres
An introduction to literary forms, either traditional (such as lyric, epic, comedy, and tragedy) or modern (such as the novel and short story). The genres studied and their number vary from year to year. Prerequisite: English 401. 4 credits.

518. The Bible as Literature
The various literary types found in the Bible and a survey of the influence of the Bible on English literature. Prerequisite: English 401. 4 credits.

519. Introduction to Critical Analysis
An examination of literature apart from the historical context. Works vary from year to year. Prerequisite: English 401. 4 credits.

520. Literature and the History of Ideas
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Prerequisite: English 401. 4 credits.

523. Writing of Technical Reports
2 credits.

621-622. Non-Fiction Writing
A workshop course in the writing of non-fiction. Students interested in journalism will be able to practice writing under strict limitations of time and space in this course, which will prepare them for a career in journalism. Other students will be able to practice forms of non-fiction writing in which they are inter-

* Any student may be recalled and reassigned to an instruction group at any time in his four years of college upon report of any member of the faculty that his work in composition or in reading is deficient.
ested. Individual conferences. Mr. Murray and Mr. Morse. 4 credits. No prerequisite except permission of instructor. May be repeated for credit with approval of the department chairman.

625-626. Writing Fiction and Poetry
A workshop in the fundamental techniques of fiction and poetry. Individual conferences. Mr. Yount, Mr. Smith, and Mr. Weesner. Prerequisite: English 401. 4 credits. May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration.

651, 652. Comparative World Literature
A comparison of two or more national literatures through movements, genres, motifs, and dominant philosophic and artistic ideas. 4 credits.

695, 696. Senior Honors
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English. In the first semester the student will examine a series of special literary problems and write a number of short papers. In the second semester, he will investigate independently one or two larger topics and write one or two long papers. Mr. Miller. 4 credits. Open to seniors by departmental invitation only. May be counted as two courses toward the eight which constitute a major in English.

697, 698. Senior Seminars
Intensive study of specialized topics which vary from year to year. Enrollment in each seminar limited to 15 students. 4 credits. Permission of instructor required. Exceptional juniors may be admitted with permission of instructor and department chairman.

701-702. Advanced Writing of Fiction and Poetry
Workshop discussions of advanced writing problems and readings of students’ fiction, poetry, or plays. Individual conferences. Mr. Williams. Prerequisite: English 625-626 or its equivalent. 4 credits. May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration.

703-704. Advanced Non-Fiction Writing
A workshop course for advanced students of writing. The course provides a second year of training for those interested in journalism, but it also provides an opportunity for students to practice other forms of non-fiction writing. Individual conferences. Mr. Murray. 4 credits. No prerequisite except permission of instructor. May be repeated for credit with the approval of the department chairman.

705. English Grammar
A review of English grammar including both traditional and contemporary approaches. Mr. Goffe. 4 credits.

706. English Linguistics
A descriptive approach to modern English grammar, emphasizing the insights provided by linguistic analysis. Mr. Hunter. 4 credits.

709, 710. Critical Analysis of Exposition and Fiction
709: Exposition; 710: Fiction. 4 credits.

711. Critical Analysis of Poetry and Drama
A non-historical, non-genre approach to individual poems and plays with emphasis on the works themselves. Mr. Richardson. 4 credits.

713, 714. Literary Criticism
Major critics from Plato to the present and the chief critical approaches to literature. 4 credits.

742. Puritanism and the Enlightenment in America
American literature and thought from the Colonial beginnings through the early republic. Mr. Duffy. 4 credits.
English

743. American Transcendentalists
Emerson, Thoreau, and other transcendentalists. (Formerly English 775). Mr. Duffy. 4 credits.

744. American Fiction to the Civil War
Cooper, Poe, Hawthorne, Melville, and others. (Formerly English 776). Mr. Goffe. 4 credits.

745. American Poetry of the Nineteenth Century
Bryant, Poe, Emerson, Whitman, Dickinson, and others. (Formerly English 777). 4 credits.

746. American Realism and Naturalism
Twain, James, Adams, Stephen Crane, Dreiser, and others. 4 credits.

747, 748. American Fiction and Drama of the Twentieth Century
Fitzgerald, Hemingway, O'Neill, Faulkner, and others. (Formerly English 779, 780) Mr. Nicoloff and Mr. Potter. 4 credits.

749. American Poetry of the Twentieth Century
Robinson, Frost, Stevens, Pound, Eliot, Jeffers, Hart Crane, Robert Lowell, and others. Mr. Nicoloff and Mr. Potter. 4 credits.

751. History of the English Language
A study of the evolution of the English language, with special emphasis upon the relation between linguistic change and literary style. Mr. Carnicelli. 4 credits.

753. Old English
An introduction to Old English language and literature through readings of selected poetry and prose. Mr. Carnicelli. 4 credits.

754. Beowulf
A reading of the poem and an introduction to the scholarship. Mr. Carnicelli. Prerequisite: English 753. 4 credits.

755, 756. Chaucer
755: Chaucer's allegorical poems and Troilus and Criseyde. 756: The Canterbury Tales. Mr. Underwood. 4 credits.

757-758. Shakespeare
757 surveys a number of representative plays from throughout Shakespeare's career; 758 studies a few plays more intensively. Mr. Happgood, Mr. Hunter, Mr. Logan. 4 credits.

759. Milton
Milton's life and times, all his poetry, and a selection of his prose. Mr. Hunter. 4 credits.

763, 764. English Literature in the Sixteenth Century
763: Major literary figures of the continental Renaissance (in translation), including Petrarch, Machiavelli, Ariosto, Rabelais, Montaigne, Cervantes, and Erasmus; major English writers of the period, including More, Skelton, Wyatt, and Surrey. 764: Sidney, Drayton, and other late Elizabetheans, with emphasis upon Spenser. Mr. Logan. 4 credits.

765, 766. English Literature in the Seventeenth Century
765: Major writers of prose and poetry in the first half of the century; special emphasis upon the relationships between the "metaphysical" and the "classical" modes of poetry. 766: Restoration comedy of manners, heroic drama, verse satire, Dryden, Milton, and Bunyan. Mr. Underwood. 4 credits.

767, 768. English Literature in the Eighteenth Century
767: Addison, Steele, Defoe, Pope, and Swift. 768: Gray, Collins, the Wartons, Burke, Goldsmith, Reynolds, Johnson, Boswell, Crabbe, Burns, and Blake. Mr. Maynard. 4 credits.

769. The English Romantic Period
Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey, Byron, Shelley, and Keats. Mr. Miller. 4 credits.
771, 772. Victorian Prose and Poetry
771: Carlyle, Mill, Ruskin, Newman, Tennyson, and Browning. 772: Arnold, Clough, the Pre-Raphaelites, Swinburne, Hopkins, Hardy, Housman, and others. Mr. Miller. 4 credits.

773, 774. British Literature of the Twentieth Century
773: Conrad, Joyce, Yeats, and others. 774: Huxley, Lawrence, Eliot, Auden, Dylan Thomas, and others. Mr. Richardson. 4 credits.

781, 782. Introduction to English Drama
The development of English drama, exclusive of Shakespeare, from the Middle Ages to the present. 781: From the Middle Ages to the closing of the theatres in 1642. 782: From the Restoration to the present. Mr. Caldwell. 4 credits.

783. The English Novel of the Eighteenth Century
4 credits.

784. The English Novel of the Nineteenth Century
One representative novel of each of the following: Jane Austen, Scott, Dickens, Thackeray, Emily Brontë, Charlotte Brontë, Trollope, George Eliot, and Hardy. Mr. Miller. 4 credits.

English Education 791. Problems in the Teaching of High School English
Principles and methods of teaching literature, composition, and language in secondary schools. Required of all students in the English teaching major. Open to English majors with permission of the instructor. Mr. Goffe. 4 credits. No credit toward the English major.

795, 796. Independent Study
Individual guided study in special topics. Open to highly qualified juniors and seniors both semesters but for a maximum of 4 credits. To be elected only with permission of the department chairman and of the supervising faculty member or members.

797, 798. Special Studies in Literature
The precise topics and methods of each section will vary. 4 credits. No more than 2 courses may be counted toward the minimum of 5 courses in literature required for the English major.
1. Old English Literature
2. Medieval Literature
3. The Renaissance
4. The Seventeenth Century
5. The Eighteenth Century
6. The English Romantic Period
7. The Victorian Period
8. The Twentieth Century
9. The Drama
10. The Novel
11. Poetry
12. Non-Fiction
13. American Literature
14. A Literary Problem

Entomology (29)
Acting Chairman: Robert L. Blickle

PROFESSORS: Walter C. O’Kane, emeritus; Robert L. Blickle, James G. Conklin
ASSISTANT PROFESSORS: G. Thomas Fisher, R. Marcel Reeves

400. Insects: Their role as man’s greatest competitor
What are insects? Their role in the environment as it relates to man and his sphere of activities. Open to any student. Not to be used for major credit. Staff. 2 lectures; 4 credits.

(402), 402. Introductory Entomology
An introduction to entomology in its broad aspects. The structure, biology, and classification of insects. This course is adapted to students contemplating a major in entomology, in wildlife management, or in the fields of biology or biology-education. Each student is required to make an insect collection. Open to any student. Mr. Conklin. 3 lectures; 1 laboratory; 4 credits.
503. Principles of Economic Entomology
The nature of insect damage. The methods of insect control. Quarantine and regulatory measures. Natural control. Applied control measures. Open to any student. 3 lectures; 4 credits.

506. Forest Entomology
Structure and development of insects. Orders and families of insects of importance to foresters. Principals of insect control. Biology and control of representative forest insects. Each student is required to make an insect collection. Adapted especially for forestry majors. Open to any student. Mr. Reeves. 3 lectures; 1 laboratory; 4 credits.

704. Medical Entomology
Insects and arachnids in relation to public health. The more important disease carriers, their biologies, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lectures; 1 laboratory; 4 credits.

707, 708. Advanced Entomology
Insect anatomy, insect ecology, and systematic entomology. Required of entomology majors. Open to others by permission of the instructor. R 1. Taxonomy; R 2. Morphology; R 3. Aquatic Insects; R 4. Insect Physiology. Mr. Blickle, Mr. Conklin. 2 lectures; 1 4-hour laboratory; 4 credits.

709, 710. Advanced Economic Entomology
Studies in the specialized phases of entomology. This course is structured to meet the objectives of the individual student. R 1. Agricultural Entomology; R 2. Biological Control of Insects; R 3. Chemical Control of Insects; R 4. Regulatory Entomology; R 5. Structural Pest Control. Mr. Conklin, Mr. Blickle. Required of entomology majors. Open to others by permission of instructor. Hours to be arranged. 2 or 4 credits.
ence 501 taken concurrently. 3 lectures; 1 laboratory; 4 credits.

528. Applied Statistics I
Development of elementary statistical techniques through the analysis of prepared data. Topics reviewed include numeric scales; continuous and discreet probability distributions; distributions of sample statistics; small-sample theory; elementary analysis of variance, regression, correlation, their non-parametric analogues and chi-squares. Attention is paid to the use of available computer programs in the numerical solutions to statistical problems. Mr. Durgin. 4 credits.

542. Forestland Surveying
The use of common forest surveying equipment and techniques. Course to include use and preparation of maps with various types of equipment and methods, public land survey, and courthouse search for deeds and surveys. Mr. Foster. Two-week field session in June. 2 credits.

544. Forest Economics
Principles of economics as applied to the past, present, and future supply and demand situation for forest products and services. Forestry and the general economy. Economics of the firm. Elements of forest valuation. Forest taxation. Mr. Foster. Prerequisite: a course in the principles of economics. 4 credits.

629. Silviculture
The theory and techniques of applying ecological knowledge to the control of establishment, composition, and growth of forest stands for economic purposes. Field practice including marking of stands for various kinds of cutting and for cultural treatment. Mr. Hocker. Prerequisites: Forest Resources 425 and 527. 2 lectures; 2 laboratories; 4 credits.

634. Wildlife Ecology
The biological principles and human factors affecting wildlife and fish populations, and an introduction to the theory and practice of wildlife management. Includes a survey of common fish and wildlife species, research problems, and management techniques. Mr. Olson. Prerequisite: a basic course in biology, botany, zoology, or consent of instructor. 2 lectures; recitation, laboratory; 4 credits.

635. Contemporary Conservation Issues
Man's technology applied to the wildland renewable resources causes biological and social conflicts because men's objectives relative to these resources differ. Game, timber, water, minerals, and soil are major sources of economic growth but conflicts between use and preservation must be continually resolved. Elective for all students except freshmen and forestry majors. Mr. Wallace. Staff. 4 credits.

644. Forest Biometrics
Application of mathematical, statistical and computer techniques in forest resource measurements and inventory. Course includes area sampling, point sampling, and photogrammetric techniques. The least-squares approach is used in sampling and in deriving volume and biological growth equations. Prerequisite: calculus, computer techniques, and spring field session. Mr. Barrett. 2 ½-hour seminars; 1 laboratory; 4 credits.

660. Forest Fire Protection
Principles and techniques of forest fire prevention, predicting fire behavior, and effective forest fire control. Weather phenomena related to fire occurrence and behavior. Fire effects and determination of damage. Fire as a part of forest management activity. Mr. Weyrick. Prerequisites: Forest Resources 527 or 629, Soil and Water 501. 2 lectures; 1 laboratory; 10 weeks of semester; 2 credits.

695, 696. Investigations in Forestry
Work to be arranged according to the needs of individual students. Staff. Prerequisite: permission of instructor. Hours to be arranged. 2 or 4 credits. 1. Forest Resources

702. Natural Resources Policy
Contemporary issues in the management and allocation of natural resources. The impact of human activity and demands on resources, including agricultural and forest lands, water, wildlife, fisheries, and minerals. Historical perspective as it contributes to an understanding of current public and private resource policies. Mr. Bruns, Mr. Weyrick, Mr. Bowring, Mr. Drew. Prerequisite: permission of instructor. 4 credits.

711. Statistical Methods II
An intermediate course in statistics. Topics include basic concepts of sampling, linear models and analyses for one-way and multiway classifications, factorial arrangement of treatments; multiple regression, and covariance. Mr. Barrett. Prerequisite: Forest Resources 528 or equivalent. Two 1 ½-hour seminars; 1 laboratory; 4 credits.

712. Sampling Techniques
A study of the techniques of sampling a finite population. Topics include choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Mr. Barrett. Prerequisite: Forest Resources 528 or equivalent. Two 1 ½-hour seminars; 1 laboratory; 4 credits.

720. Forest Tree Improvement
The genetics of forest tree improvement with emphasis on variation in natural populations, the basis for selection of desired characters, and the fundamental of controlled breeding. The application of principles will be directed toward silviculture, management, and utilization. Mr. Hocker. Prerequisite: permission of instructor. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered in 1971-72.)

737. Game Management I
Biological characteristics, habitat usage, research, and management techniques of upland game birds and big game mammals. Students should be prepared for weekend field trips to wildlife areas in New England. Mr. Olson. Prerequisite: wildlife management major or consent. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

738. Game Management II
Biological characteristics, habitat usage, research and management techniques of small game mammals, furbearers, and waterfowl. Students should be prepared for weekend field trips to wildlife areas in New England. Mr. Olson. Prerequisite: wildlife management major or consent. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

745. Forest Management
Production control in forests with many uses and management objectives. Analysis of silvicultural, economic, and business problems. Practice of forest administration. Professional responsibilities and opportunities. Mr. Weyrick and Mr. Bruns. Prerequisite: completion of junior year in forestry curriculum. 3 lectures; 1 laboratory; 4 credits.

753. Operations Control and Analysis
Applications of economic principles to the control and analysis of harvesting and other field-based forest operations. The use of quantitative methods in developing cost functions, mathematical programming, PERT, game theory, simulation, and scheduling problems. Mr. Foster. Prerequisite: forest biometrics and forest economics. 4 credits.

754. Wood Products Manufacture and Marketing
A study of the wood products manufacturing industry from the harvesting and procurement of raw material to finished product processes with emphasis on management decisions, marketing and promotion problems. Visits to harvesting
operations and manufacturing plants in the New England region are used as the basis for study. Mr. Hill. Prerequisite: Forest Resources 426 and 753. 3 lectures; 1 laboratory; 4 credits.

758. Photogrammetry in Forestry
Elementary principles of photogrammetry with emphasis on their application to land management. The value and use of aerial photos in forest typing; planimetric and topographic mapping; measurement of area and volume estimation. Mr. Bruns, Mr. Barrett. Prerequisite: permission of instructor. 2 lectures; 2 laboratories; 4 credits.

764. Forest Industry Economics
Application of business methods and economics in the establishment and operation of forest industries; planning for minimum cost operations and the profitable use of capital in forest enterprises. Mr. Wallace. Prerequisite: senior standing and permission of instructor. 2 1 1/2-hour lectures; 1 laboratory; 4 credits.

797. Forest Recreation Seminar
The recreational use of forest lands, including factors that affect demand and supply for recreation. Planning for state and local recreational use, emphasizing the economic and social aspects. Mr. Wallace. Prerequisite: junior standing and permission of instructor. Two 1 1/2-hour sessions; 4 credits.

798. Forest Resources Management Seminar
Population trends and human needs in relation to forest land productivity for timber, wildlife, water, recreation, and grazing. Organized groups involved in forest land use and management, and overall planning to help maximize forest land use and productivity for our society. Mr. Wallace. Prerequisite: Forest Resources 661. 4 credits.

French and Italian
Chairman: Louis J. Hudon

French and Italian
PROFESSORS: Clifford S. Parker, emeritus; Louis J. Hudon
ASSOCIATE PROFESSOR: Samuel E. Stokes, Jr.
VISITING ASSOCIATE PROFESSOR: Edna S. Hudon
ASSISTANT PROFESSOR: Grover E. Marshall
VISITING ASSISTANT PROFESSOR: Bernard Faudon
ADJUNCT INSTRUCTOR: Ronald W. Lewis

French (56)
New students will be assigned to proper courses on the basis of their scores on the College Board Achievement test. All courses are conducted in French. Papers are written in French unless otherwise noted. Junior and senior non-majors may write papers and examinations in English in courses numbered 600 and above. French 605-606 is the first course counting toward a major. Students who had two years or more of French in high school or who studied French in grammar school may not take French 401-402. Students educated in French-speaking countries may not register for courses below the 700 level.

400. French for Reading Knowledge
For seniors and graduate students without a previous knowledge of French. The course is limited to reading and is designed for students going on toward a Ph.D. The course does not satisfy the Liberal Arts language requirement. 4 recitations; 4 credits.

401-402. Elementary French
For students without a previous knowledge of French. Development of basic skills in aural comprehension, speaking, writing, reading. 5 recitations; 2 laboratories; 4 credits.
501. Intermediate French
The same course as French 503 below, but for students with less preparation and students from French 401-402. To be followed second semester by French 504. (Credit toward a minor. Open to freshmen.) 5 recitations; 2 laboratories; 4 credits.

503-504. Intermediate French
Intensive reading of complete texts of intrinsic literary and intellectual worth, formal review of grammar, training in oral and written expression of ideas. (Credit toward a minor. Open to freshmen.) 3 recitations; 2 laboratories; 4 credits.

505-506. Introduction to French Literature and Thought
Reading and analysis of significant works in French Literature. The term paper is in English. Credit toward a minor. Open to freshmen. (Not open to students who have had French 503-504.) 3 recitations; 4 credits.

514. French Grammar and Speech
Thorough review of grammar and practice in oral and written expression. Prerequisite: French 504 or 506. 3 recitations; 4 credits.

603-604. French Literature in Translation
This course is designed to present outstanding works of French literature in translation to students who have satisfied the language requirement in another language. Texts will vary from year to year. Certain periods will be covered by professors whose specialty is involved. Not open to freshmen. 3 recitations; 4 credits.

605-606. Readings in French Literature
Intensive readings in French literature from the Middle Ages to the present day. Outside readings on the historical and cultural background of the works read. This course is intended primarily for sophomores. It will treat works and periods not covered in French 503-504 or French 505-506. Open to students who have received a grade of C or better in French 504 or 506. Required of majors. 3 recitations; 4 credits.

685-686. Junior Year at Dijon University
A program of studies at the University of Dijon (France) for juniors who have completed their sophomore year at the University of New Hampshire and have passed with a grade of B or better French 605-606 and French 514. Students interested in the program are expected to take courses in French in both their freshman and sophomore years. The students chosen for the program will be required to take a non-credit orientation course during the second semester of their sophomore year. Interested students should consult with the director of the program, Professor Louis J. Hudon. 32 credits. Not offered for graduate credit.

707-708. Comparative Literature
For 1970-71, a study of the European novel of the twentieth century, taught by members of the faculty of the Departments of English, French and Italian, German and Russian, and Spanish and Classics. 4 credits. This course is the same as German 707-708 and Spanish 707-708.

741. French Literature of the Middle Ages
Readings in the epic, lyric poetry, and the romance. Prerequisite: French 606. 4 credits.

742. French Literature of the Renaissance
Readings in the literature of the sixteenth century. Prerequisite: French 606. 4 credits.

759-760. French Literature of the Seventeenth Century
Readings in the literature of the seventeenth century. Prerequisite: French 606. 4 credits.
761-762. Eighteenth Century French Literature and Thought
Readings in the Age of Enlightenment and belles lettres of the period. Prerequisite: French 606. 4 credits.

767-768. Nineteenth Century French Literature
Readings in Romantic, Parnassian, and Realistic literature of the century. Prerequisite: French 606. 4 credits.

770. Introduction to Modern French Poetry
Studies in French Poetry from Baudelaire to the present. Prerequisite: French 606. 4 credits.

781-782. Contemporary French Novel and Theater
Readings in the French novel and theater of the twentieth century. Prerequisite: French 606. 4 credits.

790. Advanced Language and Style
Translation of literary texts, intensive study of the principal techniques of style, explication de textes. Open to qualified students who have had a minimum of two courses in French numbered 741 and above. 4 credits.

791. Problems of Teaching French
Teaching methods, materials, devices, and an introduction to linguistics as applied specifically to the problems of teaching French. Examination of the goals and organization of French programs in American schools. Observation of classes in the local school system. For prospective teachers of French at precollege levels, 4 credits. No credit towards a major. Prerequisites: French 605-606 and 514 or its equivalent.

795, 796. Special Studies in French Language and Literature
Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics which may be selected are: the work of a major French author, specific topics in any area of French literature.

798. Seminar in French Literature
A study of French authors chosen by the instructor. Prerequisite: French 606. 4 credits.

Italian (59)
New students will be assigned to the proper course on the basis of their scores on the College Board achievement test. Students educated in Italian-speaking countries may not register for courses below the 700 level.

401-402. Elementary Italian
For students without a previous knowledge of Italian. Development of basic skills in aural comprehension, speaking, writing, reading. 5 recitations; 2 laboratories; 4 credits.

503-504. Intermediate Italian
Intensive reading of complete texts of intrinsic literary and intellectual worth, formal review of grammar, training in oral and written expression of ideas. (Credit toward a minor. Open to freshmen.) 4 credits.

Geography (50)
Chairman: William H. Wallace

PROFESSORS: Donald H. Chapman, William H. Wallace
ASSISTANT PROFESSOR: Robert G. LeBlanc
INSTRUCTOR: Robert L. A. Adams

401, 402. Regional Geography of the World
A survey of the geography of the world, organized in terms of the major culture areas of the earth. Geography 401 considers the areas of Western culture — Europe and the New World countries of the Americas and Australia and New Zealand. Geography 402 is concerned with the study of Non-Western culture areas.
Geography

— Black Africa, The Dry World, Oriental Asia, and the Pacific. In each area the unique integration of human and physical phenomena that produces the distinctive character of the region is studied. Mr. Adams, Mr. LeBlanc, Mr. Wallace. 4 credits.

473. The Weather
Interpretation of atmospheric phenomena; heating and circulation of the atmosphere; nature and movement of air masses influencing the weather of North America, especially New England. Explanation of day-to-day weather changes as they occur by graphic analysis, including practical or applied meteorology. Mr. Chapman. 4 credits. (Does not satisfy the Social Science requirement.)

511. Geography of Anglo-America
A regional and topical analysis of the United States and Canada. Physical features and human phenomena are studied in the context of their contributions to the character of the area. Mr. Wallace. 4 credits. (Alternate years.)

531. Geography of Western Europe and the Mediterranean
A regional and topical analysis of the geography of Western Europe and the Mediterranean region. Major topics studied include the patterns of natural phenomena, cultural features, and economic systems. Most of the course is devoted to the analysis of the following regions: the British Isles, Northern Europe, the Benelux countries, Germany, Alpine Europe, France, and Mediterranean Europe. Mr. Wallace. 4 credits. (Alternate years.)

532. Geography of the USSR and Eastern Europe
A systematic analysis of the Soviet Union and the Communist Bloc countries of Eastern Europe with an emphasis on the former. Topics include natural regions, population, ethnography, agriculture, manufacturing, transportation, and trade. The contemporary pattern of population and the location of economic activity are viewed from the perspectives of historical process, the physical resource base, and the economic ideology of Communism. Mr. LeBlanc. 4 credits. (Alternate years.)

571, 572. Physical Geography
A systematic study of the geography of the earth in terms of climates, landforms, vegetation and soils. Geography 571 is concerned with the study of cartography, weather, and climate. Landforms, vegetation, and soils, and the integration of physical features in selected areas are studied in Geography 572. Mr. LeBlanc and Mr. Wallace. 2 lectures, 1 laboratory, 4 credits. (Alternate years.) (Does not satisfy the Social Science requirement.)

581. Cultural Geography
An analysis of the geographic pattern of mankind. The differentiation of the world in terms of population, race, language, religion, and economy. Emphasis is placed on the historical origin and the diffusion of these phenomena as well as their significance in understanding the contemporary culture map of the world. Mr. LeBlanc. 4 credits. (Alternate years.)

582. Economic Geography
The analysis of the areal variation on the earth’s surface in terms of man’s activities related to the production, exchange, and consumption of economic goods. Agriculture, extractive industries, manufacturing, trade, transportation, and various tertiary activities will be investigated with regard to their location, their characteristics, and their relationships with other phenomena. Emphasis will be placed upon the development and application of various theories of location. Mr. Adams. 4 credits. (Alternate years.)

670. Climatology
The study of the climates of the world. A knowledge of the basic meteorological processes is assumed. Major topics studied include: The atmospheric circulation and its effect upon climates; climatic change; and the problems of climatic description and classification. Most of
the course is devoted to the analysis of the climatic characteristics of the major regions of the world. Prerequisite: Geography 473 or Geography 571 or permission of instructor. Mr. Wallace. 4 credits. (Alternate years.) (Does not satisfy the Social Science requirement.)

782. Advanced Economic Geography
A conceptual analysis of the social and behavioral problems of resource allocation and use as they relate to man's economic activities. Varying views of resource adequacy and practices of resource utilization will be investigated with respect to population pressure, man's perception of his environment, changes in science and technology, and concerns for environmental quality. Emphasis will be placed upon methods of determining resource adequacy, exploration of the meaning of resource scarcity, and an evaluation of man's decision-making mechanisms for resource allocation. Reference will be made to specific regions with particular reference to modern America. Mr. Adams. 4 credits. (Alternate years.)

783. Historical Geography of the United States
A geographic analysis of population, economy, and resources at several stages in the development of the United States to 1900. The study of places as they were in the past and as they were perceived. Mr. LeBlanc, 4 credits. (Alternate years.)

795. Special Project in Geography
The study of special problems in geography by means of readings, library, archival, and field work. This course is intended primarily for seniors majoring in geography. Prerequisite: permission of instructor. Staff. 4 credits.

797. Seminar in Geography
The methodology and philosophy of geography. The course deals with the history of geographic thought, the organization concepts of the discipline, and the approaches to geographic analysis. The definition and investigation of research problems from the geographic perspective. Primarily for seniors majoring in geography. Mr. Adams. 4 credits.

Geology (51)
Chairman: Herbert Tischler

PROFESSORS: Donald H. Chapman, T. Ralph Meyers, Cecil J. Schneer, Herbert Tischler
ASSOCIATE PROFESSORS: Henri E. Gaudette, Glenn W. Stewart

Group A

401. Principles of Geology I
The earth and its history. A consideration of land forms and a discussion of the materials and structures of the earth's crust. Staff. 3 lectures; 1 laboratory; 4 credits. Offered both semesters.

501. Introduction to Oceanography
Descriptive and regional oceanography covering the physical, chemical, biological, and geological aspects of the sea. Mr. Anderson and Mr. Wiseman. 3 lectures; 4 credits.

781. Physical Geology
The materials and structures of the earth and the erosive agents that modify them are described in the lectures and are examined and studied in the laboratory and on field trips. This course is for certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Geology 401 or equivalent.) 4 credits.

Group B

Prerequisite: Geology 401 or 781.

402. Principles of Geology II
The earth and its history continued. The interpretation of past geologic events and their effect on the development of life forms. Staff. 3 lectures; 1
Geology

laboratory; 4 credits. Offered both semesters.

409. Environmental Geology
An understanding of geological processes allows man to use the products and forces of nature to exploit and manage his environment and to anticipate some of the unforeseen problems that may arise. Topics to be discussed will include: water resources; geologic hazards, such as landslides, earthquakes, stream erosion, and sedimentation; and land use, site investigations, and the exploitation of natural resources. Mr. Stew­art. Prerequisite: Geology 401 or permission of instructor. 4 credits.

512. Descriptive and Determinative Mineralogy
The physical and chemical properties of minerals, their associations, modes of occurrence and uses with training in their identification. Mr. Meyers. Prerequi­sites: in addition to Geology 401, Chemistry 402 or 404. 2 lectures; 2 labora­tories; 4 credits.

782. Historical Geology
The history and development of the physical features of the earth and the development of life on the earth. Fossil organisms will be briefly surveyed in the laboratory and the methods of historical geology will be illustrated in the laboratory and on field trips. Prerequi­site: Geology 781 or equivalent. This course is for certified elementary or high school science teachers who need an intro­duction to the earth sciences. (Not available for credit after completing Geology 402 or equivalent.) 4 credits.

Group C

613-614. Mineralogy
First semester: Introduction to crystallography, the physics and chemistry of crystals, the atomic structure of minerals; mineral classification and the non­silicate minerals. Second semester: Sili­cate mineralogy and structure; optic theory and optical mineralogy. Mr. Schneer and Mr. Bothner. Prerequisite: 1 year of college chemistry and/or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

797. Geology Colloquium
Study of selected topics in both classical and modern geological thought. De­signed for geology and earth science majors. 0 credit; NLG.

Group D

Geology 402 (or permission of the instructor) is a prerequisite for most courses in Group D in addition to other prerequisites shown with each course.

531. Structural Geology
The structural units of the earth’s crust and the mechanics of their forma­tion. Mr. Stewart. 3 lectures; 1 labora­tory or field work; 4 credits.

561. Geomorphology
The factors producing the present aspect of the land surface, particularly that of New England. Special emphasis on the work of running water, glaciers, and marine agents. Field trips during the fall season. Mr. Chapman. 3 lectures; 1 laboratory; 4 credits.

632. Mapping Techniques and Field Geology
Training in basic techniques of geo­logic mapping. Mr. Stewart. Prerequisite: Geology 531. 1 lecture; 2 laboratories; 4 credits.

652. Invertebrate Paleontology
The classification, evolution, and strati­graphic occurrence of invertebrate ani­mals as recorded by fossils. Field trips will be made to collect specimens and to study environments of living and fossil material. Mr. Tischler. 3 lectures; 1 laboratory; 4 credits.

662. Glacial Geology
The characteristics of existing glaciers and an interpretation of Pleistocene gla­cial features. The abundant and varied evidence of glaciation in northeastern North America and Baltic Europe will
be emphasized and New Hampshire examples of both alpine and continental glaciation will be studied in the field. Mr. Chapman. 3 lectures; 1 laboratory; 4 credits.

**Group E**

Geology 613-614 (or permission of the instructor) is a prerequisite for most courses in Group E in addition to other prerequisites shown with each course.

**725. Petrology-Petrography**

The identification and classification of igneous, metamorphic and sedimentary rocks in hand specimen and thin section with emphasis on mineralogic and textural relationships leading to an understanding of petrogenesis. Mr. Bothner. 3 lectures; 1 laboratory; 4 credits.

**741. Geochemistry**

Applications of thermodynamics to geological processes; geochemical differentiation of the earth; the principles and processes which control the distribution and migration of elements in geological environments. Mr. Gaudette. 3 lectures; 1 laboratory; 4 credits.

**754. Sedimentation-Stratigraphy**

The properties of sediments and sedimentary rocks, with emphasis on lithofacies, biofacies, principles of stratigraphic correlation and sedimentary tectonics. Mr. Anderson and Mr. Tischler. 2 lectures; 1 laboratory; 4 credits.

**758. Physical Oceanography**

An introduction to the physics of the oceans in sufficient scientific and mathematical detail to permit understanding of the current oceanographic literature. Both the descriptive and dynamic concepts of physical oceanography will be treated. Mr. Wiseman. Prerequisites: permission of instructor. 3 lectures; 1 student project; 4 credits.

**759. Geological Oceanography**

Geologic properties of the earth that are unique to the continental shelves and ocean basins. Special emphasis will be placed on submarine geomorphology, eustatic sea level changes, crustal and subcrustal oceanic structure, and the evolution of the ocean basins. Mr. Anderson. Prerequisite: Geology 501 and Geology 754. 2 lectures; 1 discussion group, 1 special project; 4 credits.

**771. Economic Geology**

The distribution utilization and geology of mineral fuels and some related materials. Mr. Meyers. Prerequisite: Geology 402. 4 credits.

**795. Geological Problems**

1. Areal Geology
2. Geochemistry
3. Geomorphology, Advanced
4. Geophysics
5. Glacial Geology, Advanced
6. Groundwater Geology
7. Historical Geology, Advanced
8. Industrial Minerals
9. Micropaleontology
10. Mineral Fuels
11. Mineralogy, Advanced
12. Optical Crystallography
13. Ore Deposits
14. Paleontology, Advanced
15. Petrology, Advanced
16. Regional Geology
17. Sedimentation
18. Stratigraphy
19. Structural Geology, Advanced
20. Marine Geology
21. Physical Oceanography

Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. Staff. 2 or 4 credits.

**796. Honors Project**

Independent research projects similar to Geology 795 for students with 3.0 or better average in geology. Staff. 2 or 4 credits.
German and Russian

Acting Chairman: Marron C. Fort

PROFESSOR: Hermann W. Reske
ASSOCIATE PROFESSORS: Marron C. Fort, Helmut Pfanner
ASSISTANT PROFESSORS: Alexander P. Danoff, emeritus; Guenter Herr, James L. Sherman
INSTRUCTORS: Alfredo Cappon, Roman Legedza, Hildegard S. Reske

German (57)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary German*
For students without previous knowledge of German. Aural-oral practice and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. No credit toward a major. Students who offer two or more entrance units of high school work in German will not be permitted to register for credit for German 401. 5 recitations; 2 laboratories; 4 credits.

403-404. Elementary Dutch
An introduction to the language of the Netherlands and Flemish Belgium. Aural-oral practice and the study of fundamental speech patterns to achieve a firm basis for an active command of the language. 5 recitations; 2 laboratories; 4 credits.

501-502. Intermediate German
A systematic review of German grammar and syntax. Practice in oral and written expression. 4 recitations; 2 laboratories; 4 credits.

503-504. Scientific German
Intensive reading of selected texts in all areas of the physical and natural sciences. 4 recitations; 4 credits. Restricted to non-majors.

507-508. Intensive Intermediate German
This course is designed for students who have demonstrated superior ability in German 401-402 and who are planning a career in Germanic studies. Prerequisite: a grade of A in German 402 or permission of the chairman. Intensive practice in written and oral expression, 4 recitations; 2 laboratories; 4 credits.

601-602. Advanced Language and Style
This course, which is essential for all students intending to engage in study or research in a German-speaking country, is designed to develop native facility in the use of spoken and written German. Treatment of a wide range of topics in essays and oral reports. 4 recitations; 2 laboratories; 4 credits per semester.

605-606. Introduction to German Literature
Reading and analysis of works selected from the most important periods in German literature. Outside readings on the historical and cultural background of the works read. Papers and discussion in German. Term paper in English. This course or its equivalent is prerequisite to all higher literature courses in German. Prerequisite: B or better in 402 or C or better in 502. 4 credits.

685-686. Junior Year at Marburg
A program of studies at the University of Marburg (West Germany) for students at the University of New Hampshire who have completed their sophomore year and have passed a minimum of four full courses in German with an average grade of B or better. Those applying will be

* A student educated in a foreign country will not be permitted to register for any German or Dutch course on the 400 and 500 level if German or Dutch is the student’s native language.
expected to attend a non-credit orientation seminar regularly during the semester preceding their year abroad. Interested students should consult the department chairman. 32 credits.

693-694. The German Novella
An extensive study of the German novella with an interpretation of the most representative works of this special literary genre. Course will be conducted exclusively in German. Prerequisite: German 606 or permission of instructor. 4 credits.

695-696. Honors Work in German
For seniors writing a research paper in the honors program in German. Prerequisite: permission of department chairman. 4 credits.

707-708. Comparative Literature
For 1970-71, a study of the European novel of the twentieth century, taught by members of the faculty of the Departments of English, French and Italian, German and Russian, and Spanish and Classics. This course is the same as French 707-708 and Spanish 707-708.

726. German Culture and Civilization
A survey of the historical, social, artistic, and folkloristic developments in German-speaking countries from the beginnings to the present. 4 credits.

751-752. The Civilization of the Low Countries
A survey of the literature, art, history, and social structure of the Netherlands and Flanders from the beginnings to the present. This course is conducted in Dutch and English. 4 credits.

756. German Literature of the Age of Enlightenment
German literature from the Baroque period to the beginning of the period of Storm and Stress with emphasis on readings and interpretations of works of Lessing and Wieland. Prerequisite: German 606. 4 credits.

757-758. The Age of Goethe
The German literature of the Storm and Stress and the Classical Period; Wagner, Klinger, Lenz, Schiller and Goethe. 4 credits per semester.

761. Kleist—Holderlin—Jean Paul
Outstanding authors outside the Romantic School. 4 credits.

762. German Romanticism
German Literature from 1780-1830. Critical analysis and interpretation of prose, drama and poetry from Wachenroder to Eichendorff. 4 credits.

771. German Literature of Biedermeier, Junges Deutschland and Vormarz
A study of the works of Grillparzer, Morike, Stifter, Heine, Büchner and other writers of the Post-Romantic period. 4 credits.

772. The Age of Realism
The outstanding prose and lyrics of Keller, Meyer, Storm, Fontane, and others. 4 credits.

777-778. Bibliography and Advanced Stylistics
A study of the methods of bibliographical research including a thorough grounding in the techniques of German stylistics. Students will prepare an extensive bibliography and submit frequent research papers. 4 credits.

781. History and Development of the German Language
The changes in the sounds, structure, and vocabulary of the German language from the earliest record to the present. 4 credits.

783. Modern German Drama
Critical readings and discussion of works by Hauptmann, Schnitzler, Hofmannsthal, Brecht, Dürrenmatt, and others. 4 credits.

791. Methods of the Teaching of German
A critical study of modern language teaching at all levels from the elemen-
German and Russian

Tertiary school through college. The course emphasizes the use of the most modern equipment, including films, tapes and other audio-visual aids. 4 credits.

795, 796. Special Studies in Germanic Languages, Literature, and Culture
Topics to be arranged. Prerequisite: permission of instructor. 4 credits.

Russian (61)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Russian
Elements of Russian grammar. Oral practice and written drills designed to achieve a mastery of grammatical patterns. Reading of graded prose. Students who offer two or more entrance units of high school work in Russian will not be permitted to register for credit for Russian 401. No credit toward a major. 5 recitations; 2 laboratories; 4 credits.

501-502. Intermediate Russian
Review of Russian grammar. Reading of prose and practice in oral and written expression. Open by placement examination and to students who have passed Russian 402 with a grade of C or better. 4 recitations; 1 laboratory; 4 credits.

605-606. Introduction to Russian Literature
Readings of selections from Russian literature. Discussion and composition based on the texts read. Prerequisite: Russian 502 with a grade of B or Russian 502 with a grade of C and permission of instructor. 4 credits.

795-796. Special Studies in Russian Language and Literature
Courses of study in selected topics in Russian language and literature. 4 credits.

Greek

(See Spanish and Classics)

History (53)

Chairman: William R. Jones


ASSOCIATE PROFESSORS: Gibson R. Johnson, emeritus; William R. Jones, Allan B. Partridge, Robert C. Gilmore, Marion E. James, Douglas L. Wheeler, George E. Cunningham

ASSISTANT PROFESSORS: Charles E. Clark, Thomas M. Kemnitz, Allen B. Linden, Robert M. Mennel, Marc L. Schwarz, John O. Voll

INSTRUCTOR: J. Bradley Lentz

Lower-division (500-level) courses are primarily designed for freshman and sophomore students; upper-division (600-700-level) courses are primarily for junior and senior students.

Students are not permitted to enroll concurrently in survey courses and advanced courses of the same area. Nor are they eligible to enroll in elementary courses after having completed advanced courses in the same area. Exemptions from this rule are possible only through petition.

Basic Course

The following course is recommended for students who desire a general introduction to the study of history.

501, 502. World History
A historical analysis of the fundamental developments in human societies from the Paleolithic Age to the present. Special effort is made to view history from a world perspective and to analyze social and cultural as well as political factors of the human experience. Staff. 4 credits.
Group I. American History

503, 504. History of the United States
American history from Washington's first administration to the present. Political, social, economic, and diplomatic aspects. Staff. 4 credits.

505, 506. Afro-American History
A survey of experiences, aspirations, and contributions of black Americans from their ethnic origins in Africa to the present American crisis in race relations. The historical method and constructive criticism will be applied in this course in order to arrive at knowledge about America's black people. Extensive reading of available sources will be encouraged. Mr. Cunningham. 4 credits.

703. The Colonial Period of American History
Anglo-America from the late sixteenth century to the mid-eighteenth century, encompassing a general and interpretative view of the development of an Anglo-American culture along the eastern seaboard of North America. Mr. Rutman. 4 credits.

704. The Sources and Methods of Colonial American History
An introduction to the materials and methodology of the historian of Anglo-America, structured around a series of problems underlying the interpretations considered in History 703, specific approaches to these materials, and what historians have done with the materials. Prerequisite: History 703 and (for graduate students) permission of instructor. Mr. Rutman. 4 credits.

705, 706. America in the Eighteenth Century and the Revolution
American colonial and revolutionary history during the period from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. Mr. Gilmore. 4 credits.

711, 712. Nineteenth-Century America
The historical factors, both domestic and international, involved in the development of the American Republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. Mr. Jellison. 4 credits.

715, 716. Twentieth-Century America
United States history since 1896, from the triumph of industrialism on the national scene to the emergence of America as world power in the nuclear age. Political, economic, and diplomatic developments. Mr. Greenleaf. 4 credits.

719, 720. The Foreign Relations of the United States
Primarily the history of American diplomacy, with attention given to the non-diplomatic aspects of foreign relations. Mr. Long. 4 credits.

721, 722. History of American Thought
An examination of the ideas, considered in their social context, of significant American thinkers. First semester, 1600 to 1860. Second semester, 1860 to the present. Mr. Clark, Mr. Mennel. 4 credits.

723. American Historiography
An examination of the principal writings of American historians from the Colonial period to the present time. Emphasis will be given to those works that pertain mainly to the American people and their immediate neighbors. Mr. Jellison. Prerequisite: permission of instructor. 4 credits.

724. American Urban History
The primary emphasis of this course will be on the development of urban society in America from Colonial times to the present. However, lectures will also explore the comparative histories of
European and American cities. Mr. Men­nel. 4 credits.

725, 726. Afro-American History
Basic historical problems, with reference to the economic, political, and social conditions of black Americans, from the early slave-trade period to recent radical confrontations and the Black Power movement. Mr. Cunningham. 4 credits.

Group II. European History

535, 536. Modern European History
Europe from the end of the Middle Ages to the present. The evolution of the national state; international relations; the expansion of Europe overseas; and the background of modern Western civilization especially its ideas, literature, and art. A basic course for those who wish to proceed further in the study of European history as well as a survey for those who are interested in special aspects of Western cultural development. Staff. 4 credits.

559, 560. History of England
The history of the British Isles from earliest times to the present, and a consideration of the British Empire and Commonwealth of Nations. A parallel to English literature, a background to American political history, and a study of English culture and institutions in the democratic and social integration of the world. Mr. Partridge. 4 credits.

739, 740. Three Medieval Civilizations
A study of the demise of classical antiquity in the lands bordering the Mediterranean and the genesis and fruition of three new cultural traditions: the Latin Christian, the Islamic, and the Byzantine. Stress will be put on religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. Mr. Jones. 4 credits.

743. Renaissance and Reformation
The history of Europe during the fifteenth and sixteenth centuries with primary emphasis on the Italian Renaissance, the Protestant Reformation, and the emergence of the national state. Staff. 4 credits.

749. The Age of Revolution
Revolution as a socio-political phenomenon in its historical setting. Comparative approach to Puritan, American, and French revolutions with reference to contemporary movements. Mr. Gilmore. 4 credits.

756. Twentieth Century Europe
The background of World War I, the interwar period, the rise of European totalitarianisms, World War II, and the attempts to solve the conflicts of modern society in the post World War II period. Mr. Heilbronner. 4 credits.

759. History of Modern Spain and Portugal
The Iberian states and their peoples from the coming of liberalism to the present. Why Iberian liberalism and liberal government failed to triumph will be a featured theme. Political and social change will be emphasized as well as imperial and intellectual movements. In the study of two modernizing countries with persistent traditions, influences of Western European thought and activity will be included. Mr. Wheeler. 4 credits.

761, 762. England in the Tudor and Stuart Periods
An examination of the political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the Revolution of 1688-89. Mr. Schwarz. 4 credits.

763, 764. History of Russia
The development of the Russian state from its foundation to its present status as a world power. The course is designed to increase the understanding of the present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. Mr. Heilbronner. 4 credits.
History

767, 768. History of Germany
Germany and the various German states from the Reformation to the Third Reich and the presently divided Germany. The course will emphasize the relationship and importance of Germany to the rest of Europe. Mr. Lentz. 4 credits.

771, 772. Modern England
Emphasis will be placed on changes in the social and economic structure, and on political and intellectual changes. Mr. Kemnitz. 4 credits.

774. European Historiography
The central concern of this course will be approaches to history and the writing of history. The works of major European historians will be the material discussed in the course. Mr. Kemnitz. Prerequisite: permission of instructor. 4 credits.

Group III. Non-Western History
531, 532. Latin-American History
The development and influence of Spanish and Portuguese culture as a widespread world force; the history of the Latin-American peoples; the relationship of Latin America to North America, particularly in view of recent growth in friendly and diplomatic relations. Mr. Partridge. 4 credits.

575. The Ancient Near East
A history of the Near East from the neolithic revolutions to the time of Alexander the Great. Special attention will be given to the rise of civilization, the nature of man's artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt, and Judaism in its historical setting. Miss James. 4 credits.

576. The Aegean World
A history of the Aegean area from Crete to the death of Alexander the Great in 323 B.C. Miss James. 4 credits.

579, 580. The History of China and Japan
The development of Chinese and Japanese civilizations from their origins to the present. The course is intended to help the student understand how modern Chinese civilization and modern Japanese civilization reflect the conflict of traditional values of the Chinese and Japanese peoples and modern values learned from Europe and America. Mr. Linden. 4 credits.

585, 586. The History of the Middle East
The history of the Middle East from the time of Muhammad to the present. The first semester covers the origins and expansion of Islam and the nature of medieval Islamic civilization. The second semester covers Ottoman history, relations with European powers, and the emergence of modern nations in the Middle East. Mr. Voll. 4 credits.

587, 588. History of Africa South of the Sahara
Africa from ancient times to the present. First semester: from prehistoric times to 1860. Second semester: from 1860 to the present. Topics analyzed will include African migrations, kingdoms and societies, African responses to the slave trade, Islam, European imperialism and colonialism, and industrialization. African nationalism, independence, and post-independence problems will be studied. Mr. Wheeler. 4 credits.

777, 778. The Hellenistic-Roman World
The history of the Mediterranean and the Near East from the death of Alexander the Great to the collapse of the Roman and Persian Empires (fifth to seventh centuries A.D.). The course will cover the main political and social developments of the area, but will give most consideration to artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general
religious climate that prepared the way for Islam. Miss James. 4 credits.

(781). History of Modern China, 1850-1950
The modernization of China. The political, social, and cultural changes which have occurred in China from its early contacts with the West to the establishment of the Communist regime. Mr. Linden. 4 credits.

784. History of Southern Africa Since 1820
The struggle for political and economic control in the only region of Africa where European groups remain in power. With special attention to the development of European hegemony, the course will trace the impact of European imperialism, European settler nationalism, racial conflict, economic competition and industrialization, Apartheid, and Assimilation. Included will be a discussion of official American policy in this region. Mr. Wheeler. 4 credits.

785. The Modern Middle East
A history of the Middle East from the eighteenth century to the present time, with special attention given to the problems created by modernization and reform of the traditional society, the conservative reaction to reform, the impact of nationalism, and the appearance of new ideologies. Mr. Voll. 4 credits.

(787). Black Consciousness and Protest
A survey of the origins and cause of the rising consciousness and consequent activism of the peoples of Negro descent in the New World and in Africa from the early nineteenth century to the present. Will include lectures, discussions, and panels on protest literature, black nationalism, Pan-Negroism, Pan-Africanism, negritude, the Nation of Islam, and separatist religious sects in the Americas and Africa. The framework of the course will be cross-cultural and multi-disciplinary. Mr. Wheeler. 4 credits.

(793). Advanced World History
History from the perspective of the experience of the whole human community. The histories of separate areas will be examined in terms of their relationship to the general historical experience of man. Problems of interpretation, interrelationships, similarities, and differences in the development of the major traditions of civilization. Students will present oral and written reports as a basis for discussions. Mr. Voll. Prerequisite: permission of instructor. 4 credits.

Group. IV. Special Courses
(697). Colloquia for Senior History Majors
Intensive study of selected historical subjects in seminar or colloquium. Topics and instructor to be announced each year. Open only to history majors. This course is required of all history majors and it is expected that they will take this course during their senior year. Juniors may be admitted with the permission of the instructor. May not be repeated for credit except with the permission of the department. Offered both semesters annually. Depending on the particular subject, may be used to satisfy major requirements in American, European, or non-Western history. Staff. 4 credits.

(789). Seminar in the History of Science
Selected topics, conducted through special lectures, individual study, oral and written reports. The subject will vary from year to year. This course is the same as Physical Science (789). Cannot be used for credit in history without permission of the history department. Prerequisite: permission of adviser and instructor. Mr. Schneer. 4 credits.

History-Education 791. Problems in the Teaching of High School History and Other Social Studies
Bibliography and new interpretations of history; the social studies curriculum, past and present; aims and objectives in
the social studies; selection and organization of teaching material; teaching and testing techniques. Special emphasis on teaching American history and the problems of American democracy. This course may not be used to satisfy major requirements. Mr. Draves. 4 credits.

795, 796. Independent Study

Students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered may undertake an independent study project in that area. In order to register for independent study, the student must obtain the permission of his major adviser and a member of the faculty who agrees to supervise his study. Staff. 4 or 8 credits.

(797). Colloquia in History
Selected topics in American, European, and non-Western history. Open to advanced undergraduate and graduate students. Prerequisite: permission of instructor. Depending on the particular subject, may be used to satisfy the major requirements in American, European, or non-Western history. Staff. 4 credits.

Home Economics (31)
Chairman: Marjory A. Wybourn

PROFESSOR: Marjory A. Wybourn
ASSOCIATE PROFESSORS: M. Elizabeth Rand, Mary E. Holder, Earl O. Goodman, James L. Spangenberg
INSTRUCTORS: Virginia Griewank, Andrea Desjardins, M. Priscilla Royal, Andrée Poisson
LECTURER: Helen P. Hall

307 (307). Workshops
Supervised, non-credit workshops to develop skills in areas of individual need. A student may enroll in a workshop at any time it is scheduled in order to achieve the degree of skill desired. There may be some expense involved for materials. Limited to home economics majors. No credit. 1. Basic Clothing Construction; 2. Tailoring; 3. Basic Food Preparation; 4. Evaluation Devices; 5. Creative Activities for the Young Child; 6. Demonstration Techniques; 7. Home Management Techniques; 8. Interior Design.

407, 607. Professional Seminars
Designed to help the student define and clarify professional and educational objectives, to become acquainted with the philosophy, focus, and issues in home economics and with professional opportunities in the field. A student may enroll in the first half of the course in the freshman or sophomore year and the second half in the junior or senior year. Field trips and guest speakers will be an integral part of the course. HE 407: fee for field trips, $10. 2 credits each semester, NLG.

462. The Family in Societal Change —A Symposium
Why does a family exist? Are families needed in contemporary societies? What is a family? How are families affected by environment? How are individuals affected by families? These are some of the questions which will be explored in
Home Economics

an attempt to bring together and evaluate various points of view on crucial issues influencing families today. The focus will be cross-cultural, with participants and resource persons from various cultures. Conducted as a symposium with guest lecturers, faculty and student reactor panels, small group discussions, and guided reading. There will be opportunity for some community field trips and observation experiences with families. 4 credits.

465. Man in Families—
A Symposium
How is self concept formed and affected by families? How are male-female roles identified? How are man’s food, clothing, and shelter needs and functions satisfied and managed? How do child rearing practices differ? These are some of the questions which will be explored in a cross-cultural symposium. Lectures by guests and faculty members, reactor panels of family members from various income levels and cultural backgrounds, small group discussions, and guided reading. There will be opportunity for some participation with family groups. 4 credits.

507, (507). Field Experience
A supervised experience in the community which provides opportunity for students to explore various careers opportunities in nursery schools, day care centers, cooperative extension, programs for the handicapped, youth groups, schools, community and family welfare agencies, hospitals, and others. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits.

514. Textiles
Factors which affect the acquisition and use of clothing and textile products. Special consideration given to textile fiber and fabric properties, producer-retailer-consumer interrelationships, and the textile industry. 4 credits.

525, (525). Human Development
An examination of theories and supportive research concerning the development and guidance of the child from conception through adolescence. Observation in the preschool laboratory and/or other situations is included. 4 credits.

531, (531). Environmentics
The processes that shape man’s environments, i.e., philosophical, historical, scientific, creative, aesthetic. Application to interior design projects with emphasis on design. 4 credits.

557. Consumer Education
The role and responsibility of the consumer in an economic society. An examination of the decision-making framework through which the consumer may acquire skills in identifying and evaluating alternative choices in an increasingly complex market system. Student-developed problems will focus on some of the current social and economic issues that affect the lives of individuals. Team teaching by faculty from such areas as consumer economics, foods, and clothing. Field trips fee, $8. 4 credits.

573, (573). Human Nutrition
The functions, acquisition, and utilization of essential nutrients and the relation of nutrition to health during the various stages of life and in stress situations. 4 credits.

583, (583). The Young Adult
The concerns of the young adult from his viewpoint. Topics considered will include body change, social relations, personal achievement, respect, and issues identified by students. 4 credits.

615. Specialized Clothing Construction
The interrelationship of methods, processes, and techniques involved in pattern designing, custom tailoring, and advanced clothing construction. Laboratory experiences are provided for application of and experimentation with selected
principles. Mastery of basic skills is assumed. 4 credits.

626. The Young Child
Normal development and behavior with emphasis on the research concerning infancy and early childhood. The student will design and conduct an individual study with young children. Prerequisite: Home Economics 525 or equivalent. 4 credits.

627. Creative Activities in Preschool Programs
An exploration of how needs of young children are met through art, music, drama, literature, and science experiences. The focus will be an appreciation and understanding of the creative process and guidance of activities as a basis of curriculum development in preschool programs. The student will observe and participate in preschool programs. Prerequisite: Home Economics 525, home economics major, or permission of instructor. 4 credits.

657, (657). Management and Decision Making in the Family
An examination of the integrated nature of management in the family as a means to the realization of family goals and values. Particular emphasis is given to the decision function as the crux of management. Opportunities will be provided for direct experience in family situations. 4 credits.

671. Introduction to Food Science
Introduction to the experimental study of food, application of the principles underlying food preparation, and experimentation in comparative food preparation. Prerequisite: knowledge of basic food preparation principles. 4 credits.

674. Quantity Food Purchasing and Production
Principles and methods of quantity food purchasing and production. Laboratory experiences in University dining halls. Prerequisite: basic food preparation and permission of instructor. 4 credits.

683, (683). Family Relations
An examination of theories and supporting research concerning dynamics and patterns of interaction, role behavior, and development in families in specific cultural settings. Prerequisite: some background study in the behavioral sciences. 4 credits.

685, (685). One Semester at the Merrill-Palmer Institute
A junior or senior student in the Department of Home Economics may attend the Merrill-Palmer Institute in Detroit, Michigan, for one or two semesters. Enrollment by application to the Department of Home Economics. See page 79. 15-17 credits per semester.

(694), 694. Supervised Teaching in Home Economics and Family Life
Supervised teaching in a school. See page 91 for a description of the secondary student-teaching Block Program. 8 credits.

695, (695). Independent Study
A student who has shown special ability in a selected area of home economics may, with department approval, elect to work on a problem of special concern in the area of her choice. Regular conferences with an adviser are required. Prerequisite: department permission. One or more semesters. 2 or 4 credits.

707, (707). Practicum with Children and Families
A planned supervised experience with children or families at both participating and observing levels. The practicum is designed to increase the students' awareness and understanding of the ways human beings grow and behave and the dynamics of the family. Weekly discussions will be combined with individual and small group supervisory conferences. Students have the opportunity to choose a focus for their practicum from among the following areas: 1. Young children, e.g., preschool program; 2. School-age children; 3. Adolescents; 4. Children and parents; 5. Low-income families, e.g.,
management experiences. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits, maximum of 6 credits in one area.

(715). Clothing in Relation to Human Behavior
The analysis of research and theory in the social psychological aspects of clothing. An exploration and study of clothing behavior of individuals and groups. Special emphasis given to stages of the life cycle, development of the self, and the phenomenon of fashion. 4 credits.

725. Preschool Programs
The organization and operation of programs for young children. Theoretical knowledge about children and educational techniques will be related to the curriculum, facilities, and administration in a variety of group programs for young children. Field trips will be planned. Prerequisite: Home Economics 627, home economics major, or permission of instructor. 4 credits.

754. Personal and Family Finance
Major financial alternatives available to families during the various stages of the family life cycle. 4 credits.

774. Nutrition and Disease
Application of principles of normal nutrition to clinical problems with description of altered nutrient requirements in human disease. Diet therapy as an applied aspect of clinical nutrition is considered. A practicum in a field situation will be a part of the experience. Prerequisite: Home Economics 573 or equivalent. 4 credits.

(776). Nutrition—A World View
The major nutritional problems facing the world today. Consideration of protein-calorie malnutrition, obesity, nutritional status of adolescents, and special nutritional problems of pregnancy, infancy, childhood, and the aging. An exploration of concepts and methodologies for nutrition education. Prerequisite: Home Economics 573 or equivalent. 4 credits.

(786). Dynamics of Family Change
An examination of the theories and supporting research of the intervention techniques used to affect changes in family behavior. The secondary focus is the student’s examination of his interaction processes and their effect on intervention efforts. Prerequisites: Home Economics 683 and Psychology 545. 4 credits.

791, (791). Methods of Teaching Family Life and Home Economics
Home economics education in the school program, curriculum materials, methods, and resources in teaching home economics and family life. Offered each semester as part of the secondary student-teaching Block Program and as an independent course in alternate years. 4 credits.

(793). Sex Education in Home, School, and Community
An exploration of human sexuality and of programs, materials, and methods for sex education in home, school, and community. Issues, community mores, goals, and values will be examined. 4 credits.
feeding, leisure time, and allied fields. NLG. 0.5 credits each.

509. Financial Analysis and Controls
A specific approach to the unique controllership of the lodging and feeding industries, demonstrating concern for the perishable commodities as related to the personal production, service, time factors, and the mobile characteristic of the customer. 4 credits.

655. Management for Transient, Leisure, and Institutional Services
Planning of feasibility, development, financing, and organization, relating to the price mechanism involving costs and economic life. Case studies provide observation of production and cost functions, human motivation, and institutional behavior, with the customers present. 4 credits.

656. Management of Physical Structures
Analysis of the components of physical structures as functional units through logical development of principles rather than application of formulae and rigid rules. The concept of building management is presented as demonstrating the interdependence of planning, construction, equipment, maintenance, personnel, and the on-premise customer. 4 credits.

666. Markets and Promotion of Public Services
Aspects of the services market with emphasis on consumer behavior. Internal and external stimulation of sales in competitive and non-competitive markets, and the vagaries of environmental concept. Experimental techniques embodied in industry sponsored sales-blitz activities. 4 credits.

667. Functional Management
Experiences in organizational behavior within the framework of functional services. The responsibility of management is assumed in various roles involving marketing, promotion, sales, production, personnel, and customer attitudes. 4 credits.

695. Independent Analysis
An independent study and research project for honor students performed for the advancement of knowledge in the lodging and feeding fields. Prerequisite: senior standing and permission of instructor. 4 credits.

698. Seminar
Explorations of techniques, procedures, and policies of the service industries. Case studies augmented through discussions of the various related areas of administration. 2 credits.

### Humanities (43)

501-502. Humanities
A course in general education involving the departments of English, French and Italian, German and Russian, Spanish and Classics, Philosophy, The Arts, and Music. It aims to develop an appreciation of literature, the various arts, and philosophy, and to give an understanding of western cultural traditions. The course will operate within a historical framework but is not intended to be a historical survey. Weekly lectures or demonstrations, readings, slides, films, recordings, class recitations, and discussion. There will be at least one museum trip each semester. Mr. Caldwell, Mr. Casas, Mr. Leighton (chairman), Mr. Maynard, and guest lecturers. Not open to freshmen. 4 credits.
Italian
(See French and Italian)

Latin
(See Spanish and Classics)

Liberal Arts (40)

400. Understanding and Changing Knowledge and Man
The emphasis will be on understanding the problems and paradoxes in current knowledge and presenting an alternative system which provides the means for changing knowledge and the individual person. Principles developed in class will provide the student with tools for defining problems, asking significant questions, planning, and making decisions so that he can construct a more adequate personal system of knowledge. The integration of knowledge and the development of skills for criticizing knowledge will be stressed. The course will prepare the student to be an active participant in the college community. There will be 3 lectures and 1 discussion group weekly. Mr. Jervis. 4 credits. NLG.

695, 696. Independent Study (Honors)
Independent study for the College of Liberal Arts junior or senior honor student whose major department has no independent study course. Prerequisite: junior or senior with honor standing (cumulative average of at least 3.0), approval of student's supervisor, and the department. A junior may register for a total of 8 credits and a senior for a total of 12 credits. See description of the College of Liberal Arts Honors Program.

Mathematics (84)
Chairman: M. Evans Munroe

Associate Professors: David M. Burton, William E. Bonnice, Homer Bechtell, Robert O. Kimball, Eric Nordgren
Assistant Professors: Frederick J. Robinson, William G. Witthoft, Samuel D. Shore, Christopher C. White, Albert B. Bennett, Jr., Berrien Moore, III
Instructors: B. Robert Ellis, James W. Estes

403. Introduction to Digital Computer Programming
Development of algorithms and programs. Basic programming and programming structure utilizing the FORTRAN IV language. Introduction to the use of an operating system. Basic data representation. Computer solution of numerical and non-numerical problems. 2 credits.

404. Intermediate Programming of Digital Computers
Use of operating systems and programming systems. Data representation and the use of number systems in computers. Basic computer organization. Survey of computers, systems, and applications. Computer solution of numerical and non-numerical problems using the IBM 360's operating system and remote access computing system. Prerequisite: Mathematics 403. 2 credits.

405. Introductory College Mathematics
Enrichment and development of the material presented in the last part of the senior high school mathematics program. Content: trigonometry, analytic geometry, theory of equations, inequalities, number systems, permutations and
combinations; elementary set theory. Prerequisite: 3 entrance units in college preparatory mathematics. 4 credits.

410. Digital Computer Systems
    Development of algorithms and programs. Basic programming and program structure utilizing the FORTRAN IV language. Use of programming systems and operating systems. Data representation and the use of number systems in computers. Basic computer organization. Survey of computers, languages, and applications. Computer solution of numerical and non-numerical problems using the IBM 360's operating system. 4 credits.

415. Mathematics of Business and Economics
    Topics in analytic geometry, integrals and derivatives, partial derivatives, maxmin problems (in one and several dimensions), areas, matrices, and systems of linear equations. Prerequisite: 3 entrance units in college preparatory mathematics. Classes through reading period. 4 credits.

420. Fundamental Mathematics
    A presentation of basic ideas in several branches of mathematics; sets and functions, calculus, linear algebra, linear programming, abstract algebra. Prerequisite: 3 entrance units in college preparatory mathematics. 4 credits.

425. Calculus I
    First course in analytic geometry and calculus. Prerequisite: at least 3 entrance units in college preparatory mathematics including trigonometry. Classes through reading period. 4 credits.

426. Calculus II
    Conclusion of introductory course in calculus of functions of one argument. Prerequisite: Mathematics 425. Classes through reading period. 4 credits.

527. Differential Equations
    Basic exact and approximate methods for solving ordinary differential equations; first order equations; higher order linear equations; sequences and infinite series; series solutions of second order linear equations; linear systems; Laplace transforms; elementary nonlinear equations. Prerequisite: Mathematics 426. Classes through reading period. 4 credits.

528. Multidimensional Calculus
    Theory, methods, and applications of partial differentiation; composite functions and chain rules; maxima and minima; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; integral theorems. Prerequisite: Mathematics 426. Classes through reading period. 4 credits.

621. Arithmetic for Elementary School Teachers
    Basic concepts of logic and sets; real numbers and subsystems (properties, history, algorithms, problems of pedagogy); numeration systems; number theory (elementary properties of integers, Euclidean algorithm, divisibility, and figurate numbers.) Prerequisite: consent of instructor. 4 credits.

622. Algebra for Elementary School Teachers
    Functions (relations, operations, graphs, polynomials and their roots, and systems of equations); finite systems (modular arithmetic, linear congruence, and symmetries); groups, rings, and fields (elementary concepts with applications to numbers systems and factoring.) Prerequisite: Mathematics 621. 4 credits.

623. Geometry for Elementary School Teachers
    Euclidean geometry (construction and basic concepts of plane and solid geometry); analytic geometry (basic concepts, applications to geometry), congruences and similarity, vectors (operations and applications). Prerequisite: Mathematics 622. 4 credits.
635. Partial Differential Equations
Sturm-Liouville problems; exact and approximate determination of characteristic values and functions; Fourier series and Fourier integrals; solution of boundary value problems for partial differential equations by series and integrals; classification, canonical forms, and basic concepts of second order linear partial differential equations; elliptic, parabolic, and hyperbolic equations. Prerequisites: Mathematics 527 and 528. 4 credits.

640. Linear Algebra
Vector spaces, matrix algebra, bases and linear transformations, determinants, inner products, quadratic forms. Prerequisite: Mathematics 426. 4 credits.

645-646. Analysis for Applications
Real functions; uniform convergence; matrix algebra; special functions; second order ordinary differential equations; Sturm-Liouville problems; Green functions; Fourier expansions. Prerequisites: Mathematics 527 and 528. 4 credits.

656. Introduction to Number Theory
Unique factorization, linear and quadratic congruences, quadratic reciprocity law, arithmetic functions, quadratic forms, an introduction to algebraic numbers. Prerequisite: Mathematics 640. 4 credits.

657. Geometry I
Fundamental properties of Euclidean geometry from an advanced standpoint. Prerequisite: Mathematics 640. 4 credits.

658. Geometry II
Systems of postulates of various geometries, geometric invariants, synthetic and analytic projective geometry, introduction to non-Euclidean geometry. Prerequisite: Mathematics 640. 4 credits.

682. Nonlinear Differential Equations
Phase plane analysis of linear and nonlinear autonomous systems; critical points; limit cycles; periodic solutions; approximate methods for second order nonlinear ordinary differential equations; stability and asymptotic behavior of solutions of linear and nonlinear equations. Prerequisite: Mathematics 527. 4 credits.

696. Independent Study
Individual study projects in various areas of mathematics as determined to be of interest and value to the student and the department. Supervision is by an appropriate faculty member. Consent of the faculty supervisor and department chairman is required. 1-6 credits.

698. Senior Seminar
Individual study on special topics. Preparation and presentation of reports on topics assigned. Prerequisite: senior standing in mathematics. 4 credits.

710. Advanced Programming Systems
An introduction to computer systems organization, machine language, and digital representation of data. Software studied are assemblers, loaders, system utility programs, and macros. All programming will be done in basic assembly language on the IBM 360. Prerequisite: Mathematics 410 or equivalent. 4 credits.

735. Probability
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prerequisite: Mathematics 528. 4 credits.

736. Statistics
Sampling theory, estimation of parameters, testing of hypotheses, non-parametric methods. Prerequisite: Mathematics 735. 4 credits.

753, 754. Numerical Methods and Computers
This course is oriented toward the use of numerical analysis on digital computers (with laboratory). Computer organization, algorithmic languages, and compilers, solution of polynomial and transcendental equations, numerical solutions of differential equations, linear
systems of equations, eigenvalues and eigenvectors, polynomial interpolation, quadrature, curve fitting, discussion of errors, systems simulations, and mathematical optimization techniques. Selected algorithms will be programmed for solution on high-speed computers in the Computation Center. Prerequisites for 753: Mathematics 410 and 426. Prerequisites for 754: Mathematics 410 and 527. 4 credits.

763-764. Abstract Algebra
Groups, rings, integral domains, fields, and linear algebra. Prerequisite: Mathematics 640. 4 credits.

765-766. Advanced Calculus
A rigorous study of limits, derivatives, and integrals in one and several dimensions, vector calculus, line and surface integrals. Prerequisite: Mathematics 528. 4 credits.

767-768. Real Analysis
Topology of the real line, sets and countability, metric spaces, topology of Euclidean spaces, limits, sequences and series, continuity, differentiation, integration, uniformity of limit operations, equicontinuity, function spaces, inverse and implicit function theorems. Prerequisite: Mathematics 528. 4 credits.

776. Logic
Development of formal mathematics. Discussion within that system of formal systems. Consistency, completeness, decidability. Prerequisite: Mathematics 640. 4 credits.

780. Theory of Ordinary Differential Equations
Fundamental existence and uniqueness theorems; linear systems and higher order linear equations; Wronskian theory; classical Sturm Theorem and generalizations; boundary value problems for second order linear equations. Prerequisites: Mathematics 527, 640, and 767. 4 credits.

784. Topology
Basic topological notions, connectedness, compactness, metrizability, with special emphasis on the real line and plane. Prerequisite: Mathematics 640. 4 credits.

788. Complex Analysis
Complex functions, sequences, limits, differentiability and Cauchy-Riemann equations, elementary functions, Cauchy’s theorem and formula, Taylor’s and Laurent’s series, residues, conformal mapping. Prerequisite: Mathematics 528. 4 credits.

791. Mathematics-Education
A study of secondary school mathematics curriculum problems and the recommendations of various study groups concerning secondary school mathematics. Prerequisites: Education 481 and 757. 4 credits.

793. Calculus on Manifolds
Differentiable manifolds; differential forms; exterior and Grassman Algebras; integration of differential forms; Stokes’ Theorem; closed and exact differential forms. Prerequisites: Mathematics 640 and 767. 4 credits.

Mechanical Engineering (85)
Chairman: Robert W. Corell

PROFESSORS: Edward T. Donovan, emeritus; E. Howard Stolworthy, emeritus; Robert W. Corell, Godfrey H. Savage, Charles K. Taft, Asim Yildiz


ADJUNCT ASSOCIATE PROFESSOR: Wayne M. Beasley

341. Introduction to Manufacturing
A course to orient students so that they can safely operate basic machine tools on design projects or in a home workshop. Two 2½-hour sessions per week for 6 weeks (first half of semester). No reading period required. 0 credit.

413. Engineering Graphics
Communication of engineering information and concepts by multiview drawings, pictorial views, sketches, and graphs. 1 laboratory; 2 credits.

414. Engineering Graphics
The analysis of various engineering problems employing the fundamentals of descriptive geometry. Prerequisite: Mechanical Engineering 413. 1 laboratory; 2 credits.

441, (441). Engineering Graphics 
and Computer Programming
Communication of engineering information and three-dimensional concepts by multiview drawings, pictorial views, sketches, and graphs; including the fundamentals of descriptive geometry, and elements of computer technique. 3 laboratories; 4 credits.

501-502. Dynamic Linear
Systems I and II
Dynamics of electrical and mechanical linear systems, mathematical modeling, linear system transient and steady-state analysis, Laplace transforms and convolution, Fourier series and spectra. Prerequisites: Mathematics 426 and Physics 408. 2 lectures; 2 recitations; 4 credits.

503, (503). Thermodynamics I
The fundamental laws of thermodynamics and their relation to working substances. Prerequisite: Mathematics 426. 4 credits.

504. Thermodynamics II
A comprehensive study of the laws of thermodynamics and their application to real systems, presented as lectures and experimental studies; behavior of ideal and real media; thermodynamics of non-reactive and reactive mixtures. Prerequisite: Mechanical Engineering 503. 4 credits.

508. Fluid Dynamics
Introduction to the dynamics and thermodynamics of compressible and incompressible fluid flow; analysis of the behavior of fluids as expressed by hydrostatic, continuity-momentum, and energy equations. Prerequisites: Mechanical Engineering 503 and 524. 4 credits.

515-516. Systems Laboratory I and II
Introductory experiments with electrical and electromechanical systems. To be taken concurrently with Mechanical Engineering 501, 502. 1 credit.

523-524. Solid Mechanics I and II
The static and dynamic behavior of rigid and deformable bodies. Equilibrium, compatibility, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods; stress and deformation in materials and simple structural elements. Review of particle dynamics; kinematics and kinetics of rigid bodies. 4 credits.

541. Manufacturing Processes and Design
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. ½-hour lecture before 2-hour laboratory (2 times per week); no reading period required; 4 credits.

542. Methods in Manufacturing
A project course for students who wish to obtain more experience on machine tools. Prerequisite: Mechanical Engineering 341 or 541. Two 2½-hour laboratories per week; no reading period required; 2 credits.

561. Materials I
Theoretical and experimental studies of the structure and thermodynamics of solids. 3 lectures; 1 laboratory; 4 credits.
562. Materials II
The origins of the electronic and mechanical properties of solids. 3 lectures; 1 laboratory; 4 credits.

643-644. Elements of Design I and II
Synthesis, analysis, and design of machine components. Development of engineering judgement; selection of materials; kinematic arrangements; design factors; failure criteria; fluctuating loads; design for finite and infinite life; stress concentration; statistical methods. Prerequisites: Mechanical Engineering 523 and 524. 2 1-hour periods; 1 2-hour period; 4 credits.

646. Deterministic and Stochastic Measurement
The dynamic analysis of instrumentation systems, the resulting dynamic measurement errors, measurement system synthesis for specified dynamic accuracy and methods of correcting data which has dynamic errors. Introduction to the description of stochastic processes. Fourier transforms, power spectral density and autocorrelation functions and their application to measurements on systems with random excitation. 4 credits.

691. Economic Decision Making in Engineering
The principles that form the basis for making engineering decisions to obtain the most favorable economic results. Prerequisite: senior standing. 4 credits.

695 a-d—696 a-d. Mechanical Engineering Undergraduate Projects and Independent Study
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. 2-4 credits.

697-698. Mechanical Engineering Seminar
2-4 credits.

699. Undergraduate Thesis
2-4 credits.

701. Macroscopic Thermodynamics
A continuation of the study of thermodynamic principles using an analytical approach consistent with that of Gibbs and Caratheodory. 4 credits.

702. Statistical Thermodynamics
An introduction to statistical thermodynamics. 4 credits.

703. Heat Transfer
Analysis of heat transfer phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. 4 credits.

704. Experimental Heat Transfer
Experimental methods in the study and solution of heat transfer problems, including a critical comparison with analytical and other methods. Literature surveys and written and oral presentation of results will be emphasized. 4 credits.

707. Analytical Fluid Dynamics
An analytical study of the dynamic behavior of fluids. Topics include potential flow, development of the Navier-Stokes equations, turbulence, and boundary layer theory. 4 credits.

708. Gas Dynamics
Basic equations of motion of one-dimensional, subsonic and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. 4 credits.

715. Internal Combustion Engines
Application of basic and engineering science to the engineering problems of spark and compression ignition engines, design, management, and reporting of experimental studies. 4 credits.

716. Propulsion Systems
Application of basic engineering sciences to the engineering problems of propulsion systems. 4 credits.

723. Advanced Dynamics
A traditional course in classical mechanics with an orientation to contempo-
Mechanical Engineering


724. Introduction to Vibrations
The theory of discrete vibrating systems is treated in depth. Review of linear system concepts and detailed treatment of the single degree of freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods. Introduction to continuous systems. Applications are made both to structural and mechanical systems. 4 credits.

726. Experimental Mechanics
Experimental methods and their underlying theoretical bases are developed and applied to the measurement of stress, strain, and motion. 4 credits.

727. Advanced Mechanics of Solids
Advanced topics in the mechanics of solids are treated in depth; beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 credits.

730. Mechanical Behavior of Materials
The elastic and inelastic behavior of materials, both organic and inorganic, is studied from the micromechanics and macromechanics points of view. Concepts of stress, strain, and constitutive relations are reviewed and related to recent developments in dislocation theory and other phenomena on the atomic scale and to continuum mechanics on the macroscopic scale. Mechanical behavior including elasticity, plasticity, viscoelasticity, creep, fracture, and damping will be treated. Anisotropic and heterogeneous materials such as composite materials will be studied in detail. 4 credits.

741. Control of Physical Systems
Theory and methods for modeling and evaluating fluidic, hydraulic, and pneumatic control systems. 4 credits.

751. Naval Architecture in Ocean Engineering
Naval architectural principles related to surface and submerged vehicles are developed—including hydrostatic characteristics, fundamentals of powering and rules and regulations of importance to this aspect of ocean engineering. Prerequisites: Mechanical Engineering 508 or permission of instructor. 4 credits.

761. Crystalline Solids
Theoretical and experimental studies of the structure of crystalline solids using X-ray diffraction techniques. 4 credits.

763. Microstructure of Solids
Theoretical and experimental studies of the microstructure of solids using optical and electron microscopy. 4 credits.

Mathematical methods in engineering sciences are discussed, including methods for solution of discrete and continuous systems. Course includes a review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 credits.

793 a-d—794 a-d. Special Topics in Engineering
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. Content of these courses may vary from year to year. 2-4 credits.

795 a-d—796 a-d. Independent Study
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. 2-4 credits.
Medical Technology (92)
Chairman of the Program:
Theodore G. Metcalf

761-762. Clinical Laboratory Methods
An 11-month course in medical technology taken at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. This course starts about June 20, and includes lectures and laboratory work in bacteriology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. Credits will be allowed when the University has received a transcript of the candidate's record and upon certification by the Director of the School and the Supervisor of the Medical Technology curriculum that the work has been successfully completed. This course qualifies a candidate for the examination for the Medical Technology's Certificate administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists. 32 credits.

This course cannot be taken for graduate credit.

Microbiology (47)
Acting Chairman:
Theodore G. Metcalf

PROFESSORS: Theodore G. Metcalf, Lawrence W. Slanetz, Galen E. Jones, William Chesbro
ASSISTANT PROFESSOR: Fred T. Hickson

501. Public Health and Sanitation
The nature and types of microbes which cause infectious diseases; the prevalence, transmission, and control of these diseases. Sanitation of water, sewage, food, and air. Community hygiene and public health administration. Mr. Slanetz. Prerequisite: Biology 401, 402 or permission of instructor. 4 credits.

503. General Microbiology
Principles of microbiology; morphology, physiology, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Mr. Chesbro, Mr. Hickson, and staff. Prerequisite: Chemistry 401-402 or equivalent. 2 lectures; 2 laboratories; 4 credits.

600. Environmental Microbiology
Relation of microorganisms to food production; food preservation; food infections and intoxications; standard laboratory methods for the bacteriological examination of foods. Microbiology and sanitation of milk, water, sewage, air, and eating utensils. Disinfection and disinfectants. Mr. Chesbro. Prerequisite: Microbiology 503. 2 lectures; 2 laboratories; 4 credits.

701. Advanced Microbiology
The growth, nutrition, and metabolism of microorganisms; consideration of cell structure and localization of function; aspects of genetic and non-genetic regulation of metabolism; study of the influence of chemical and physical factors of the environment upon microorganisms. Mr. Chesbro and Mr. Hickson. Prerequisite: Microbiology 503. 2 lectures; 1 laboratory; 4 credits.

702. Pathogenic Microbiology
The morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Mr. Metcalf. Prerequisite: Microbiology 503. 2 lectures; 1 laboratory; 4 credits.

705. Immunology and Serology
The defensive elements possessed by men and animals which serve to protect them from infectious microorganisms. The principles of serological techniques used in the recognition and identification of biological materials including microorganisms. The preparation of
vaccines and the production of antisera in animals. Mr. Metcalf. Prerequisite: Microbiology 702. 2 lectures; 2 laboratories; 4 credits.

706. Virology
The animal and plant viruses, including bacteriophages and the rickettsiae; a consideration of techniques for the propagation and recognition of animal viruses; a study of the interactions between virus and host cell and the application to problems of plant or animal infections caused by viruses. Mr. Metcalf. Prerequisite: Microbiology 702. 2 lectures; 2 laboratories; 4 credits.

707. Marine Microbiology
Characterization of microbes in the sea as to taxonomy, physiology, ecology, and transformation of carbon, nitrogen, sulfur, and phosphorous; methods of sampling and enumeration; biogeochemistry; properties of sea water and the marine environment. Parallels to soil microbiology will be drawn. Mr. Jones. Prerequisite: Microbiology 503 and biochemistry. 2 lectures; 1 laboratory; 4 credits.

795, 796. Problems in Microbiology
Special problems, depending upon the training and desire of the student. Prerequisite: permission of department chairman and staff concerned. 4 credits.

797, 798. Microbiological Literature
Reports and discussions on current literature and recent developments in microbiology. Staff. Prerequisite: permission of instructor. 1 2-hour period; 2 credits.

Music
Chairman: Keith Polk

ASSISTANT PROFESSORS: Keith Polk, Mark DeVoto, Stanley Hettinger, Cleveland Howard, Ada-Louise Rogers, John Rogers, Paul Verrette, Howard Williams

VISITING ASSISTANT PROFESSOR: Mary Rasmussen

LECTURERS IN MUSIC: Donald Bravo, Howard Chadwick, Lynda Copeland, Frances Drinker, Ruth Edwards, Madeline Foley, Paul Gay, Nancy Hunziker, Meredith Jones, Natalo Paella, Carolyn Skelton, John Skelton, Richard Summers, R. Peter Sylvester

History, Literature and Appreciation (63)

401. Introduction to Music
A fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective is utilized in cultivating the skill of listening, but the main emphasis is on confronting significant works of musical art on their own terms. Some participation in the musical life of the University community is also required. Not open to music majors. 4 credits.

402. Survey of Music History
A survey of the historical development of musical style in relation to the whole fabric of Western civilization. Prerequisite: Music 401. Not open to music majors. 4 credits.

501, 502. History and Literature of Music
An introduction to the styles, forms, and techniques of composition in Western music. Mr. Polk and Mr. DeVoto. Required of all music majors. 4 credits.

511. Survey of Music in America
The development of music in the United States from Colonial times to the present, including the various European influences, the quest for an American
style, and the emergence of such indigenous phenomena as jazz. Prerequisite: Music 401 or 501. 4 credits.

521. Introduction to the Music of Africa and Asia
A survey of the folk and classical music of various ethnic cultures, particularly those of Japan, India, and sub-Saharan Africa. Prerequisite: Music 401, 501, or permission of instructor. 4 credits.

595. Special Topics in Music Literature
This course allows both music majors and non-majors to explore any of a variety of topics mutually agreed upon by students and instructor. The subjects will be in areas not easily covered in courses operating in the usual historical framework. Conferences and papers as required by the instructor in charge. May be repeated for credit. 4 credits.

695. Honors Program, Independent Undergraduate Study
An honors program involving two types of work: (1) The student pursues independent study in one or more specialized areas. (2) The student attends a seminar concerned with an area in which no appropriate course is offered in the undergraduate curriculum. The student will be given an opportunity in the seminars to discuss his own research with members of the faculty and other participating students. Prerequisite: an average of 3.0 or show exceptional aptitude for music and permission of instructor. 2 or 4 credits.

701. Music of the Medieval Period
The nature of the beginnings of polyphony. The pre-eminent influence of the church in the thirteenth century and the rising secular movement in the fourteenth. Music as a dominant force in the political and social life of the Middle Ages. Mr. Wicks. Prerequisite: permission of instructor. 4 credits.

703. Music of the Renaissance
A study of the works of the composers of the fifteenth and sixteenth centuries from Dunstable to Palestrina. Mr. Wicks. Prerequisite: permission of instructor. 4 credits.

705. Music of the Baroque
A study of the music of Europe from DeRore to Handel. Particular attention is given to the profusion of styles and forms in the seventeenth century. Mr. Wicks. Prerequisite: permission of instructor. 4 credits.

707. Music of the Classical Period
The growth of musical styles and forms from early classical, Baroque-influenced composers, through the high classicism of Haydn and Mozart, to the budding romanticism of the young Beethoven. The class will hear representative works in the areas of symphony, concerto, and opera. Mr. Grishman. 4 credits.

709. Music of the Romantic Period
The symphonies, concerti, chamber music, and keyboard works of Beethoven, Berlioz, Schubert, Mendelssohn, Schumann, Brahms, Franck, Chopin, and Liszt. Romantic elements contained in the development of harmony orchestration, sonority, expressive content. The rise of the short piano piece, the German art song, the symphonic poem, nationalism in music. Mr. Steele. 4 credits.

711. Music of the Twentieth Century
A study of contemporary music including its literature, its trends, and an analysis of techniques, styles, forms, and expression. 4 credits.

721. The Life and Works of Beethoven
The piano sonatas, the concerti, symphonies, and string quartets. Lectures, analysis, reports, required readings and listening. 4 credits.

731. The Lied
Study of the history and literature of the German art-song, with special emphasis on the nineteenth and early
Music

twentieth centuries. Prerequisite: permission of instructor. 4 credits.

732. The Art Song
This course will emphasize the non-German song of the late nineteenth and twentieth centuries. Prerequisite: permission of the instructor. 4 credits.

733. Survey of Opera
An investigation of representative masterpieces of this art form through listening, reading, and discussion. Mr. De Voto. 4 credits.

734. Survey of Oratorio
This course attempts to place the oratorio in clear historical perspective in relation to other forms of church music as well as opera. Mr. Wicks. 4 credits.

735, 736. Survey of Pianoforte Literature
The history and development of keyboard literature from Bach to the present. A discussion and performance of the works of Bach, the sonatas and concerti of Haydn, Mozart, Beethoven, Schubert, the Romantic composers, and of contemporary writers. Mr. Steele. 4 credits.

795. Special Studies in Music Literature
Presuming a sound musical background, this course allows the student to investigate independently and in depth any of a vast range of subjects. Barring duplication of material, this course may be repeated for credit. Prerequisite: permission of instructor. 4 credits.

Performance (63)

Registration for musical organization courses should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.

Private lessons are based on half-hour individual instruction per week. One semester hour credit may be earned with one lesson per week; two or four semester hours of credit may be earned with two lessons per week (only students in the Bachelor of Music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $25 per half-hour lessons (this fee applies for courses numbered 541 through 559). The fee includes the use of a practice room for the required preparation. Majors in performance study in the Bachelor of Arts curriculum are required to present 16 semester hours of private study over a period of four years. Four semester credits taken in the freshman year are regarded as prerequisite to the performance option.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Music Department and instructor. Enrollment is limited in these courses. A student may register for credit in successive semesters.

441. Concert Choir—Techniques and Literature
A choral group devoted to study and performance of the best classical and modern choral literature. Recommended for men and women voice majors. Open to all interested students. Mr. Howard. Prerequisite: permission of instructor. 2 laboratories; 1 credit.

442. Chamber Chorus
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present. The chorus participates from time to time with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental works. Mr. Howard. Prerequisite: permission of instructor. 2 laboratories; 1 credit.

443. Women’s Glee Club
Open to all students interested in singing the finest literature in this medium and who can fulfill the requirements of
a tryout. Recommended for all women voice majors. Prerequisite: permission of instructor. 2 laboratories; 1 credit. NLG.

444, (444). The Newhampshiremen
The male chorus of the University. Open to all students interested in singing the finest of literature in this medium and who fulfill the requirements of a tryout. Recommended for all men voice majors. Mr. Howard. Prerequisite: permission of instructor. 2 laboratories; 1 credit. NLG.

445. Summer Session Chorus and Basic Conducting
A choral group devoted to the study and performance of the best classical and modern choral literature. The basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. 1 credit. (Special Summer Session course which may be repeated.)

448, (448). Opera Workshop
Experience in operatic singing, acting, and production techniques is offered through performance of both complete operas and operatic excerpts. Prerequisite: permission of instructor. 1 credit.

450, (450). University of New Hampshire Symphony—
Techniques and Literature
The orchestra, open to all students on the basis of individual auditions, presents several concerts during the year of repertoire ranging from the great standard symphonic literature to experimental multi-media composition. Mr. Grishman. Prerequisite: permission of conductor. 2 laboratories; 1 credit.

451, (451). University of New Hampshire Training Orchestra
The training orchestra is designed for music education majors but is open to all who wish to develop instrumental proficiency on their major or secondary instruments. The course provides ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for participation in the UNH Symphony. 2 laboratories; 1 credit.

452. University of New Hampshire Symphonic Wind Ensemble
The Wind Ensemble studies and performs the finest in wind instrument literature and is open to all students on the basis of audition. Performances include campus concerts and tour appearances throughout New England. Mr. Hettinger. Prerequisite: permission of instructor. 4 laboratories; 1 credit.

453. University Band
The University Band repertoire is chosen from the standard band literature and includes original band music, transcriptions, marches, etc. The University Band functions as a musical outlet for those students whose schedule or interest does not permit music as a major interest, but are interested in maintaining their playing proficiency and continuing their study of music. Mr. Hettinger. Prerequisite: permission of instructor. 2 laboratories; 1 credit.

454. University of New Hampshire Marching Band
The Marching Band is open to all students and performs during the football season at home and away games. Rehearsals of the Marching Band conclude at the end of the football season. Prerequisite: permission of instructor. Students planning to remain in the band program at the conclusion of the football season should register for Music 452 or 453. 4 laboratories; 0 credit.

455, (455). Piano Ensemble—
Techniques and Literature
A laboratory course in ensemble playing and accompaniment. Drawing from available student instrumentalists and singers, the pianist learns the art of performing in trios, duo sonatas, two-piano works, and gains experience in Lieder accompaniment. 1 credit.
Music

456, (456). String Ensemble—Techniques and Literature
457, (457). Woodwind Ensemble—Techniques and Literature
458, (458). Brass Ensemble—Techniques and Literature

In these courses small groups of performers are organized in order that more advanced students may gain experience in chamber music performance and literature. Prerequisite: permission of instructor. 1 credit.

465, (465). Group Voice Class for Beginners

To develop the basic fundamentals in voice production, such as breathing, phrasing, pure tone, resonance, posture, and the study of vocal literature through group activity with some of the finest work of the masters. A basic knowledge of the piano keyboard and ear training is necessary. Mr. Bratton. Permission of instructor. 2 credits.

467, (467). Functional Piano

Basic instruction for potential music majors with no previous keyboard training. The subject matter is drawn from the following: pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sight reading, transposition, and modulation. The format may involve both class instruction and periodic short individual lessons depending upon the increasing facility of the student. The course may be repeated until the Music Education proficiency level is attained to a maximum of 4 credits. Mrs. Edwards, Mr. Verrette. Prerequisite: permission of instructor. 1 credit.

542, (542). Piano

The methods of presentation and the material used vary with each pupil and his degree of advancement. Emphasis is placed on musical values, musicianship, and sound piano technique. For this purpose, the literature employed is selected from the masters. Musical understanding is developed and quality of performance is stressed. With the attainment of advanced technique, the student's repertory is broadened to include works of all periods of literature. Mr. Steele, Mrs. Rogers, Mr. Wicks, Mr. Verrette, Mrs. Skelton, Mrs. Edwards. Permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

543, (543). Harpsichord

Instruction on the Adams harpsichord, the lesson covering harpsichord technique and early keyboard repertoire, with emphasis on keyboard practices of the eighteenth century. Mrs. Copeland, Mr. Wicks. 1 or 2 lessons; 1, 2, or 4 credits.

544, (544). Organ

Thorough training in the fundamentals of manual and pedal technique primarily through a graded approach to baroque and modern organ compositions. In addition to scheduled lessons organ students will meet each week as a class: (a) to perform pieces from their current repertoires and (b) to participate in a survey of organ literature. Advanced students will also receive training in service playing, improvisation, and figured bass realization. Mrs. Copeland, Mr. Wicks. Permission of instructor. 1, 2, or 4 credits.

545, (545). Violin, Viola

Students receive a thorough technical foundation on the violin or viola with
emphasis on musicianship and musical values. The choice of literature, drawn from the great instrumental repertoire, will depend on the individual student's background and ability. Prior experience is a prerequisite. Mr. Grishman. Permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

546, (546). Violoncello; String Bass
Objectives are based primarily on the student's ability and experience. A general awareness of the instrument as regards technique and tone are the first essential prerequisites. These elements will gradually broaden to include the attention and cultivation of the student's musical perception and repertoire. Miss Foley. Permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

547, (547). Woodwind
Instruction in the technique and literature for the flute, oboe, clarinet, bassoon, and saxophone. Ability and previous background determines a student's course of study. Competence in basic fundamentals of tone production, embouchure, articulation, and phrasing lead to concentration in the solo and chamber music repertoire for each instrument. The development of sound musicianship through study of music representative of all periods and styles is stressed. At least one public solo performance each semester is required. Mr. Bravo, Mrs. Drinker, Mr. Hettinger, Mr. Summers. 1 or 2 lessons; 1, 2, or 4 credits.

548, (548). Brass
Instruction in any of the following instruments: trumpet, trombone, French horn, baritone, and tuba, or any brass instrument. Correct tone production, articulation, and musical interpretation are stressed. Mr. Gay, Mr. Paella, Mr. Polk, Miss Rasmussen, Mr. Rogers. Permission of instructor. 1 or 2 lessons; 1, 2, or 4 credits.

549, (549). Percussion
Snare drum rudiments. The technique, tuning, and sticking of the timpani. Cymbals and all other percussion effects (claves, maracas, triangle, tambourine, wood-block, chimes, etc.), glockenspiel, bells, or bell lyre as well as xylophone. Mr. Whitlock, Mr. Sylvester. Permission of instructor. 1, 2, or 4 credits.

An investigation of music for vocal, vocal-instrumental, and instrumental ensemble, circa 1100 to 1450, and its realization in performance, especially with regard to rhythm, musica ficta, notation, melodic ornamentation, improvised polyphony, and the clear projection of a polyphonic texture. Course work includes an evaluation of the writings of selected Medieval theorists and modern scholars; practical exercises in transcription; and performance on reconstructions of Medieval instruments, especially the organ, harp, psaltery, rebec, vielle, and recorder. Mr. Polk. 2 or 4 credits.

756, (756). Performance Studies in Renaissance Music
An approach to the problems of musical performance, circa 1450 to 1600, via the small vocal, vocal-instrumental, and instrumental ensemble, with special reference to rhythm and tempo, musica ficta, text underlay, articulation, diminution, tablature notation, and effective distribution of voices and instruments. Course work includes a survey of performance manuals, iconographical sources, and current research; development of editing technique through the preparation of transcriptions; and an opportunity to perform on representative musical instruments of the period, notably the organ, harpsichord, lute, viols, recorders, cornetto, and trombones. Mr. Polk, Miss Rasmussen. 2 or 4 credits.

A study of performance practices in solo keyboard works, sonatas a 2 and a 3 and solo cantatas, circa 1640 to 1750,
concentrating on ornamentation, realization of figured basses, improvisation, articulation, rhythm, keyboard registration, and the influence of the construction of baroque musical instruments (including the organ) on sonority and technique. Course work includes an examination of manuscripts (on microfilm), prints, treatises, and iconographical sources and the editing and realization of selected works for recital performance. Miss Rasmussen, Mr. Wicks. 2 or 4 credits.

An intensive examination of musical styles, circa 1760 to 1815, through the performance of keyboard music and instrumental chamber music, emphasizing the relationship between structure and interpretation, late eighteenth century conventions of ornamentation and articulation, a survey of tutors and relevant theoretical writing, and a critique of currently published editions and editing techniques. Mr. Grishman, Miss Rasmussen. 2 or 4 credits.

The art of performing and coaching Lieder, piano music, and instrumental chamber music from Schubert through Debussy, with special consideration given to effective ensemble, traditions of interpretation, and the influence of structure on performance. Mr. Steele, Mr. Grishman. 2 or 4 credits.

760, (760). Performance Studies in Twentieth-Century Music
Performance of representative twentieth-century compositions for small instrumental or vocal-instrumental ensemble, with intensive work in structural analysis, rhythmic ensemble coordination, dynamic and articulation control, new instrumental techniques, notation, improvisation, and the interaction between jazz and European styles. Mr. Polk, Mr. Rogers, Mr. Verrette. 2 or 4 credits.

Theory and Composition (63)

471-472. Theory I
A composite course in theory consisting of sightsinging, ear training, dictation, and elementary harmony, both written and keyboard. Basic knowledge of the piano is necessary. Basic techniques in harmonization in four parts of soprano melodies, and basses (figured and unfigured), using triads and their inversions, and secondary dominants. Attention will also be given to harmonic rhythm, modulation, and analysis. Mrs. Rogers, Mr. Howard, Mr. Williams. 4 credits.

571-572. Theory II
A creative approach to advanced harmony through part-writing and analysis. Included is advanced study in sightsinging, ear training, and dictation. Mr. Wicks and Mr. Rogers. Prerequisite: Music 471-472 or its equivalent. 4 credits.

575-576. Conducting Methods
The development of conducting—physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal, Mr. Hettinger. Prerequisite: Music 571-572 and junior standing. 2 credits.

771-772. Counterpoint
First semester: Polyphony in two to four voices based on the linear, harmonic, and rhythmic techniques of sixteenth century vocal music. Work in species and imitative forms as exemplified by Palestrina. Second semester: Tonal counterpoint based on eighteenth century style. Various exercises in two to four voices referring to keyboard and instrumental examples of Bach and Handel. Mr. Rogers. Prerequisite: Music 571-572 or permission of instructor. 2 credits.
773-774. Canon and Fugue
Continuation of studies in tonal counterpoint. Construction of canons and 2-, 3-, and 4-voice fugues based on the keyboard and instrumental style of Bach. Mr. Williams. Prerequisite: Music 771-772 or permission of instructor. 2 credits.

775-776. Composition
Consideration of simple phrase structures, binary and ternary forms as exemplified in classic sonata movements, theme and variations and textsettings as basic models for the unifying of specific composition projects. Mr. Williams. Prerequisite: permission of instructor. 2 credits.

777-778. Advanced Composition
Composition projects of the student, unlimited in scope and nature and reflecting the student’s compositional interests. Guidance and advice of the instructor as appropriate to each individual project. Mr. Williams. Prerequisite: permission of instructor. 4 credits.

779. Orchestration
The characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students will be expected to study appropriate scores, to write arrangements utilizing these various groupings, and to have these arrangements performed if at all possible. Some aspects of vocal writing will also be covered. Mr. Rogers. Prerequisite: permission of instructor. 4 credits.

781. Form and Analysis
A consideration of various formal and textural elements both as concepts and within the context of musical examples. Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line, and formal articulation. Mr. DeVoto. Prerequisite: permission of instructor. 4 credits.

Music Education (64)

595. Special Projects in Music Education
A course to allow an undergraduate to undertake individual investigation, research, or study in any aspect of music education in which he has particular need or interest. Projects of a creative nature may be included. Mr. Whitlock. Prerequisite: permission of instructor. 2-4 credits.

741-742. Techniques and Methods in Choral Music
A lecture-workshop course concerning problems in the organization and performance of high school, college, and community choruses. Emphasis is placed on techniques of choral conducting and rehearsal, repertory, and materials. Mr. Bratton. 2 credits.

743. Materials and Methods in Piano Music
A course designed to give potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher. Mrs. Edwards. 2 credits.

745-746. Techniques and Methods in String Instruments
Class and individual instruction on stringed instruments, students are expected to practice four hours per week as a basic course requirement. A high level of instrumental proficiency results from intensive training on the violin, viola, cello, and double bass, enabling participants to perform in string ensembles. The course will explore classroom procedures, the establishment of string programs, and the evaluation if available methods materials. Mr. Grishman. 2 credits.

747-748. Techniques and Methods in Woodwind Instruments
Basic fundamentals of performance in woodwind instruments, techniques of
Nursing class instruction, associated acoustical problems, and study of woodwind literature. Emphasis in the first semester will be on clarinet, flute, and saxophone. The double reed instruments will be emphasized in the second semester. Mr. Hettinger. 2 credits.

749-750. Techniques and Methods in Brass Instruments
A basic course in embouchure formation, tone, tonguing, fingering, flexibility, accuracy, and range development as applied to the trumpet or baritone horn, French horn, and trombone, in conjunction with a survey of the methods, studies, solos, and ensembles, most likely to be useful with grade school, junior high school, and high school players of brass instruments. Qualified, advanced students may elect honors work in composition, arranging, and ensemble coaching. Miss Rasmussen. 2 credits.

751. Techniques and Methods in Percussion Instruments
The basic skills necessary for performance on snare drum, timpani, mallet instruments, and the other percussion instruments used in bands and orchestras. Materials and methods of instruction are included. Mr. Whitlock. 2 credits.

785. Music for the Elementary Classroom Teacher
For the non-specialist interested in utilizing music in the classroom. The correlation and integration of music in the school curriculum, and the basic skills and techniques necessary. Mr. Whitlock. 4 credits.

787. Problems in the Teaching of Elementary School Music
Aims, scope, and organization of materials and activities in the elementary schools. Modern trends in educational philosophy, development of the child's voice, and demonstration of materials and methods for the various grades. Observation and teaching in schools. Mr. Whitlock. 2-hour seminar; 3-hour laboratory; 3 credits.

791. Problems in the Teaching of Secondary School Music
The application of educational principles to the teaching and learning of music and the organization of the music curriculum on the junior and senior high school levels. The adolescent voice, the classification of voices, the selection of vocal and instrumental materials, and the building of unified concert programs. Problems of administration, management, and the relationship of the teacher to school and community. Observation of music programs in secondary schools. Mr. Whitlock. 4 credits.

Nursing (54)
Chairman: Mary Louise Fernald

ASSOCIATE PROFESSORS: Mary Louise Fernald, Marguerite Fogg

ASSISTANT PROFESSORS: Elizabeth A. Burtt, Caroline Davies, Diane Ihra, Ann M. Kelley, Katherine Schenk, Anita Sweeney

INSTRUCTOR: Sandra J. Plummer

503-504. Fundamentals of Nursing
Focuses on two main concepts: learning about man as an individual with basic human needs; and developing techniques of providing beginning care to meet man's obvious needs with emphasis on geriatrics second semester. Opportunity is provided to allow development of beginning knowledge, skills and understandings of the normal physiological, interpersonal activity, environmental and spiritual needs of people. The student is encouraged to become aware of and to explore self feelings and reactions to nursing. The laboratories are experiences in hospitals and other health agencies designed to guide the student in planning and carrying out nursing care of people. Mrs. Kelley. 4 credits.

551. Medical-Surgical Nursing
Maintaining man as an integrated whole is a framework for study. The
major health problems of people are approached as alterations in their ability to maintain normal body functions. The nurse’s role in meeting the individual’s basic needs is explored. The student is provided with an opportunity to give nursing care to adult patients in a community hospital and to become involved with a variety of health services. Prerequisite: Nursing 504. 4 credits.

602. Maternal and Child Nursing and Community Health Nursing
Designed to provide the student with the opportunity to gain new knowledge and skill as well as adapting previous learning in giving total family health care. A broad focus enables the student to demonstrate personal and professional responsibility in a relationship with individuals, families, and communities. Nursing laboratory experiences are provided, using local hospitals, a medical center, community health agencies, and other health facilities. Miss Fogg, Miss Burtt. Prerequisite: Nursing 551. 16 credits.

621. Psychiatric Mental Health Nursing
The course emphasizes behavioral concepts and interpersonal dynamics as they relate to the mental health of people. Students will participate in relationships with individuals and groups of people in order to apply knowledge, gain greater skill in the therapeutic use of self and plan, carry out and evaluate nursing intervention. There will be opportunities to observe and participate in interdisciplinary team conferences on an in-patient unit of a Mental Health Center. Observation of patient and family interviewing, other agency functions; an observation day at a state hospital and a Community Health Service in order to further explore the role of nursing in Mental Health is also included. Mrs. Ihra. Prerequisite: Nursing 551. 8 credits.

631. Acutely Ill Patient
Emphasis is placed on planning and giving care to patients with life-threatening illness. The development of technical skills in administering physical care to the acutely ill and the development of interpersonal skills in interviewing and problem-solving with the patient and his family are included. The student works with the staff in a medical center hospital, spending a period of time in the Intensive Care Unit; she may participate in discharge planning and make follow-up home visits. Mrs. Schenk. Prerequisite: Nursing 551. 8 credits.

702. Nursing
Senior nursing provides an opportunity for the student to adapt and build upon previous knowledge, understanding, and skill in order to demonstrate competency in personal and professional nursing responsibilities. A broad approach enables the student to develop self-awareness, ability to function as a leader, understand group dynamics, and an understanding of beginning research. Miss Davies. Prerequisite: Nursing 602 and 621. 8 credits.

The Nursing Curriculum is under review and is, therefore, subject to change.

Occupational Therapy
Chairman: R. Virginia Bell

ASSISTANT PROFESSORS: R. Virginia Bell, Laurel G. Bunker

PRE-CLINICAL INSTRUCTOR: Mrs. Kathryn M. Whitman

MEDICAL LECTURERS: William Amman, M.D., Ear, Nose, Throat Conditions; Arthur DiMambro, M.D., Orthopedics; Alan W. Handy, M.D., Pathology; Charles H. Howard, M.D., General Medicine and Surgery; Gerald Shattuck, M.D., Pediatrics; Paul C. Young, M.D., Pathology

ASSOCIATED PRE-CLINICAL FACILITIES: Manchester Rehabilitation Center, New Hampshire Hospital, Danvers State Hospital
The following courses are for occupational therapy students; elective for others by permission of the department chairman.

300. Exploration of Occupational Therapy
A broad survey of occupational therapy as a service-oriented health profession. The educational requirements, the responsibilities and goals, the satisfactions and opportunities. The curriculum will be explored by review of television tapes made by occupational therapy students. Visits to local occupational therapy departments, films, and guest speakers. Mrs. Whitman. 0 credits.

411. Occupational Therapy Theory I
Developmental concepts and historical perspectives of the basic theories and techniques of occupational therapy. The fundamentals of evaluation, testing, and problem solving; the central role of the patient in planning and administering treatment. Lecture presentations are correlated with clinical observation and supervised clinical participation. Staff. 3 lectures; 1 laboratory; 4 credits.

412. Needlecraft
Basic instructions in sewing, needlecrafts, knitting, and crocheting. The application of needlework as a therapeutic media and/or recreational program in chronic hospitals, and those aspects of needlecraft pertinent to the administration of ancillary personnel in this area. Mrs. Burrows. Prerequisite: permission of instructor. 2 laboratories; 2 credits.

515. Treatment Media I—Crafts
An introduction to craft techniques in selected basic activities, including printing, leather work, and ceramics. The analysis of crafts in relation to their potential as treatment tools. Methods of teaching basic procedures and skills to patients. Minimum laboratory fee, $12. Staff. Prerequisite: Occupational Therapy 411. 2 laboratories; 4 credits.

520. Treatment Media II
A methods and skills course basic to work with patients in the fields of pediatrics, geriatrics, physical disabilities, general medicine, surgery, and rehabilitation. Developmental activities, activities of daily living, splinting, and adaptive device construction. This course is to be taken concurrently with Occupational Therapy 584 and 526. Fee for materials. Staff. Prerequisite: Occupational Therapy 411. 4 credits.

524. Occupational Therapy Theory II—Psycho-Social Treatment Methods
The application of psychiatry and psychology to the practice of occupational therapy with psycho-socially disabled patients. Learning theory, group dynamics, treatment, and rehabilitation techniques. Application of theory and training in evaluative techniques is presented and practiced in the clinical setting. Prerequisite: Occupational Therapy 583. 4 credits.

526. Occupational Therapy Theory III—Physical Dysfunction
Basic evaluation and training methods for patients with physical disabilities. These include techniques of joint measurement, muscle testing, perceptual motor development, work tolerance and vocational testing. Methods for developing coordination and improvement of neuromuscular patterns of movement. The importance of providing the patient a wholesome psychological climate conducive to recovery is stressed. This course is to be taken concurrently with Occupational Therapy 520 and 584. Miss Bunker. Prerequisite: Physical Education for Men 652 and Occupational Therapy 411. 4 credits.

531. Group Process
Dynamics and development of group relationships are studied with emphasis on self awareness and sensitivity to others. The meaning of group processes in OT practice, role development and leadership concepts may be explored. Will be presented as a laboratory or lecture course. 2 recitations; 2 credits.
580. Medical Terminology and Pathology
Introduction to concepts of the effects of disease on the body with emphasis on meaning of pathology in Occupational Therapy practice. Topics will include inflammation, vascular disturbance, infection, mechanical injury, degenerations, congenital defects, and the language of medicine. Drs. Allen W. Handy and Paul C. Young, Jr., and Occupational Therapy faculty. Prerequisite: sophomore Occupational Therapy standing. 2 lectures; 2 credits.

583. Medical Lectures I—Psychiatry
Clinical psychiatric conditions presented by a psychiatrist. Both adult and childhood disabilities are discussed with patient presentations when possible. Recitations review and stress those aspects of the material most important in Occupational Therapy practice. The course is offered for 4 credits instead of 2 credits when in addition to the above material the student is involved in a sensitivity group training situation. Prerequisite: Child Development and Psychology 545. 2-4 credits.

584. Medical Lectures II—Physical Dysfunctions
Lecture and clinical presentation of selected medical conditions of primary concern to the occupational therapist. Consideration is given to the etiology, pathology, symptoms, prognosis, and treatment of general medical and surgical conditions, pediatric conditions; and orthopedic and neurological conditions. This course is to be taken concurrently with Occupational Therapy 520 and 526. Drs. Charles C. Howarth, William Amman, Gerald Shattuck, and Arthur Dimambro. Prerequisite: Zoology 508, Occupational Therapy 580. 6 credits.

627. Occupational Therapy Theory IV—Advanced Physical Dysfunction
Muscle reeducation techniques used in treating patients with orthopedic and neurological disabilities. Cerebral palsy, polio, amputees, muscular dystrophy, spinal cord injuries, and degenerative neurological conditions are presented and discussed, as are the basic principles of the application of therapeutic exercises, prosthetic training, and the facilitation techniques of Bobath, Rood, Knott, Brunnstrom, and Fay. Miss Bunker. Prerequisites: Neurology, Occupational Therapy 526 and 584. 4 credits.

698. Senior Seminar
A two-semester discussional seminar which will consider topics including senior thesis, research methods, supervisory and consultive functions of the OTR, community practice, professional relationships, administrative procedures, and selected current professional issues. Miss Bell and staff. Prerequisite: senior standing in the major. 4 credits.

Philosophy (66)
Chairman: Asher Moore

PROFESSORS: Donald C. Babcock, emeritus; Asher Moore
ASSOCIATE PROFESSORS: Robert P. Sylvester, Duane Whittier
ASSISTANT PROFESSOR: Paul Brockelman
INSTRUCTORS: R. V. Dusek, Frank Birmingham

405, (405). The Philosophic Dimension
The effort of the course is to give the individual student the authentic philosophic experience. Under critical guidance, students are encouraged to reflect on their own experience and to compare their thinking with the ideas of others. Small workshops will meet twice a week with specially chosen upperclass students; participation in these workshops is expected of all students. Short papers and write-at-home essays will be required in the workshops. There will be one lecture a week to the entire class. Students will be evaluated on their progress in clear, honest, and comprehensive
Philosophy

self-reflection and on their willingness to confront the ideas of others, as these are evaluated both in reading and in discussion. Open only to freshmen and sophomores. 4 credits. NLG.

406. (406). The Philosophic Dimension
In format Philosophy 406 is identical to 405, and will meet for the same weekly lecture; but the discussion section will meet separately. Open only to juniors and seniors. 4 credits. NLG.

410. (410). Introduction to Philosophy
An examination of representative philosophies and of some of the persistent problems of philosophy. An introductory course designed to acquaint the student with the nature of philosophy and to help him think about his experience philosophically. 4 credits.

412. Logic
An introduction to the principles of good reasoning, including practice in their application. The correct use of language, the logical structure of arguments, the detection of fallacies in reasoning, and the nature of scientific method. Open to Liberal Arts freshmen and sophomores. 4 credits.

421. Philosophy and The Arts
A consideration of contemporary works of literature, music, theatre, film, and the plastic arts in an attempt to elicit philosophic concerns and perspectives which dominate the present. Intensive use will be made of the cultural resources of the University and the region, so there will be some expense involved. Open only to freshmen and sophomores. 4 credits. (Formerly 521).

495. Tutorial Reading
Reading of selected books under the direction and guidance of a member of the Department of Philosophy. The books offered for tutorial reading may be in any area the instructor chooses. Open only to freshmen and sophomores. 4 credits. (Formerly 595).

510. Philosophy of Religion
A philosophical study of the nature and significance of religious experience, with historical and systematic analysis of such traditional problems of philosophical theology as faith and reason, evil and the existence of God. A part of this course will consist of an intensive phenomenological study of the religious experience and an attempt to deal with the traditional problems from this point of view. Not open to freshmen. 4 credits.

512. Logic and Scientific Method
A course in the logic of science and mathematics. The problems of induction and the paradoxes of logic are emphasized. The nature of probability logic and the character of axiom systems are treated in relation to the methodology and foundations of the empirical sciences. The course is especially suggested for students who are familiar with elementary mathematics (algebra, calculus, or Mathematics 420). Freshmen who have had calculus in High School or who have permission of the instructor may elect the course. 4 credits. (Formerly 480).

520. Introduction to Oriental Philosophy
A philosophical introduction to the systems of ideas in the Orient (Hinduism, Buddhism, Confucianism, Taoism, etc.). Not open to freshmen. 4 credits.

522. Philosophy of Art
The nature of art; the nature of creation and appreciation; the art media; judgments of worth; the relation of expression, form and subject; the relevance of aesthetic experience to the larger philosophical picture. Not open to freshmen. 4 credits.

530. Ethical Theories
The problems of moral philosophy through the critical examination of important traditional and contemporary theories of ethics. Not open to freshmen. 4 credits.
535. Social and Political Philosophy
An examination of the distinctively philosophical problems encountered in social and political philosophy through the study of representative figures in the history of this branch of philosophy. An essential aim of this course will be to bring the student to serious and intensive reflection upon his own social and political philosophy. Not open to freshmen. 4 credits.

550. Symbolic Logic
The principles and techniques of modern logic, with special attention to their philosophical significance. Discussion of sentential calculus, class calculus, truth tables, and lower functional calculus as well as the nature of deductive systems and the problems of formal consistency. Prerequisite: Philosophy 412, 512 or permission of instructor. 4 credits.

570, 572, 573. History of Philosophy
The sequence 570 (Ancient), 572 (Rationalists), 573 (British Empiricists), each of which is a four-credit course, surveys the history of Western philosophy from the early Greek philosophers to Kant at the end of the 18th Century. Students with a serious interest in philosophy should take this sequence as early as possible. Such students may elect 570 with the permission of instructor. Students who wish to register for Philosophy 572 or 573 without having taken Philosophy 570 must secure the permission of instructor. Students may take 573 before 572 if they so wish. (Formerly 500-501).

571. Medieval Philosophy
The philosophic thought of the Middle Ages from Augustine to Scotus but with particular emphasis upon the writing of St. Augustine and St. Thomas Aquinas. Prerequisite: Philosophy 570 or permission of instructor. Not open to freshmen. 4 credits. (Formerly 502).

600. Philosophy Through Literature
The philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. 4 credits.

603. Nineteenth Century Philosophy: Idealism, Materialism, Existentialism
The development of German philosophy from Kantian transcendentalism to dialectical absolutism: Kant, Fichte, Schelling, Schopenhauer, Hegel. The religious, existential, and economic reactions to Hegelianism: Kierkegaard, Nietzsche, Marx. Prerequisite: Philosophy 572 and 573, or consent of instructor. 4 credits. (Formerly 503).

604. Nineteenth Century Philosophy: Phenomenalism and Naturalism
An historical survey of concepts in nineteenth century epistemology of science and history. Emphasis will be placed on major figures in England and on the Continent. Readings from major thinkers such as John Stuart Mill, Compte, Mach, Darwin, Bergson, and the neo-Kantians should be expected. Others studied might include Dubem, Poincare, Frege, Dilthey, Marx, and Engels. Prerequisite: Philosophy 573 or consent of instructor. 4 credits. (Formerly 504.)

630. Philosophy of Science
A discussion of various philosophical problems raised by science. For example, the status of theoretical terms, the role of mathematics in science, the nature of scientific concepts of space and time, the relations of science to common sense, the relation of theory to observation, the logic of scientific discovery, the nature of historical changes in scientific worldview, the relation of the logic of science to the psychology and history of science. 4 credits.

650. Problems in Philosophy
A systematic study of traditional problems in philosophy. Topics such as metaphysics, epistemology, philosophy of mind, philosophy of history, philosophy of logic, and the like may be offered in this category. Since the course covers
one systematic area the semester it is offered, a student may repeat the course as long as the topic offered is one he has not already taken for credit. Permission of instructor required. 4 credits.

699. Senior Thesis
Independent work under a faculty adviser culminating in a senior thesis. Required of, and open only to, philosophy majors. 4 credits.

700, (700). Studies in the History of Philosophy
Intensive study of individual philosophers, important movements, schools, or periods in the history of philosophy. Subjects and instructors to be announced each year. Prerequisite: Philosophy 570, 572, 573. 4 credits. Barring duplication of subject, this course may be repeated for credit.

701. Topics in Systematic Philosophy
Intensive study of selected problems of philosophy is such areas as epistemology, metaphysics, and theory of value. Topics and instructors to be announced each year. Prerequisite: Philosophy 570, 572, 573. 4 credits. Barring duplication of subject, this course may be repeated for credit.

710. Analytic Philosophy
Its roots in the nineteenth century, its relation to science, and its development to the present day. The application of the analytic method to the solution of philosophic problems. Readings from such recent and contemporary figures as Russell, Wittgenstein, Ayer, Carnap, and Ryle. Prerequisite: Philosophy 570, 572, 573. 4 credits. (Formerly 610).

715. Contemporary Movements in Philosophy
Contemporary pragmatism, neo-realism and naturalism, with their roots in nineteenth century American philosophy. Readings from such recent and contemporary figures as Peirce, James, Dewey, Santayana, Whitehead, and C.I. Lewis. Prerequisite: Philosophy 570, 572, 573. 4 credits. (Formerly 615).

720. Existentialism
Readings selected from such philosophers as Kierkegaard, Nietzsche, Jaspers, Heidegger, Sartre, and Marcel. Prerequisite: Philosophy 570, 572, 573. 4 credits. (Formerly 620).

795, 796. Individual Study
Students who are adequately prepared to do independent philosophical work involving extensive reading and writing may do advanced work on an individual basis. Before registering for this course the student must formulate a project and secure the consent of a member of the department who will supervise his work. Conferences and/or written work as required by the supervisor. Credits to be arranged.

Physical Education for Men (90)
Chairman: Gavin H. Carter

ASSOCIATE PROFESSORS: Gavin H. Carter, Robert E. Wear, Walter E. Weiland, Gus C. Zaso, chairman, program in Recreation and Parks

ASSISTANT PROFESSORS: Robert Kertzer, Charles G. Arnold, Thomas R. Barstow

INSTRUCTORS: Louis A. Datilio, Donald E. Heyliger

Faculty from the Department of Intercollegiate Athletics

DIRECTOR OF ATHLETICS: Andrew T. Mooradian

PROFESSOR: Paul C. Sweet

LECTURERS: Charles E. Holt, Louis A. Tepper, Thomas F. Upham, Gerard J. Friel, James R. Goodfellow

The Department of Physical Education for Men strives to meet the needs and interests of each college student by providing opportunities for physical fitness and skill development in a wide variety of physical and recreational activities.

In the basic instructional program, required and elective activity-courses, instruction is aimed at providing the attitudes, knowledge, and skills necessary for the intelligent utilization of opportunities for active recreation while at the University and in later life.

The Department also offers a program of professional preparation for men wishing to enter the fields of physical education or recreation education.

Requirements and Regulations

All entering freshman male students (except majors) must register for Physical Education 301, the non-credit undergraduate required physical education program. A student must continue in physical education until such time as all requirements for the basic instructional program of physical education are completed or for a period not to exceed two years. Freshmen interested in selecting physical education or recreation education as a field of concentration should elect Physical Education 441 in place of 301.

Each student must, before entering the University, have a physical examination by a physician. Students with physical disabilities or limitations must register for physical education as other students. In most cases, modified activities are recommended by the University Physician.

Special gymnasium uniforms are provided, consisting of blue trunks, grey jersey, and grey socks. Students are required to furnish regulation gymnasium sneakers and are encouraged to supply their own equipment in the individual sports. Equipment is furnished for badminton, fencing, golf, handball, riflery, squash, and tennis. Students should check the requirements for equipment and special fees before enrollment.

301. Required Physical Education

All male freshman students will be required to take tests in three different areas of physical education: (1) physical efficiency, (2) swimming ability, and (3) skill in two recreation-type sport activities. The tests will be administered over a two-week period at the beginning of the freshman year.

Those students whose physical efficiency test performance is not satisfactory will be assigned to a developmental course during their first semester. Freshmen who fail to pass the swim classification test will enroll in a beginning swimming course for a semester.

Students may demonstrate proficiency in two recreational-type sport activities by passing a skill test and, in some cases, a written knowledge test. The selected activities include: badminton, golf, handball, ice skating, riding, skiing, squash, swimming, and tennis. These proficiency tests are administered at scheduled intervals during the school year.

Students unable to pass the tests and those freshmen who do not wish to take proficiency tests in any of the above sport activities must enroll in two (one per eight-week quarter) physical education courses of their choosing which are in the required physical education program for men.

Those freshmen who achieve acceptable standards in the three test areas upon entrance to the University will be exempted from the physical education requirement. Students not satisfying established test standards must take an appropriate physical education program without academic credit until such time as they either pass the proficiency tests or satisfactorily complete prescribed physical education activity courses for a period not to exceed two years. 3 hours; 0 credit. NLG.
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433, 434. Elective Physical Education

Freshmen and upperclassmen may elect additional physical education activity courses for credit upon completion of the undergraduate physical education proficiency requirement by registering for 433, 434. Courses in aquatics, dance, gymnastics, and individual, dual, and team sports are offered each semester on a seasonal basis. No activity may be repeated for credit. Prerequisite: Physical Education 301. 3 hours; 1 credit. NLG.

Physical Education Courses—Specialized

Specialized courses for students majoring in physical education providing basic skills in a variety of physical activities taught in the elementary or secondary school. Physical Education 441, 442 are for freshmen; 443, 444, 445 are for sophomores; 446, 447, 448 are for juniors; 449, 450 are for seniors. 3 hours; 1 credit. NLG.

Theory Courses

510. Medical Aspects of Sports and Physical Education

The etiology, pathology, treatment, and prognosis of sports injuries are discussed and related to preventive measures. The various problems encountered in teaching physical education to the physically and mentally handicapped are related to the different pathologies of each disability. Mr. Aultman. 4 credits.

521. Theory of Coaching Basketball*

Theory and practice in the fundamentals of individual offense and defense. The various styles of team offense and defense and rules of the game. Problems in handling and conditioning a team. Mr. Friel. Prerequisite: Physical Education 442. 2 credits.

522. Theory of Coaching Football*

Analysis of various systems of play. Instruction in team and individual offensive and defensive fundamentals. The theory, strategy, generalship of team play, coaching methods, physical conditioning, and rules. Football staff. Open to physical education majors only. 2 credits.

523. Theory of Coaching Hockey*

Theory and practice in the fundamentals of team offense and defense, the fundamentals of each position, coaching methods, physical conditioning, and rules. Mr. Holt. 2 credits.

524. Theory of Coaching Baseball*

Theoretical and practical consideration of basic principles of batting and fielding, the fundamentals of each position, special stress on problems of team play, coaching methods, physical conditioning, and rules. Mr. Conner. Prerequisite: Physical Education 441. 2 credits.

525. Theory of Coaching Soccer*

Combination of lectures and on-the-field demonstrations to help teachers and coaches view practices and concepts used in modern soccer. Material covered will include the following: fundamental and advanced skills and techniques, offensive and defensive principles of team play, tactical formations and strategy, methods of training and practicing, rules of the game. Mr. Weiland. Prerequisite: Physical Education 447. 2 credits.

526. Theory of Coaching Wrestling*

Theory, practical teaching methods, and the development of advanced skills in an individual sport. The course will emphasize theory and practical application of wrestling skills and techniques from basic maneuvers to the more advanced. The basic objective of the program will be to develop sufficient skills and knowledge to teach and coach wrestling. Mr. Hess. Prerequisite: Physical Education 441. 2 credits.

527. Aquatic Leadership Training*

The course is designed to survey the methods, organization, and administra-

* Students in the physical education curriculum must complete four of these courses

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tion of both American Red Cross and YMCA aquatic programs. Topics covered include methods of teaching, swimming, diving and lifesaving, program planning, officiating, operation and maintenance of swimming pools, camp waterfront, health and safety aspects of the aquatic program, legal problems, skin and SCUBA diving, drowning proofing. Mr. Arnold. Prerequisite: senior lifesaving certificate. 2 credits.

528. Theory of Coaching Track and Field*
Instruction and practical demonstration in starting, sprinting, middle distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin throwing. Methods of preparing contestants for the various events. Mr. Sweet. Prerequisite: Physical Education 445. 2 credits.

529. Theory of Coaching Gymnastics*
The theory, practical teaching methods, and officiating of competitive gymnastics. Emphasis will be placed on the construction of gymnastic routines, from the elementary to the international level. Practical work sessions will be held. Mr. Datilio. Prerequisite: Physical Education 444. 2 credits.

530. Theory of Coaching Swimming and Diving*
A thorough analysis of the techniques of coaching swimming and diving. Course includes a systematic treatment of the philosophy, historical development, and psychological theories of coaching aquatics. Much emphasis is placed on the mechanical and kinesiological aspects of the competitive strokes and required and optional dives, both low and high board. Mr. Arnold. Prerequisite: Physical Education 443. 2 credits.

582. Personal and Community Health
The individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. 4 credits.

620. Physiology of Exercise
The acute and chronic physiological effects of exercise. Emphasis will be on respiration, circulation, and energy metabolism. Lectures will be supplemented by laboratory sessions demonstrating physiological adaptation to the demands of muscular activity. Mr. Kertzer. Prerequisite: Zoology 508. 4 credits.

652. Kinesiology
The science of human motion. Detailed analysis of human muscular anatomy and a consideration of the actions of skeletal muscles in light of recent electromyographic evidence. Application of selected concepts of muscle physiology and biomechanics to physical education activities. Mr. Kertzer and Mr. Aultman. Prerequisite: Zoology 507. 4 credits.

668. Measurement Procedures in Physical Education
Procedures used in interpretation and administration of measurement techniques in physical education. Essential elementary statistical methods are covered so that measured data may be scientifically evaluated for application to the program. Mr. Weiland and Miss Amsden. 4 credits.

Student Teaching Block

Education 659. Principles of Education
4 credits.

665. Administration of Physical Education in Secondary Schools
Administrative methods in the conduct of physical education, health education, and recreation. The planning of programs and policies in the light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public re-
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ratations. Miss Beckwith, Miss Amsden. 4 credits.

Education 694. Supervised Teaching of Physical Education
6 credits are also taken within the block program. See page 91 for description of secondary school teacher preparation program.

792. Problems of Teaching Physical Education in the Elementary School
Methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school. Mr. Barstow. 4 credits.

Physical Education for Women (91)
Chairman: Frances McPherson

PROFESSORS: Frances McPherson, Marion Beckwith, Evelyn Browne
ASSOCIATE PROFESSORS: Caroline Wooster, Barbara Newman
ASSISTANT PROFESSORS: Katherine Amsden, Phyllis Hoff, Karen Hogarth, Elizabeth Knowlton, Joyce Mills, Jean Morrison
INSTRUCTORS: Judith Jones, Lona Lesh, Jean Mead, Frances Plunkett, Enid Whittaker, Joyce Kertzer

The Department of Physical Education for Women provides an opportunity for each student to participate in a program which will give her a theoretical and practical knowledge of movement-concepts and an understanding of the need for physical activity in developing total fitness. The program includes a movement fundamentals course and a wide choice of sports, dance, aquatics, and gymnastics courses. An opportunity for participation in a modified program is provided for those students with medical restrictions.

Requirements and Regulations

All women students are required to register for Physical Education 301 upon entrance to the University and to continue enrollment in that course until completion of the proficiency requirement or for a period not to exceed four semesters. Students with physical limitations will be scheduled in a modified program of activity after registration in Physical Education 301.

At the beginning of the freshman year all students registered in Physical Education 301 will be required to take physical efficiency tests and a swimming safety test. Exemption requirements for Physical Education 301 include successful completion of the physical efficiency tests, passing the swimming safety test, and demonstrating proficiency in two activities selected by the student. Students not passing the swimming safety test must enroll in a swimming course until passing the safety test or for a period not to exceed one semester. Activity proficiency testing will be scheduled at appropriate times during the year. Students interested in majoring in Physical Education or Recreation and Parks should register for Physical Education 411 in place of Physical Education 301 and should also register for Physical Education 421.

The Elective Program

Either a quarter-course or a half-course in physical education at the 400 level may be elected for credit by students who have satisfied the Physical Education 301 requirement. A student who is still completing Physical Education 301 may take elective work in physical education at the 400 level for credit with permission of the Department of Physical Education for Women.

Intermediate and Advanced Instruction

To provide for the more highly skilled student and the interested participant, the department offers coursework at intermediate and advanced levels in a variety
of activities. Students are encouraged to elect physical education for further experience and participation in activity.

Special uniforms are provided consisting of black leotards and tights and a blue cotton tennis-type dress. Students are required to furnish white socks, sneakers, a bathing cap, and their own individual equipment for such activities as tennis, skiing, and skating. Equipment for all other activities is furnished by the department. A $35 fee per person is charged for riding; fees are also charged for off-campus activities such as skiing.

Women’s Recreation Association Program

Club activities, intramurals, and an intercollegiate sports program, designed to provide recreational experiences for the novice and the highly skilled individual, are sponsored jointly by the Women’s Recreation Association and the department. Club groups include Badminton Club, Contemporary Dance Club, Durham Reelers (folk dance), Fencing Club, Gymnastics Club, Skating Club, and Synchronized Swimming Club. Intercollegiate sports include field hockey, basketball, volleyball, skiing, tennis, and lacrosse.

Instructional Courses

Instruction is provided in the following activity courses on a seasonal basis in four quarters: Fall, Winter I, Winter II, Spring: archery, badminton, basketball, bowling, campcraft, dance (folk and square, modern), physical education activities for children, field hockey, figure skating, fitness laboratory, foil fencing, fundamentals of movement, golf, gymnastics, individuals, lacrosse, outdoor education, riding, riflery, ski conditioning, skiing, softball, squash, swimming (basic instruction, diving, synchronized, senior life saving, water safety instructor), tennis, and volleyball.

Physical Education for Women

Instructional Program

301. Required Physical Education
Coursework in fundamentals of movement and activities elected from the sports, dance, aquatics, and gymnastics areas. 3 hours; no credit.

405, 406. Elective Physical Education
Coursework in physical education. Activities elected from sports, dance, aquatics, and gymnastics areas. May be elected by students enrolled in Physical Education 301 with departmental permission. 3 hours; 1 credit.

407, 408. Elective Physical Education
Coursework for students who wish to elect a second course in physical education. 3 hours; 1 credit.

Physical Education Courses—Specialized

Specialized courses for students majoring in Physical Education or Recreation and Parks. Others by permission of instructor. 411, 412, 421, 422 for freshmen; 413, 414, 423, 424 for sophomores; 415, 416, 425, 426 for juniors; 417 for seniors. 3 hours; 1 credit.

Theory Courses—Physical Education

428. Water Safety Instructors’ Course
Conducted through the auspices of the American Red Cross, the course includes analysis of aquatic techniques and methods of teaching swimming, diving, and lifesaving. Instructor authorization is awarded to candidates who demonstrate a high caliber of personal skill, knowledge, and teaching ability in aquatics. Prerequisite: current senior lifesaving certification. 2 credits.

431. Analysis of Rhythm
A theoretical consideration of the factors which affect and effect rhythm with application to a variety of media. Miss Morrison, 2 credits.
Physical Education for Women

432. Labanotation
The study and practice of recording human movement by the method of Labanotation. Miss Morrison. Prerequisite: intermediate modern dance or permission of instructor. 2 credits.

433. Dance Composition
A practical, developmental approach to the process of creating dance. Prerequisite: intermediate modern dance. Miss Morrison. 2 credits.

434. Advanced Dance Composition
Choreographic methods with an emphasis on the use of music and group design. Miss Morrison. Prerequisite: Physical Education 433. 2 credits.

453. Principles of Physical Education
An approach to the field of physical education and related areas through a study of the evolutionary and historical factors affecting its development from pre-historic times to the present day. The application of principles from the fields of biology, psychology, ethnology, and sociology to the field will be discussed. The place of physical education in the academic community and its relation to the aims and objectives of general education, the world of sports, and athletics will be considered. Miss Browne. 4 credits.

554. Theory of Teaching Dance
A study of the methods, materials, techniques, and theories of teaching dance. The first half of the course covers dance as an art form; the second half, recreational dance. Miss Morrison and Miss Hogarth. Prerequisite: beginning, intermediate modern dance; folk, square, and social dance. 4 credits.

563-564. The Theory of Teaching Sports for Women
The implications and practical application of various teaching methods which may be employed in the teaching of Physical Education. A combination of classroom and laboratory experiences will be used. A practicum will be included in selected areas. Mrs. Mead and staff. Prerequisite: a specified activity sequence. 2-4 credits.

625. Dynamics of Human Movement
A consideration of factors which affect efficiency in human movement. An examination of the generality of movement in relation to fundamental and specific motor skills found in sports, dance, and everyday movement sequences. Miss Knowlton. 2 credits.

655. Remedial Gymnastics
The adaption of exercise to individual needs, capacities, and limitations; causes and treatment of physical abnormalities; theory and techniques of massage. Mrs. Wooster. Prerequisite: Zoology 601 or concurrently. 3 lectures; 3 laboratories; 4 credits.

656. Problems of Health Education
A survey of total school health: environment, services, and education. Methods, materials, and principles of teaching school health from kindergarten through grade 12. Open to physical education majors and others by permission of instructor. Mrs. Wooster. 2 credits.

668. Measurement Procedures in Physical Education
Procedures used in the interpretation and administration of measurement techniques used in physical education. Essential, elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Miss Amsden and Mr. Weiland. 4 credits.

775. Perceptual Motor Learning
The variables which affect the learning and performance of skilled activity, including ability and motivational characteristics of the learner, and the processes which enhance skill acquisition. Miss Hoff. 3 lectures; 1 laboratory; 4 credits.
Student Teaching Block
Education 659 is also taken within the block program.

665. Administration of Physical Education in Secondary Schools
Administrative methods in the conduct of physical education, health education, and recreation. The planning of programs and policies in light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Miss Beckwith, Miss Amsden. 4 credits.

Education 694. Directed Teaching of Physical Education
Opportunity for teaching physical education activities under supervision primarily in the elementary and secondary schools. Miss Newman. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture; 2-5 hour laboratories; 6 credits.

Physical Education 792. Problems of Teaching Physical Education in the Elementary School
The methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school and in recreation programs. Miss Newman. Prerequisite: Physical Education Activities for Children or its equivalent. 4 credits.

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401-402. The Evolution of Physical Science
The principles and methods of physical science illustrated by the development of major scientific ideas in the physical world. The course is directed toward an understanding of the intellectual achievement and problems of science as part of culture. Mr. Schmeer. 3 lectures; 1 laboratory; 4 credits. No credit toward a major.

(789). Seminar in the History of Science
Selected topics in the history of science, conducted through the use of special lectures, individual study, oral, and written reports. The subject of the seminar will vary from year to year. This course is the same as History 789. Mr. Schnee. Prerequisite: permission of instructor. 4 credits. (Course usually offered in the second semester.)

Physics (86)
Chairman: Lyman Mower

PROFESSORS: Harry H. Hall, emeritus; Edward L. Chupp, Robert E. Houston, Jr., Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., William R. Webber

ASSOCIATE PROFESSORS: David G. Clark, (associate chairman); Richard L. Kaufmann, Robert E. Simpson, Roger L. Arnoldy, L. Christian Balling

ASSISTANT PROFESSORS: Mark P. Klein, Harvey K. Shepard, John F. Dawson, John Dowling, Jr.

401-402. Introduction to Physics I and II
A broad survey of both classical and modern physics with emphasis on the latter. Designed to enable the student to appreciate the role of physics in the society and technology of today. While emphasis is placed upon the fundamental laws of nature on which all science is based, the interrelationships between other disciplines will be stressed. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

405. Concepts of Physics
A descriptive course investigating a limited number of important physical systems. Emphasis will be placed on how the system is to be investigated and the patterns in which the results fall. The intuitive concepts used in investigations will be traced into their application in
modern physics. Every effort will be made to relate the patterns of thought in physics to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 credits.

406. Introduction to Modern Astronomy
A brief descriptive course covering contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. 4 credits.

407-408. General Physics I and II
An elementary course emphasizing mechanics as the foundation underlying all physics. Selected topics from electrostatics and electromagnetism. Prerequisite: Mathematics 425-426 passed or taken concurrently. Physics 407: 3 lectures; 2 recitations. Physics 408: 2 lectures; 2 recitations; 1 laboratory; 4 credits.

505-506. General Physics III and IV
Selected topics from wave motion, kinetic theory, relativity, and quantum theory. An introduction to twentieth century physics, including the structure of atoms and nuclei, the basic ideas of quantum mechanics, and solid state theory. Prerequisites: Physics 408 or equivalent for Physics 505, Physics 505 or equivalent for 506. Mathematics 527 and 528 passed or taken concurrently. 2 lectures; 1 recitation; 1 laboratory; 4 credits.

601. Physical Mechanics
An analytical treatment of classical mechanics covering the dynamics of particles and rigid bodies. Some specific topics include Newton’s laws, conservation theorems, oscillations, central force motion, generalized coordinates, and Lagrange’s equations. Prerequisites: Physics 505 or equivalent; Mathematics 528. 4 credits.

602. Thermal Physics
This course will include both a classical and a statistical approach to the subject of Thermodynamics. Kinetic Theory. Prerequisites: Physics 505 or equivalent; Mathematics 527. 4 credits.

605-606. Experimental Physics I and II
Experiments in electrical measurements and circuits, passive and active circuit elements, optics, and atomic physics. Prerequisite: Physics 601 taken concurrently. 2 lectures; 2 laboratories; 4 credits.

607. Physical Optics
The electromagnetic theory of light, interference, diffraction, polarization, related phenomena, and nonlinear optics. Prerequisite: Mathematics 527. 4 credits.

609-610. Experimental Physics III and IV
Work of a project nature. Special problems are assigned to the individual student. Prerequisite: senior standing in physics. 2 laboratories; 4 credits.

613-614. Special Topics I and II
Any selected topics not sufficiently well covered in a general course. Prerequisite: senior standing in physics. 4 credits.

618. Introduction to Solid State Physics
A brief summary of the theory underlying the behavior of solids will be given. Emphasis will be placed on transport theory and the interaction of radiation and matter. The operation of semiconducting and superconducting devices and lasers will be considered. Prerequisites: Mathematics 527, Physics 508, or equivalent. 4 credits.

696. Independent Study
Individual study projects in physics under the direction of a faculty adviser. Open only to physics honor students. 4 credits.
701. Introduction to Quantum Mechanics
An introduction to quantum mechanics with applications to atomic and molecular spectra. Prerequisite: Mathematics 635 passed or taken concurrently. 4 credits.

702. Atomic and Nuclear Physics
Natural radioactivity, nuclear reactions, nuclear scattering, models of the nucleus, high energy nuclear physics, cosmic rays. Prerequisite: Physics 701. 4 credits.

703-704. Electricity and Magnetism I and II
Foundation of electromagnetic theory, including electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction to electrodynamics. Prerequisites: Physics 507-508 or equivalent, Mathematics 635 passed or taken concurrently. 4 credits.

Plant Science (32)
Chairman: Lincoln C. Peirce

PROFESSORS: Ford S. Prince, emeritus; Lincoln C. Peirce, Gerald M. Dunn, Clarence A. Langer

ASSOCIATE PROFESSORS: Douglas G. Routley, Owen M. Rogers

ASSISTANT PROFESSORS: James B. Loy, George O. Estes, James R. Mitchell, Otho S. Wells

421. Concepts of Plant Growth
Development of genetic and physiological concepts underlying plant growth and response of plants in modified environments. Open to all students. Mr. Estes. 3 lectures; 1 laboratory; 4 credits.

427. Landscaping the Home Grounds
The design and maintenance of small properties with emphasis on the principles of arrangement and the use and identification of plant materials in the beautification of home surroundings. Mr. Rogers. 2 lectures; 1 laboratory; 4 credits.

663. Fruit Crops
Growth and management of tree and small fruit crops, storage and marketing of produce. Prerequisite: plant physiology. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered first semester 1971-72.)

664. Vegetable Crops
Classification of vegetable crops. Genetic and physiological response of crops to management and climate. Mr. Peirce. Prerequisite: plant physiology. 3 lectures; field trip; 4 credits. (Alternate years; offered second semester 1970-71.)

665. Pasture Crops
Growth, culture and management of the important forage and pasture crops. Prerequisite: plant physiology. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered first semester 1971-72.)

667. Turfgrass Management
Characteristics of growth of fine turf-grasses, their adaptation for recreational and aesthetic use. Prerequisite: plant physiology. 2 lectures; 1 laboratory; 1 field trip; 4 credits. (Alternate years; not offered first semester 1970-71.)

668. Annual Crops
Growth and management of annual grasses and silage crops. Prerequisite: plant physiology. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered second semester 1970-71.)

678. Ornamental Plants
The important ornamental plants, their growth characteristics, culture, and use. Mr. Rogers. Prerequisite: plant physiology. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered second semester 1970-71.)

699, (699). Research Participation
Requires development of a project embodying the scientific method. Consultation with faculty member required. May be elected only one time at begin-
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ning of junior or senior year. Staff. 4 credits.

706. Plant Physiology
Structure and properties of cells, tissues, and organs; absorption and movement of water; metabolism; growth and irritability. Botany and Plant Science Staff. Prerequisites: Botany 411 or 503 or Plant Science 421, and one year of chemistry. 2 lectures; 2 laboratories; 4 credits.

708. Plant Nutrition
Nutrient requirements of plants; ion uptake, translocation and accumulation mechanisms; role of elements in metabolic processes. Genetic and environmental factors governing nutrient absorption and composition of plants. Mineral element and soil-plant relationships governing nutrient availability; growth, yield and crop quality as influenced by nutrient status; characteristics and formulation of commercial fertilizers. Laboratory emphasis on analytical procedures and instrumentation for soil and plant tissue analysis. Prerequisites: plant physiology, organic chemistry, soils. Mr. Estes. 3 lectures; 1 laboratory; 4 credits.

711, 712. Advanced Topics in Plant Science
A flexible course structure permitting independent study or group discussion of advanced technical or scientific topics. Students should consult with appropriate course coordinator before registering. 2 or 4 credits.
R-1 Physiology — Mr. Estes
R-2 Genetics — Mr. Dunn
R-3 Ornamentals — Mr. Rogers
R-4 Vegetable Crops — Mr. Peirce
R-5 Fruit Crops — Mr. Loy
R-6 Field Crops — Mr. Estes
R-7 Turfgrass — Mr. Dunn

762. Plant Metabolism
The function, occurrence, synthesis and degradation of plant constituents. Emphasis is placed on respiration and photosynthesis and the metabolism of nitrogenous and aromatic compounds. Biochemical mechanisms such as those involved in seed dormancy, fruit ripening, and disease resistance are discussed in relation to their roles in plant survival. Prerequisite: Biochemistry 651 or 751. 2 or 4 credits.

769. Plant Growth Regulators
Study of hormones and plant growth substances; relationship of differentiation and development of plant tissues. Mr. Routley. Prerequisite: plant physiology, biochemistry. 2 or 4 credits. Laboratory optional. (Alternate years; offered first semester 1971-72.)

773. Methods and Theory of Plant Breeding
Theory and use of plant breeding systems with emphasis on quantitative plant improvement. Mr. Peirce. Prerequisites: genetics, statistics. 3 lectures; 1 laboratory; 4 credits. (Alternate years; offered first semester 1970-71.)

Political Science (52)
Chairman: George K. Romoser

PROFESSORS: John T. Holden, Robert B. Dishman, George K. Romoser
ASSOCIATE PROFESSORS: Erwin A. Jaffe, Frederic W. Wurzburg, David L. Larson, John H. Woodruff, Peter Savage
ASSISTANT PROFESSORS: Lawrence W. O'Connell, Joseph P. Ford, John R. Kayser, Ann T. Schulz
INSTRUCTORS: Robert E. Craig, B. Thomas Trout, Susan O. White, Robert Winston, Raymond E. Matheson
RESEARCH ASSOCIATE, PUBLIC ADMINISTRATION SERVICE: Roger Hoeh

Except for the introductory course and independent study and seminar offerings, political science offerings are listed by fields, with courses substantially relating to more than one field cross-listed.

Courses which have an asterisk (*) following the number are often alternate-year offerings. Consult the depart-
ment for schedule of courses offered in a particular semester.

**401, 402. Introduction to Political Science**

The nature of politics, its vocabulary and purpose; institutions, ideologies, and behavior. The American political system; significant contemporary issues. Required of all majors in political science. Preferably to be taken in sequence. Staff. 4 credits.

**American Politics**

**511, 512. State and Local Politics**

History, structure, and processes of American government at the level of the state and their subdivisions. Mr. Dishman, Mr. Ford. 4 credits.

**571, 572.* American Political Thought**

Major theories which have contributed to American political thinking from Colonial to present times. Mr. Jaffe. 4 credits.

**715. Urban and Metropolitan Politics**

Planning, management, and problems of the urban community. Mr. O'Connell. 4 credits.

**716. Political Parties and Voting Behavior**

Functions, organization, operation, and bases of electoral support of American political parties. Mr. Craig. 4 credits.

**717.* Pressure Groups and Public Policy**

Functions, organization, operation, and bases of support of American pressure groups. Mr. Ford. 4 credits.

**718. Psychology of Political Behavior**

Cultural, social, economic, and emotional forces molding the citizen's political activity. Mr. Craig. 4 credits.

**719. Legislative Behavior**

Role, organization, operation, and conduct of American legislatures. Mr. Dishman, Mr. Craig. 4 credits.

**720. The President as Political Executive**

The American president's ways and means of pursuing political objectives. Mr. Dishman, Mr. Craig. 4 credits.

**721. Administrative Process**

The administrative and bureaucratic process in public life. Mr. O'Connell, Mr. Savage. 4 credits.

**722.* Administration of Justice**

Criminal and civil justice under various legal institutions; contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the legal process. Mrs. White. 4 credits.

**723. Supreme Court and the Judicial Process**

The Supreme Court as interpreter of law and arbiter among forces in American politics. Mr. Dishman. 4 credits.

**724.* Political Socialization**

Pressures integrating the individual into the context of American political life. 4 credits.

**725. United States Foreign Policy**

The formulation and execution of American foreign policy. Mr. Larson. 4 credits.

**727. Selected Topics in American Politics**

Courses in American politics of a special nature not regularly offered. Staff. 4 credits.

**Comparative Politics**

**531. Comparative Politics**

Concepts of political dynamics, institutional arrangement, and change in the modern world. 4 credits.

**532. Democratic Systems**

Western European politics: Britain, France, Germany. Mr. Woodruff, Mr. Wurzburg, Mr. Trout. 4 credits.
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533. Dictatorship and Totalitarianism
Hitler's Germany, Stalin's Russia, modern movements in the developed and underdeveloped world. Mr. Woodruff, Mr. Wurzburg, Mr. Trout. 4 credits.

736. Communist Systems
A comparative study of Communist politics. Mr. Trout. 4 credits.

737, 738. Comparative and International Area Studies
The politics of individual nations, groups of nations, or regions. 4 credits. The following listing of individual courses may be expanded or contracted from time to time, and courses will be offered as staff is available and student needs dictate:
(1) Government and Politics of the U.S.S.R. Mr. Trout.
(2) Soviet Foreign Policy. Mr. Trout.
(3) Government and Politics of China. Mr. Woodruff.
(4) Government and Politics of Japan. Mr. Woodruff.
(5) Contemporary South Asia. Mr. Holden.
(6) Contemporary Southeast Asia. Mr. Holden.
(7) Governments of Latin America. Mr. Larson.
(8) Contemporary Politics in Europe. Mr. Romoser, Mr. Wurzburg.
(9) Government and Politics of France. Mr. Wurzburg.
(10) Government and Politics of Germany. Mr. Romoser.
(11) Government and Politics of Canada. Mr. Woodruff.
(12) Government and Politics in the Middle East. Mrs. Schulz.

745. Politics of Development
Concepts of political change viewed in relation to existing political situations. Mr. Savage. 4 credits.

746. Comparative Administration
The history, organization, and potential of public bureaucracies as a political instrument. Mr. Savage. 4 credits.

747. Selected Topics in Comparative Politics
Courses in comparative politics of a special nature not regularly offered. Staff. 4 credits.

International Relations

550. America in World Affairs
Issues confronting the United States as a world power and policies to meet them (formerly 403). Mr. Holden. 4 credits.

551, 552. International Relations
Introduction to the study of international relations, including inter-nation simulation. Mr. Larson. 4 credits.

737, 738. Comparative and International Relations
See listing under Comparative Politics. 4 credits.

755.* International Politics
Problems and choices confronting nation states in dealing with conflict of regional and international scope. Mr. Holden. 4 credits.

756.* Foreign Policies of the Great Powers
Application of foreign policies in the international political process. Mr. Holden. 4 credits.

758.* International Law
Theory, practice, and function of law in international disputes as analyzed from decisions of national and international tribunals. Mr. Woodruff. 4 credits.

759. International Organization
Collective security and cooperation through international organizations such as the League, United Nations, and regional bodies. Mr. Romoser, Mr. Larson. 4 credits.

767. Selected Topics in International Relations
Courses in international relations of a special nature not regularly offered. Staff. 4 credits.
For information on the international relations option in the department see description of Political Science major.

Political Thought

571. American Political Thought
See listing under American Politics.

775. Classical and Medieval Political Thought
Origins of political philosophy in the West, and political thinkers from the Greeks to Machiavelli. Mr. Kayser. 4 credits.

776. Modern Political Thought
Modern political theorists from Hobbes to Marx. Mr. Jaffe. 4 credits.

777. Contemporary Ideologies and Political Thought
Liberalism, conservatism, and radicalism; contemporary ideologies of commitment and science and their implications. Mr. Romoser. 4 credits.

787. Selected Topics in Political Thought
Courses in political thought of a special nature not regularly offered. Staff. 4 credits.

Scope and Methods

691.* Logic of Empirical Political Inquiry
The empirical method of procedure, evidence, and proof in explaining political reality. 4 credits.

793.* Political Sociology
The social bases of political activity. 4 credits.

794. Methods of Research in Political Behavior
Methodology and techniques in evaluating political behavior, surveys, experimental designs, and basic data processing. Aspects of computer technology and political research. Mr. Craig. 4 credits.

Independent Study and Seminars

795, 796. Independent Study
Research in various fields on subjects of special interest to the student, carried out under the instructor's supervision. Staff. 4 credits.

(1) American Politics.
(2) Comparative Politics.
(3) International Relations.
(4) Political Thought.
(5) Scope and Methods.

797, 798. Seminars
Small group discussion and examination of themes chosen by the instructor. Staff. 4 credits.

(1) American Politics.
(2) Comparative Politics.
(3) International Relations.
(4) Political Thought.
(5) Scope and Methods.

Psychology (67)

Chairman: Raymond L. Erickson

PROFESSORS: Herbert A. Carroll, emeritus; George M. Haslerud, Raymond L. Erickson, Frederick M. Jervis, Robert I. Watson

ASSOCIATE PROFESSORS: Peter S. Fernald, Gordon A. Haaland, (assistant chairman), Earl C. Hagstrom, Ronald E. Shor.

ASSISTANT PROFESSORS: Robert G. Congdon, Kirk E. Farnsworth, G. Alfred Forsyth, John R. Forward, Leslie A. Fox, Burton I. Klinger, Edward F. Rutledge

INSTRUCTORS: Peggy D. Forsyth, Anthony A. Walsh

General Courses

401. Introduction to Psychology
Psychology as a behavioral science with emphasis on both its theoretical and applied aspects. This is a prerequisite for all other courses in the department, except with permission of the Department Chairman. Offered both semesters. To actively experience the nature
Psychology

of psychological research, the student is expected to serve as a subject. 4 credits.

545. Clinical Approaches to Human Behavior
The dynamics of normal and abnormal behavior are considered from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. The emphasis is distinctly on human behavior and attention is given to clinical procedures of evaluating and modifying behavior. No training in the use of clinical techniques is given. The emphasis is on familiarizing the student with the nature of the clinical approach. Prerequisite: Psychology 401. 4 credits.

575. Development of the Normal and Exceptional Child
The behavioral and psychological development of children from the prenatal period through adolescence. Topics include intellectual, social, personality, and physical development with discussion of major theorists and current findings in these areas. The exceptional child is discussed in terms of characteristics, causation, adjustment problems, and educational requirements. Areas of exceptionality include giftedness, retardation, physical handicaps, and emotional disturbance. Prerequisite: Psychology 401. 4 credits.

Major Courses

601. Statistics and Methodology in Psychology
Introduction to the uses of statistical analysis and experimental methodology in psychological research. The major goal of the course is to aid students in understanding the basic statistical and procedural considerations involved in answering questions in psychological research. Substantive problems are emphasized as illustrations of typical applications. Prerequisite: Psychology 401. 4 credits. Required of all undergraduate majors and minors in psychology.

602. Experimental Psychology
The application of experimental methods to a variety of psychological phenomena with emphasis on the principles of experimental design and methods of data analysis. In addition to participating in and writing up a sequence of basic laboratory experiments, each student will be responsible for conceiving, conducting, and reporting an original experiment. Prerequisite: Psychology 601. 4 credits.

751-752. The Development and Behavior of Man in the Social System
A systematic examination of normal and abnormal behavior in the context of the social system. Problems of development, personality, and abnormal behavior are considered in the context of social psychological variables. Significant topics are socialization, personality theory, normal and abnormal behavior patterns, and social influence processes. Prerequisite: Psychology 601. Psychology 751 is prerequisite to Psychology 752. 4 credits.

758. Psychology of Learning and Motivation
The roles of learning and motivation are studied in relation to contemporary theories of behavior and integrated with other areas of psychology. Emphases are on theory, research methods, and applications. The major concepts and most recent research findings in the areas of learning and motivation are discussed. Prerequisite: Psychology 601. 4 credits.

778. Brain and Behavior
Relationships between the nervous system and behavior. The course examines the physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in man, as well as the evolution of these functions in lower animals. Prerequisite: Psychology 601. 4 credits.
794. The History of Psychology: An Integration
An opportunity for the major to re­
assess, extend, and integrate his knowl­
dge of psychology within an historical
perspective. Attention is given to ante­
cedents in philosophy and the physical
sciences and their relationship to the
subsequent development of schools and
systems of psychology. In addition, the
course examines contemporary thought
and research in the field. Normally taken
during the senior year. Prerequisite: 20
major credits in psychology or permis­
sion of instructor. 4 credits.

Special Courses
701, (701). Contemporary Topics
in Psychology
A non-credit seminar focusing on
topics of particular interest to students
in psychology. Jointly organized by stu­
dents and faculty to respond to request
of students. Prerequisite: Psychology 401.
No credit.

789, (789). Special Topics
Taught by a different staff member
each year. The instructor presents ad­
vanced material in an area in which
he has developed specialized knowledge
through research and study. Students
may repeat the course, but may not
duplicate areas of specialization. Pre­
requisite: 16 major credits in psychology
or permission of instructor. 4 credits.

795, (795). Independent Study
This course provides the opportunity
for a psychology major to pursue inde­
pendent study with a member of the
faculty. 1) Physiological, 2) Perception,
3) History and Theory, 4) Learning, 5)
Social, 6) Cognition, 7) Development,
8) Experimental, 9) Personality, and
10) Statistics and Methods. Arrange­
ments are to be made with a specific
faculty member and enrollment is by
permission only. 14 credits.

Recreation and Parks (95)
Chairman of Program: Gus C. Zaso

454. Organized Camping
The methods, objectives, and purposes
of organized camping; standards, facili­
ties, equipment, food, sanitation, health,
and safety requirements; program plan­
ing and leadership qualifications; inte­
gration of camping in the public schools;
basic outdoor living skills. Permission of
instructor. 4 credits.

455. Introduction to Community
Recreation
History, trends, community organiza­
tion, financial aspects of administration,
program planning, and leadership of
community recreation, including play­
grounds. Principles and philosophy of
recreation. Elective for sophomores,
juniors, and seniors. 4 credits.

460. Recreation Leadership
A practical study of the areas of social
recreation, materials, and methods of
leadership in the areas of games, music,
drama, etc. Creative to formal training
in leadership techniques with all kinds of
group recreation situations. Designed for
those desiring work on playgrounds, in
camps, scouts, hospitals, 4-H, and other
leisure-time groups. 4 credits.

541. Recreation Practicum
A practical leadership workshop where
the student actually plans, leads, and
evaluates experiences of a recreational
nature with area groups desiring help
with recreation leadership. Majors only.
Prerequisite: Recreation 460. 2 credits.

561. Nature Recreation
A course that evaluates the natural phe­
nomena surrounding man through an ac­
quision of a general background in
the natural and physical sciences. Current
practices, leadership techniques, and ac­
tivity skills include field identification
of animal, bird, fish, and insect life;
trees and shrubs; terrain and geological
formations; cloud, wind, and weather implications; and conservation methods as they relate to man in his natural environment. Mrs. Milne. 2 lectures; 1 laboratory; 4 credits.

644. Outdoor Recreation
School camping and its methodology. Class includes preparing, experiencing, and evaluating two weeks at camp with elementary school children. Use of wildlife and conservation specialists with work in practice and theory of outdoor living. 4 credits.

663. Recreation and Park Administration
Administrative problems and challenges in park and recreation departments. Staff and departmental organization, personnel, facilities, finance, program, and public relations. Administration, operation, and maintenance of city parks and recreation facilities will be evaluated. 4 credits.

677. Areas and Facilities Design for Parks and Recreation
Methods and materials available to the recreation and parks designer in accordance with established standards. Various assigned projects with one major design and rendering work. 1 lecture; 4 laboratories; 4 credits.

788. Recreation Field Work
Opportunity for participation in the planning and operation of a variety of recreation programs, under supervision, in nearby agencies and community centers. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture; 2.5 hour laboratories; 6 credits.

798. Recreation Research Seminar
Consideration of the various behavioral, sociological, and historical aspects of recreation that may lend themselves to research. Students will prepare short research papers, and select and prepare topics for independent study in fields of special interest. Research methodology and evaluative techniques. This course is primarily for Recreation and Parks majors. 4 credits.

Reserve Officers Training Corps
Department of Military Science (98)

PROFESSOR OF MILITARY SCIENCE: Colonel Herbert H. Flather, Infantry
ASSISTANT PROFESSORS: Lieutenant Colonel Donald E. Reid, Infantry; Major Dister L. Deoss, Air Defense Artillery; Major John A. Allard, Infantry
ASSISTANTS: Master Sergeant Burley C. Johnson, Sergeant First Class Donald L. Campbell, Staff Sergeant Robert R. Gagnon

ARMY ROTC PROPERTY OFFICER: Master Sergeant Clarence P. Andersen, U. S. Army (Retired)

The Army Reserve Officer Training Corps offers a course of instruction leading to a commission as second lieutenant in one of fourteen branches of the United States Army. Successful completion of the course and the award of a baccalaureate degree by the University qualify the graduate for this commission. The ROTC program is divided into basic and advanced courses. A student normally takes the basic course during freshman and sophomore years. The same student may elect and be accepted for advanced ROTC during junior and senior years. To qualify for the advanced course and its military allowance, applicants are required to have earned a minimum overall cumulative grade average of 2.0, to have demonstrated positive leadership potential in the basic course, to be physically qualified, to be selected by the Professor of Military Science, and to be approved for admission to the program by the President of the University. A two-year intensified program leading to a commission in the U. S. Army also will be offered. For the requirements of
this special course, contact the Professor of Military Science.

The Army Military Science program is under review; it is expected that courses will follow the student's normal academic progression. The 400 series and the 500 series MS courses taken during the freshman and sophomore years respectively contain fundamentals and overview topics designed to provide a foundation for advanced ROTC. The junior portion of advanced ROTC, covered by 600 series MS, stresses small-unit leadership principles and preparatory work for a six-week summer camp. The summer camp period may be considered essentially as a long laboratory period employing in a practical sense those subjects learned in the classroom. The senior 700 series expands on earlier leadership subjects and prepares the student for commissioning.

ROTC courses will be supplemented by courses from the other departments, such as civil engineering, political science, and economics. Advanced course ROTC students, who can meet physical and aptitude requirements, may volunteer for the Army flight training program. This program conducted by licensed flight instructors includes a thirty-five hour ground school and a thirty-six hour flying phase. Successful completion may lead to a private pilot's license and a career in Army aviation.

Aerospace Studies

Air Force ROTC offers both a four-year and a two-year campus program. Both programs lead to an Air Force commission. The four-year Air Force ROTC curriculum has two divisions, the general military course (basic), or lower division, and the professional officer course (advanced), or upper division. The courses cover the growth and development of aerospace power, astronautics and space operations, and management principles and practices. Selection for the professional officer course is based upon character, attitude, academic record, and leadership ability. Each cadet selected must be a student in good standing with the University, must successfully complete a battery of Air Force officer qualifying tests, and be physically qualified for a commission. Two-year program students must have two years of undergraduate or graduate study remaining to be eligible to apply, and must successfully complete a six-week field training course prior to admission. Four-year students normally attend field training for four weeks in the summer between the junior and senior years.

Successful completion of the professional officer course and the award of a degree by the University qualify the student for a commission as an officer in the U. S. Air Force Reserve. About one-third of those admitted into the professional officer course are physically qualified for, and desire, flight training as a pilot or navigator. Pilot cadets will receive, during their senior year, ground instruction, and 36½ hours of flight instruction, under the supervision of the Federal Aviation Agency, as a prelude to the Air Force flight schools. Attractive financial aid is available to students enrolled in the four-year program. Students in the four-year program will be eligible to compete for merit scholarships which cover all costs of tuition, fees, and books. In addition, all students accepted for entry into the professional officer course will receive a monthly retainer pay while pursuing courses of study leading to an

Department of Aerospace Studies (99)

PROFESSOR OF AEROSPACE STUDIES: Colonel Carl G. Yeaton, USAF
ASSISTANT PROFESSORS: Major Salvatore DeVincenzo, Jr., USAF; Captain Robert W. Crane, USAF; Captain John F. Kenney, USAF
ADMINISTRATIVE: Technical Sergeant Louis R. Ouellette, USAF; Staff Sergeant Philip J. Armitage; Staff Sergeant Richard J. L. Valliere
Air Force commission. Special pay is authorized cadets when they attend summer training at an Air Force base. The Air Force ROTC courses are currently undergoing revision; therefore, specific courses are not identified by number in this catalog. A student wishing to enroll in AFROTC on preregistration cards should merely indicate AFROTC and leave the course number blank. On registration day, at the beginning of the fall semester, students planning to take AFROTC should visit the AFROTC department where they can obtain specific course numbers to enter on their academic schedules.

Resource Economics (21)
Chairman: James R. Bowring

ADJUNCT PROFESSOR: George E. Frick
ADJUNCT ASSOCIATE PROFESSOR: Nelson L. Le Ray
ASSISTANT PROFESSORS: Chauncey T. K. Ching, Sherrill B. Nott

401. Environmental and Resource Economics
An introduction to the economics of resource use and environmental policy. Emphasis is on understanding the underlying economic and institutional forces that influence the use and misuse of resources, the quality of the environment, and human well-being. Macroeconomics concepts studied as guides to national, regional and local resource-use policy. Resource, trade, and development strategies for low-income communities, regions and countries are examined. The practical application of economic concepts to contemporary problems receives major consideration throughout the course. Mr. Jansen. 4 credits.

402. Economics of Resource Use and Growth
The roles of labor, capital, and technology in growth and development. The economics of agricultural production, food marketing, and consumer decision making. National policy for agricultural prices, land use, and resource development. Mr. Henry. 4 credits.

501. Agricultural Business
Structure, organization, and performance in the agricultural business sector. Major emphasis is placed on the decision-making process in management and on quantitative techniques used to aid in decision making. Demand estimation, cost analysis, pricing policies, plant location, and other related topics are integral in the course content. This material is related to the market and institutional environment within which the firm must function. Actual problems and case materials are used to develop the student's capabilities. Mr. Nott. 4 credits.

504. Management of Farm and Related Resource-Based Business
Planning, operation, and control of firms in the institutional environment of commercial agriculture. Major emphasis is on organizing the farm firm, planning adjustments, use and analysis of records, and taxation. Laboratory experience in budgeting changes, analyzing alternatives, estimating credit needs, and farm appraisal. Emphasis is placed upon the proprietorship and partnership forms of business organization. Prerequisite: Economics 402 or Resource Economics 402 or permission of instructor. Mr. Nott. 2 lectures; 1 laboratory 4 credits.

506. Population, Food and Resource Use in Developing Countries
The economic, technical, cultural, social and political factors that influence food supplies, resource use, income distribution and growth potentials in the developing countries. The solution of
population and food problems is given emphasis within the context of an overall economic development strategy. Specific topics include: the population explosion; strategies for expanding food supplies; social, and institutional factors constraining agricultural and economic development; strategies and policies for economic development; the role of international trade, foreign aid and technical assistance. Elective for all students. Mr. Jansen. 4 credits.

701. Applied Statistics I
Use of elementary statistical techniques in analysis of prepared data. Topics surveyed include elementary probability, discrete and continuous probability distributions, distributions of sample statistics, small sample theory, elementary analysis of variance, regression, correlation, chi square and non-parametric analogues of regression and analysis of variance. Attention will be paid to the use of available computer programs to the solution of statistical problems. Mr. Durgin. 4 credits.

705. Structure, Economic Problems, and Planning of Communities in the Non-Urban Environment
The community is taken as an economic unit and analyzed using appropriate methodologies with emphasis on economic growth. Economic forces relative to employment, income, transportation, housing, etc., are analyzed. Community income, expenditures and public services are taken in the context of growth and planning. Prerequisite: one course in social science. Mr. Le Ray. 4 credits.

706. Economics of Resource Development
The classical and modern theories of economic development. Economic problems of land and resources in relation to market location, urban-rural conflicting demands, and conservation and water supply. Population mobility, capital needs, and the roles of public and private leadership will complete the framework for discussion of the major resource development problems of New England. Mr. Bowring. Prerequisite: Economics 401. 4 credits.

707. Research Methods in Social Sciences
The scientific method of research. Analysis of research problems in social sciences. The design of research and the application of research techniques to identifying and solving problems. Can be used in place of Sociology 702. Mr. Drew. Prerequisite: three hours of statistics. 4 credits.

715. Linear Programming Methods
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications, nonlinear programming, discrete programming, and solving input-output and game theory problems. Applications to firm and aggregate economic analysis. Mr. Andrews. Prerequisite: Mathematics 420 or permission of instructor. 4 credits.

756. Regional Economic Analysis
Concepts and methods of delimiting regional economics, theories of regional growth, methods of measuring regional economic activity, empirical approaches to regional economic planning and development, and public policies for regional economies. Although theoretical aspects of regional economics will be considered, primary emphasis will be placed on empirical research studies and their policy implications for regional economic performance. Mr. Ching. Prerequisite: intermediate economic theory, elementary statistics, elementary calculus, elementary linear programming, or permission of instructor. 4 credits. (Alternate years; not offered in 1970-71).

758. Introduction to the Location of Economic Activity
Economic theories explaining the behavior of individual firms and consumers in selecting sites for carrying on economic activities. The relationship of
these theories to patterns of industrial location, systems of cities, and land-use competition in general. Problems of locational change and adjustment and the effects of public policy on spatial economic activities. Mr. Ching. Prerequisites: Resource Economics 715 or its equivalent, Mathematics 425 or its equivalent or permission of instructor. 4 credits. (Alternate years; offered in 1970-71).

795, 796. Investigations in Resource Economics
Special assignments in readings and problems to satisfy students' needs. Staff. 4 credits.

Secretarial Studies (73)

ASSOCIATE PROFESSORS: Doris E. Tyrrell, emeritus; Myra L. Davis

401-402. Shorthand
Principles of Gregg shorthand with practice in transcribing from shorthand plates and class notes, Miss Davis. Prerequisite: proficiency in typing or Secretarial 407-408 which must be taken in conjunction with this course. 4 credits.

405, (405). Personal Use Typewriting
Practice in acquiring correct typing techniques, arranging letters, outlines, notes, themes, bibliographies, and simple tabulations. Open to any student who does not know how to typewrite. Miss Davis. 5 laboratories; 2 credits. NLG.

407-408. Typewriting
Practice in acquiring correct typewriting techniques and in arranging letters, tabulations, and simple manuscripts. Miss Davis, Prerequisite: permission of instructor. 5 laboratories; 2 credits. (See Secretarial 427).

427. Typewriting
Practice in acquiring correct typewriting techniques, and in arranging letters, tabulations, and simple manuscripts. This course is to be taken instead of Secretarial 407 by students who have had Secretarial 405 or the equivalent. Prerequisite: Secretarial 405 or equivalent and permission of instructor. Miss Davis. 5 laboratories; 1 credit.

Social Science (45)

These courses are given under the auspices of the Division of Social Science of the College of Liberal Arts.

681, (681). Internships
Field work in a department, agency, or institutional setting of the state or local government, or in a selected and approved private agency. The work will be under the supervision of the department or agency to which the student is appointed. The chairman of the department involved or his representative will be responsible for arranging the student's individual internship program. Prerequisite: internships for seniors only may be approved by the departments of History, Political Science, Psychology, or Sociology or the Whittemore School of Business and Economics. Not more than 16 credits.

697, 698. Social Science Colloquium
A seminar devoted to the study of the social sciences. The unique aspects of political science, psychology, sociology, economics, and history are emphasized, as well as interdisciplinary implications, through extensive written work and discussions. Limited to Ford Foundation scholars. 4 credits. NLG.

Sociology (68)

Chairman: Arnold S. Linsky

PROFESSORS: Richard Dewey, Stuart Palmer, Solomon Poll, Murray A. Straus

ASSOCIATE PROFESSORS: Melville Nielsan, Melvin T. Bobick, Peter Dodge, Richard E. Downs, Bud B. Khleif
ASSISTANT PROFESSORS: Pauline Soukaris, Richard Ingersoll, Frederick Samuels, Arnold S. Linsky, Thomas Burns, Amnon Orent
INSTRUCTORS: Robert Cabral, Matthew Cooper, Howard Shapiro
LECTURERS: Forbes Bryce, David Fullam

Anthropology Courses

411. Cultural Anthropology
The concepts and methods of anthropology. The structure of culture; culture and personality; economic, family, educational, political, and religious institutions; art; language. Data concerning various primitive societies are presented. 4 credits.

512. Introduction to World Ethnography
Primarily for sociology majors and minors but also for those with a general interest in sociology or anthropology. Selected studies of peoples in the major ethnographic areas of the world. Particular attention will be paid to historical and geographic factors involved in these areas, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Prerequisite: Sociology 411 or equivalent, or permission of instructor. 4 credits.

751. Peoples and Cultures of Africa
A survey of African (below the Sahara) social systems. The stress will be on the analysis of segmentary and non-segmentary systems in terms of their variation throughout the continent. The focus will be on "how" these societies solve the problems of daily living in terms of the tribe, clan, and lineage. Prerequisite: Sociology 411 or Sociology 400. 4 credits.

752. Social Problems in Modern Africa
Urban and rural adjustments (acculturation) of tribal systems in Africa (below the Sahara) to the twentieth century. This course is a follow-up of Sociology 751 although the latter is not a prerequisite. Prerequisite: Sociology 411 or Sociology 400. A background in sociological theory and methods is desirable. 4 credits.

755. Ethnography of Southeast Asia
A study of the geographical, racial, cultural and historical factors in the development of the area, together with detailed examinations of selected peoples and aspects of their cultures. Prerequisite: Sociology 411 or equivalent, or permission of instructor. 4 credits.

Social Service Courses

621. Introduction to Social Welfare
The field of social welfare: historical analysis, the study implications of contemporary federal-state programs including poverty, social security and public assistance programs. Required for social service majors. 4 credits.

622. Methods of Social Work
Study of social casework, social groupwork, and community organization, differentiating the application of social work processes in psychiatric, medical, and correctional settings. Required for social service majors. 4 credits.

631. Social Welfare Field Experience
To give the student an understanding of social welfare through observation and participation. Social service majors will work in a social welfare setting for a period of at least six weeks; this field work is generally done during the summer following the junior year. Weekly seminar sessions constitute the classroom work of the course. Prerequisite: Sociology 621, 622, and permission of instructor. Does not count for major credit in Sociology. 4 credits.

Sociology Courses

400. Introductory Sociology
Man’s social and cultural relationships as revealed in his customs and institutions. Social theory, methods and tech-
Soil and Water Science

741. Social Change and Societal Development
Comparative, interdisciplinary approach to the study of social change. The course focuses on the interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prerequisite: permission of instructor, Sociology 740 recommended. 4 credits.

745. Social Stratification
Nature, functions, patterns, and effects of social stratification. Social mobility. The social class system in the United States. Prerequisite: Sociology 400. 4 credits.

761. Population Dynamics
Examination of major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems, and policies of countries at different stages of economic development. Emphasis is on the interrelationship of population and society. 4 credits.

770. Culture, Personality, and Society
A cross-cultural view of the development of personality as emergent from the matrix of genetic, situational, and sociocultural determinants; and an analysis of the dynamic interplay of sociocultural and psychological behavior system. Prerequisite: permission of instructor. 4 credits.

780. Social Conflict
The nature of social conflict, especially war. The setting and initiation of conflict, its dynamics, and the factors affecting its course and outcome. Prerequisite: permission of instructor. 4 credits.

785. The Study of Work
This course is centered on the assumption that to understand society, one needs to understand the structure of work. Case studies of high-status and low-status occupations are used as clues to a larger perspective—an awareness of social processes and interrelationships in the social structure. The student is encouraged to study occupations in an ethnographic manner. Graduate students may enroll only with permission of instructor. 4 credits.

795, 796. Reading and Research in Sociology and Anthropology
A student prepared by training and experience to do independent work under the guidance of an instructor may register for one or more of the following sections: (1) communications, (2) criminology, (3) cultural/social anthropology, (4) culture change, (5) culture and personality, (6) deviant behavior, (7) prehistoric archeology, (8) family, (9) population, (10) rural urban, (11) social control, (12) social differentiation, (13) social movements, (14) social psychology, (15) social research, (16) social theory, (17) anthropological linguistics. Prerequisite: 12 hours of sociology or anthropology and permission of instructor. Hours and credit to be arranged.

Soil and Water Science (23)
Acting Chairman: Gordon L. Byers

Professor: Gordon L. Byers
Associate Professors: Nobel K. Peterson, Francis R. Hall
Adjunct Associate Professor: Robert S. Pierce
Assistant Professors: Glendon W. Gee, Robert D. Harter

Hydrology
504. Fresh Water Resources
Designed to provide an adequate background for students desiring to develop a better understanding of fresh-water resources. The subject is approached from the viewpoint of the hydrologic cycle and hydrologic budget or water balance.
Major topics include precipitation, evaporation, evapo-transpiration, infiltration, groundwater, and runoff. Consideration is given to control systems and planning for water resource development. Mr. Byers. 3 lectures; 1 laboratory; 4 credits.

703. Soil and Water Engineering
The treatment of engineering principles relating to the control of water. Major topics include precipitation and streamflow measurement, estimating runoff from a watershed, and the design of structures to control this runoff. Subsurface drainage and irrigation systems are studied in detail. Laboratory sessions are designed to acquaint the student with instrumentation and problem analysis. Mr. Byers. Prerequisite: permission of instructor. 3 lectures; 1 laboratory; 4 credits.

705. Principles of Hydrology
The physical and chemical processes involved in the movement of water through the rainfall-runoff segment of the hydrologic cycle. Major topics include infiltration and percolation, overland and channel flow, channel processes, and the nature of the stream discharge record or hydrograph. Laboratory sessions involve the use of a demonstration channel, electrical and fluid models, and selected problems to demonstrate important principles. Mr. Hall. Prerequisites: one year of geology and one year of calculus. 3 lectures; 1 laboratory; 4 credits.

710. Ground-Water Hydrology
Introduction to the principles governing the occurrence, location, and development of ground water. Major topics include well hydraulics, geophysical exploration, and chemical quality of water. Brief treatment given of water law and economics. Laboratory sessions are designed to illustrate principles by use of fluid and electrical models, geophysical instruments, and selected problems. Mr. Hall. Prerequisite: Soil and Water Science 703 or permission of instructor. 3 lectures; 1 laboratory; 4 credits.

Soil Science

501. Introductory Soils
Designed to acquaint the student with the divisions of soil science: soil physics, soil chemistry, soil microbiology, soil-plant relationships, soil classification, and soil and water conservation. The laboratories are coordinated with the lecture material. Mr. Peterson. 3 lectures; 1 laboratory; 4 credits.

502. Soil-Plant Relationships
The study of soils in relation to the requirements for optimum growth of plants; methods of determining the amount of nutrient elements in soils that are available for absorption by plants; and recognition of the symptoms in plants of the deficiency of specific nutrient elements. Mr. Peterson. Prerequisite: Soil and Water Science 501. 3 lectures; 1 laboratory; 4 credits.

701. Physics of Soils
Physical properties of soils in relation to their composition, formation, classification, and use as a vital resource. Structure, texture, water retention, and heat transfer in relation to plant growth. Methods of soil physical analysis. Mr. Gee. Prerequisites: one year of physics and one year of calculus. 3 lectures; 1 laboratory; 4 credits.

702. Chemistry of Soils
Chemical properties of soils in relation to their composition and use as a vital resource. Colloidal phenomena and its relation to exchange and fixation of elements in soil. Major topics include: cation exchange capacity and source of negative charge, the nature of soil acidity, the chemistry of nitrogen and phosphorous in the soil, and modern methods of soil chemical analysis. Laboratory sessions are designed to acquaint the student with analytical methods commonly used in soil chemistry. Mr. Harter. Prerequisite: Chemistry 517 or equivalent, or permission of instructor. 4 lectures; 1 laboratory; 4 credits.
704. Soil Classification and Mapping
The genesis, morphology, classification, and mapping of soils with emphasis on major classification systems used in the United States and throughout the world as they relate to man's uses of the soil. Prerequisites: Soil and Water Science 501 and an introductory geology course or by permission of instructor. Mr. Peterson. 3 lectures; 1 laboratory; 4 credits.

709. Soils and Community Planning
A "Town Plan" and a soils map are studied by students to develop individual reports of land use. The course includes an introduction to the soils of New Hampshire, basic information on the U.S.D.A. soil classification system, and the Soil Conservation Service criteria for rating soils for multiple use: housing, recreation, sewage, effluent disposal, conservation, transportation, surface runoff, and other soil-use problems common to many rural and urban communities. A representative of a town-planning firm, and federal and state soil scientists are guest lecturers. Mr. Peterson. 2 lectures; 2 credits.

795, 796. Independent Work in Soil and Water Science
Students with a major in the Department are required to take 795 and 796 for two credits per semester in their senior year. The student may choose his faculty consultant and topic from the options listed below. Students with an interest in some aspect of soil and water science from other departments may also enroll in 795-796 for two credits per course.

1. Soil-Plant Relationships, Mr. Peterson
2. Physics of Soils, Mr. Gee
3. Hydrology, Mr. Byers and Mr. Hall
4. Chemistry of Water, Mr. Hall
5. Chemistry of Soils, Mr. Harter
6. Soil Classification, Mr. Peterson

797, 798. Soil and Water Science Seminar
Discussions on special phases of soil and water problems by students, faculty, and guest speakers. Required of soil and water science majors who are enrolled in 795-796. Staff. No credit.

Spanish and Classics
Chairman: Michael S. Pincus

PROFESSORS: John S. Walsh, emeritus; R. Alberto Casas, Warren H. Held
ASSOCIATE PROFESSORS: Richard J. Callan, Charles H. Leighton, Michael S. Pincus
ASSISTANT PROFESSORS: John C. Rouman, Richard V. Desrosiers, Myrna C. Adams
INSTRUCTORS: Richard C. Frankhouser, Isabel A. Irwin, Philip J. Sheridan, Richard C. Spies

Classics (55)

601-602. Elementary Sanskrit
Prerequisite: permission of instructor. 5 recitations, 4 credits.

611-612. Survey of Greek Literature
The masterpieces of Greek literature in translation. Through the study of literature, the student will learn about the ancient civilization from which much of our contemporary culture has come. A cultural course for the student unprepared to read the original language but desiring acquaintance with the subject matter. A background course for majors in such subjects as English, history, Latin, or the modern languages and literatures. Not open to freshmen. Prerequisite: permission of instructor. 3 recitations; 4 credits. Offered in alternate years with Classics 621-622.

621-622. Survey of Roman Literature
The masterpieces of Roman literature in translation. The object of the course
is the same as Classics 611-612. Not open to freshmen. Prerequisite: permission of instructor. 3 recitations; 4 credits. Offered in alternate years with Classics 611-612.

695-696. Honors Work in Classics
For seniors writing a research paper in the honors program in classics. Prerequisite: permission of instructor. 3 recitations; 4 credits.

Greek (58)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Greek
Grammar, simple composition, and translation. 5 recitations; 4 credits.

503-504. Intermediate Greek
Selected readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prerequisite: Greek 402. 3 recitations; 4 credits.

601-602. Greek Prose Composition
A review of Attic Greek grammar; a study of Greek prose style; translation of English into Greek. Prerequisite: permission of instructor. 3 recitations; 4 credits.

751-752. Homer and the Archaic Period
Selected readings from the “Iliad,” the “Odyssey,” the Homeric Hymns, Hesiod, Pindar, and the Lyric Poets. Prerequisite: permission of instructor. 3 recitations; 4 credits.

753-754. Athenian Historians
Selected readings from Herodotus, Thucydides, and Xenophon. Prerequisite: permission of instructor. 3 recitations; 4 credits.

755-756. Athenian Drama
Selected readings from Aeschylus, Sophocles, Euripides, Aristophanes, and Menander. Prerequisite: permission of instructor. 3 recitations; 4 credits.

757-758. Athenian Philosophy and Oratory
Selected readings from Plato, Aristotle, Lysias, Demosthenes, and Isocrates. Prerequisite: permission of instructor. 3 recitations; 4 credits.

795-796. Special Studies in Greek
Prerequisite: permission of instructor. 3 recitations; 4 credits. Examples of topics that may be selected by instructor and student in conference are:
1. Pre-Socratic Philosophers
2. Hellenistic Greek Authors
3. Theocritus
4. Polybius
5. Greek Authors of the Roman Empire
6. Plutarch
7. Septuagint
8. New Testament
9. Greek Church Fathers
10. Byzantine Authors
11. Spoken Greek
12. Advanced Greek Composition
13. Introduction to Classical Scholarship
14. Greek Epigraphy
15. Greek Dialects
16. Comparative Grammar of Greek and Latin
17. Homer: A Linguistic Analysis
18. Greek Institutions
19. Palaeography and Textual Criticism

Latin (60)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Latin
Elements of grammar, reading of simple prose. 5 recitations; 4 credits. This course cannot be counted for major credits.

503-504. Intermediate Latin
Review. Selected readings from Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prerequisite: Latin 402 or equivalent. 3 recitations; 4 credits.
Spanish and Classics

601-602. Latin Prose Composition
A review of Latin grammar; a study of Latin prose style; translation of English into Latin. Prerequisite: permission of instructor. 3 recitations; 4 credits.

751-752. Cicero and the Roman Republic
Prerequisite: permission of instructor. 3 recitations; 4 credits.

753-754. Roman Historians
Selected readings from Livy, Sallust, and Tacitus. Prerequisite: permission of instructor. 3 recitations; 4 credits.

755-756. Vergil
Prerequisite: permission of instructor. 3 recitations; 4 credits.

757-758. Horace
Prerequisite: permission of instructor. 3 recitations; 4 credits.

759-760. Catullus and Martial
Prerequisite: permission of instructor. 3 recitations; 4 credits.

761-762. Ovid and the Elegiac Poets
Prerequisite: permission of instructor. 3 recitations; 4 credits.

763-764. Pliny and Statius
Prerequisite: permission of instructor. 3 recitations; 4 credits.

791. Problems in the Teaching of Latin in the High School
Prerequisite: permission of instructor. 3 recitations; 4 credits.

795-796. Special Studies in Latin
Prerequisite: permission of instructor. 3 recitations; 4 credits. Examples of topics that may be selected by instructor and student in conference are:

1. Minor Authors of the Republic
2. Plautus
3. Terence
4. Lucretius
5. Caesar
6. Sallust
7. Minor Authors of the Empire
8. Ovid
9. Seneca
10. Lucretian
11. Quintilian
12. Persius and Juvenal
13. Tacitus
14. Suetonius
15. Latin Church Fathers
16. Medieval Latin
17. Advanced Latin Composition
18. Introduction to Classical Scholarship
19. Latin Epigraphy
20. Italic Dialects
21. Comparative Grammar of Greek and Latin
22. Roman Law

Spanish (62)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Spanish*
For students without previous knowledge of Spanish. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. No credit toward a major. (Students who offer two or more entrance units of high school work in Spanish will not be permitted to register for credit for Spanish 401.) 5 recitations; 2 laboratories; 4 credits.

403-404. Elementary Portuguese*
For students without previous knowledge of Portuguese. Aural-oral practice and the study of fundamental speech patterns, reading, and writing to achieve a firm basis for an active command of the language. No credit toward a major. (Students who offer two or more entrance units of high school Portuguese will not be allowed to register for credit for Portuguese 403-404.) 5 recitations; 2 laboratories; 4 credits.

* No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language.
503-504. Intermediate Spanish*

Intensive and extensive reading of complete texts of intrinsic literary and intellectual worth, formal review of the structure of the language, training in oral and written expression of ideas. Classroom discussion and papers in Spanish Open by placement examination, and to students who have passed Spanish 402 with a grade of C. Students making a grade of A in Spanish 504 may take courses numbered 750 and above with the permission of the department. 3 recitations; 1 laboratory; 4 credits.

505-506. Introduction to Spanish Literature and Thought*

Reading and analysis of significant works in Spanish literature and thought. Outside readings on the historical and cultural background of the works read. Papers and discussion in Spanish. Term paper in English. This course or its equivalent is prerequisite to all higher courses in Spanish. Open to students who have achieved a grade of C or better in Spanish 504, and by placement examination. Conducted in Spanish. 4 credits.

631, 632. Advanced Spanish Conversation and Composition*

For students who wish to perfect their command of written and spoken Spanish, maintain aural-oral fluency in Spanish through intensive work in and out of the classroom, individual conferences, and laboratory sessions. Prerequisite: Spanish 503 or 504 or equivalent. 3 lectures; 2½-hour laboratory; 4 credits.

665, 666. Spanish-American Literature

The main themes of Spanish-American literature studied in the works of its most representative authors and against the historical, social, and geographical background of the New World. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

685-686. Junior Year Abroad

A program of studies at a Spanish or Spanish-American university for juniors who have completed their sophomore year at the University of New Hampshire and have passed Spanish 503-504 with a grade of B or better. Students interested in the program are expected to take courses in Spanish in their freshman and sophomore years. The students chosen for the program will be required to take a non-credit orientation course during the second semester of their sophomore year. Interested students should consult with the directors of the program, Mrs. Isabel A. Irwin or Professor Michael S. Pincus. 32 credits. Not offered for graduate credit.

695, 696. Honors Work in Spanish

For seniors writing a research paper in the honors program in Spanish. Prerequisite: permission of major supervisor. 2 or 4 credits.

701, 702. Catalan

An introduction to Catalan grammar and literature. Semester I: study of the linguistic elements of Catalan, especially in its contrasts with other Romance languages, and basic readings in Catalan. Semester II: a survey of Catalan literature from the Middle Ages to the present. Prerequisite: completion of an intermediate-level course in Latin or one of the Romance languages, or permission of the instructor. This course does not satisfy the language requirement in the College of Liberal Arts. 4 credits.

707, 708. Comparative Literature

For 1970-71, a study of the European novel of the twentieth century, taught by members of the faculty of the Departments of English, French and Italian, German and Russian, and Spanish and Classics. (This course is the same as French 707-708 and German 707-708.) 4 credits.

752. Drama and Poetry of the Siglo De Oro

The social background of the baroque period. Readings of representative plays of Lope de Vega, Tirso de Molina, Calderon, and the poetry of Lope, Gongora,
and Quevedo. Development of the prose of the period. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

754. Cervantes
The development of Cervantes' literary art. Reading and discussion of selections from all the major works of Cervantes. Comprehensive study of the Quijote, its originality and significance; its antecedents; its religious, philosophical and sociological aspects; and its artistic structure. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

755. Literature of the Nineteenth Century
Readings and discussion of works by significant writers of the nineteenth century in Spain, such as Larra, Espronceda, Bécquer, Pérez Galdós, and Blasco Ibáñez, within the artistic, philosophical, and social environment of the century. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

757. Theater and Poetry of the Twentieth Century
Critical analysis, reports, and discussion of the major developments in poetry and the drama of the twentieth century, beginning with the Generation of '98. Major writers to be studied will include Benavente, Machado, J. R. Jiménez, García Lorca, Casona, Sastre, Buero Vallejo, Dámaso Alonso, and Miguel Hernández. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

758. Spanish Prose of the Twentieth Century
Readings and discussion of the novels, short stories, and essays of such major writers of the twentieth century as Unamuno, Baroja, Menéndez Pidal, Ortega y Gasset, Julián Marías, Aranguren, Pérez de Ayala, Gironella, and Cela, as well as a survey of contemporary prose. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

760. Unamuno and Ortega y Gasset
Critical examination of the philosophical ideology and literary content of the major contributions of Miguel de Unamuno and José Ortega y Gasset. Prerequisite: Spanish 506 or equivalent, or permission of instructor. 4 credits. (Offered alternate years.)

771. Spanish-American Drama
From pre-Hispanic origins to the present, with emphasis on the modern playwrights of Mexico and Puerto Rico. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

772. Spanish-American Novel
Development of the genre from Romanticism to present-day writers, with special emphasis on contemporary trends and techniques. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

773. Spanish-American Short Story
Development of the genre through study of representative authors, with stress on the twentieth century. Principles of interpretation. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

774. Spanish-American Poetry
Discussion of major poets from modernismo to the post-Vanguard movements: Dario, Huidobro, Mistral, Vallejo, Octavio Paz. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits. (Offered alternate years.)

Spanish-Education 791. Problems in the Teaching of Spanish in the High School
The special objectives, methods, and devices of modern language teaching in high school. For prospective teachers of Spanish. Prerequisite: permission of the instructor. 4 credits.
795, 796. Special Studies in Spanish Language and Literature

Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics that may be selected by instructor and student in conference are:

1. The history of the Spanish language
2. Medieval Spanish literature
3. Spanish literature of the Renaissance
4. Spanish literature of the Golden Age
5. Spanish literature of the eighteenth and nineteenth centuries
6. Spanish literature of the twentieth century (1898-1936)
7. Contemporary Spanish literature
8. Spanish American literature of the sixteenth and seventeenth centuries
9. Spanish American literature of the eighteenth and nineteenth centuries
10. Spanish American literature of the twentieth century
11. Contemporary Spanish American literature
12. Structural and applied linguistics

Prerequisite: permission of major supervisor. 2 or 4 credits.

Speech and Drama (69)

Chairman: Joseph D. Batcheller

PROFESSORS: Edmund A. Cortez, emeritus; Joseph D. Batcheller

ASSOCIATE PROFESSORS: John C. Edwards

ASSISTANT PROFESSORS: Gilbert B. Davenport, Frederick P. Murray

INSTRUCTORS: Raymond J. Bernier, William O. Gilsdorf, Marianne H. Jaffe, Carol A. Lucha, Philip J. Sabatelli, Wilburn L. Sims

ADJUNCT INSTRUCTOR: Alice Bowes

402 (402). Communications I

A theoretical approach providing an introduction to speech communication arts and sciences. A major goal of the course is the student's awareness of himself and his role in the wide ranging process of communication. Public speaking, discussion, mass communication, speech science, speech pathology, and oral interpretation are representative communication areas. Required of all majors; two lecture demonstrations and a two-hour laboratory-discussion section. Team taught with guest lectures. Staff. 4 credits.

403 (403). Communications II

Through emphasis on performance the student will experience various forms of communication, both verbal and nonverbal. The goal will be to sensitize the speaker to aspects of the process of communications, including understanding and adapting to receivers, language choice, maximizing attention, message organization, effective listening, delivery techniques, idea selection, and development. An emphasis on self-analysis and interpersonal evaluation should result in improved effectiveness as an oral communicator. Staff. 4 credits.

435. Theatre and Its Drama I

Dramatic theory with emphasis upon the metaphorical approach and the modern theatre. Survey of theatre areas, personnel, and methods. Attendance at University Theatre and Allied Arts productions. Minimal participation in University Theatre productions. Mr. Batcheller and Staff. 4 credits.

436. Theatre and Its Drama II

Theatre and drama history and theory in its social framework from the beginnings to 1800. Mr. Batcheller and Staff. 4 credits. (Alternate years.)

438. Theatre and Its Drama III

A continuation of Speech and Drama 436 from 1800 to the present. Mr. Batcheller and Staff. 4 credits. (Alternate years.)

457. Oral Interpretation

The analysis of literature as a basis for performance; demonstration and experimentation with methods of performance which will enhance particular pieces
of literature; the development of a critical standard for evaluation of performance, and consequently, of literature. Mr. Edwards. 2 lectures; 2 laboratories; 4 credits.

459 (459). Scenic Arts I

481. Summer Repertory Theater Workshop
An intensive workshop which includes the following: 1) Classes in voice, movement, make-up, and improvisation taught by the directors and paid actors of the resident company. 2) Experience in technical aspects of theater—scenery, costumes, lighting, publicity. 3) Performance in Summer Theater production with experienced resident actors. Admission to workshop by audition only. Enrollment by permission of Mr. Edwards. 8 credits. June 22-August 14. To be arranged (classes, rehearsals, and performances). Mr. Batcheller, Mr. Edwards and staff.

501 (501). Debate Workshop
Students examine argumentation as a process of rational decision-making by exploring and applying debate techniques. Exploration includes such areas as types of propositions and debates, proofs, the structure of reasoning, research and case development, methods of refutation. Application involves active participation in a variety of debate formats: audience debating, parliamentary debating, tournament debating. May be repeated. Mr. Sims. 2 credits.

503. Group Communications
An examination of communication behavior in small groups. The goal will be increased sensitivity to the dynamics of interaction with emphasis on speaking, listening, process, leadership, self-perception, and behavioral patterns developed in formal and informal group situations. Increased communication effectiveness will be sought through evaluating and experiencing small group discussions and projects. Mr. Gilsdorf. 4 credits.

506. Persuasion
Examines the nature, function, methods, and problems of influencing human behavior. The study of both modern and classical theory is combined with performance in a variety of communication situations with particular emphasis upon audience analysis as a necessary function of effective persuasion. Mr. Gilsdorf. 4 credits.

521. Speech and Hearing Science
Anatomical, neurological, and physiological bases of the vocal and auditory mechanisms. A synthesis of the natural and physical sciences needed for human communication. Study of the processes of respiration, phonation, articulation, and audition. Acoustical and physical properties of speech. Staff. 4 credits.

524. Applied Phonetics of American English
An introduction to phonetics through use of the international phonetic alphabet primarily in the analysis of the sounds of American English. Study and transcription of American and foreign dialects in conjunction with the professional interest of the student. Staff. 4 credits.

547 (547). Scenic Arts II
Stage costume, play analysis, color coordination, fabrics, period styles, costume charts, schedules, and plates; patternmaking and costume construction for the stage. Participation in one major University Theatre production or the equivalent. To be taken concurrently with Speech and Drama 549. Mr. Davenport and staff. 2 credits.
549 (549). Scenic Arts III
Stage lighting, atomic theory, principles of electricity and color; stage lighting method—light plots and instrument schedules. Survey of innovations in lighting equipment and techniques. Participation in one major University Theatre production or the equivalent. To be taken concurrently with Speech and Drama 547. Mr. Bernier and staff. 2 credits.

551. Rehearsal and Performance I
Fundamentals of stage action for performer and director: movement and use of stage with emphasis on visual arrangement; theatrical speaking and the use of sound for auditory patterns. Exercises and criticism. Mr. Edwards and staff. 2 credits.

552. Rehearsal and Performance II
Continuation of Speech and Drama 551. Application of prior training to scenes and short plays. Mr. Edwards and staff. 2 credits.

555. Introduction to Mass Communications
The nature, development, and societal effects of mass communication in our society. Emphasis will be on a particular understanding of broadcasting, although its relation to film and printed media will be examined. The techniques of radio as a basic medium through studio practice and production. Students will also be introduced to television. Staff. 2 lectures; 1 laboratory; 4 credits.

565. Musical Comedy Workshop
An introduction to Musical Comedy performance styles with emphasis on the development of short scenes, dialogue, song and dance. Miss Lucha. 2 credits.

572. General Semantics
A study of the theory and practice of general semantics, with emphasis upon the writings of Alfred Korzybski, Stuart Chase, Irving J. Lee, S. I. Hayakawa, Wendell Johnson, Harry Weinberg, etc. The study of man as a symbol-user and the effects of language on behavior. The application of the principles of general semantics to both non-verbal and verbal behaviors, interpersonal communication, etc. Topics will include: the abstracting process, symbol and signal reactions, the general theory of time-binding, feedback mechanisms, multiordinality of language, the structural differential, limitations of language, the consequences of process thinking, etc. Mr. Sabatelli. 4 credits.

602 (602). Special Problems in Communication Disorders
Individual or group projects to enrich or expand theoretical or applied experiences. By permission and arrangement with faculty. Variable credits of 2, 4, 6, or 8. May be repeated to a maximum of 8 credits.

608. Advanced Speech Composition
In a writing-and-speaking workshop students explore problems and methods of written message-preparation designed for oral delivery. Includes analysis of past and contemporary speeches as models, preparation and delivery of various speech types to understand and refine methods, skills and techniques of written/oral communication. Mr. Sims. Prerequisite: Speech and Drama 402 or 403; expository writing; or their equivalents. Permission of instructor. 4 credits.

621. Creative Dramatics
The theory and technique of teaching creative dramatics, introducing methods useful to classroom teachers, art and music teachers, special teachers, recreation specialists, and therapists. Study of guided child improvisation, including drama appreciation, story telling, story dramatization, interaction of the arts, and puppetry. Staff. 4 credits.

622. Theatre for Children
The art of children's theatre production for both school and recreation programs. Students will observe and take part in the production of a play for children. Staff. 4 credits.
Speech and Drama

631. Speech Pathology I
An examination of the etiology and treatment of the more common speech disorders. Emphasis is given to speech development, articulation problems, and stuttering. Mr. Murray. Prerequisite: Speech and Drama 403 or permission of instructor. 4 credits.

632. Speech Pathology II
The nature of speech disorders of psychological and physical origin. Identification, case-study method, observations, referral procedures, and rationales for therapy are discussed. Pertinent research is reviewed regarding aphasia, cerebral palsy, mental retardation, and emotional disturbance. Speech/voice/language therapy is considered in an interdisciplinary context. Prerequisite: Speech and Drama 631. 4 credits.

634 (634). Clinical Practice in Speech Pathology
Supervised experience in diagnosis and therapy with speech handicapped children and adults. Discussion and demonstrations of therapeutic procedures and practices. Initial experiences are provided with school-age children with articulation disorders in individual and group therapy. Mr. Murray. Prerequisites: Speech and Drama 632 and 524. 4 credits.

638. Language and Speech Development
An examination of the pertinent research in the acquisition of language and speech in the normal child. Physical, intellectual, social, cultural, linguistic, and psychological processes. Individual measurement and observation of children's language functioning. Staff. Prerequisite: developmental psychology or equivalent. 4 credits.

652. Scenic Arts IV
Fundamentals of scene design. Problems and exercises in the design and construction of stage settings, including action and movement analysis, two- and three-dimensional composition, drafting of plans and working drawings, execution of painters' elevations, value drawings, and color renderings of perspective projections. Major project: completion of a scale model setting for an assigned play. Mr. Davenport. Prerequisites: Speech and Drama 459, 547-549. 4 credits.

654 (654). Performance Project
Application of acting and directing theory to specific assigned responsibilities in a University Theatre production or to an individual performance project. Prerequisites: Speech and Drama 551, 658. To be taken in conjunction with Speech and Drama 655, but not concurrently. 2 credits. (Can be repeated to 4 credits.)

655 (655). Scenic Art Project
Application of experience in design and technical aspects of theatre to specific assigned responsibilities in a University Theatre production or to an individual project or presentation. Prerequisites: Speech and Drama 459, 652. To be taken in conjunction with Speech and Drama 654, but not concurrently. 2 credits. (Can be repeated to 4 credits.)

657. Rehearsal and Performance III
Continuation of Speech and Drama 552. The performer and director develop interaction of character. Ensemble techniques, Mr. Edwards and staff. Prerequisites: Speech and Drama 551 and 552 or the equivalent. 2 lectures; 2 laboratories; 4 credits.

658. Rehearsal and Performance IV
Continuation of Speech and Drama 657 and of the sequence begun in Speech and Drama 551 and 552. Styles of drama for the actor and director: Greek, Shakespearean, eighteenth century comedy and nineteenth century realism. Mr. Edwards and staff. Prerequisites: Speech and Drama 551 and 552, 657, or the equivalent. 4 credits.
668. Group Interpretation
  Choric speaking, reader's theater, chamber theater, and other forms of
  group interpretation in theory and practice. Mr. Edwards. Prerequisite: Speech
  and Drama 457. 4 credits. (Alternate years.)

671. Seminar in Criticism of
  Contemporary Communication
  Analysis and evaluation of contemporary rhetoric. The first several weeks
  will concentrate on developing criteria and methodology for effective criticism,
  the remainder on a contemporary speaker, movement, or communication
  phenomena mutually agreed upon by the seminar members. Examples are cam­
  paign rhetoric, the rhetoric of racism, the rhetoric of student activism, class­
  room speaking, etc. Because of the shifting nature of the course content, the
  seminar may be repeated for additional credit. Mr. Gilsdorf. Prerequisite: Speech
  and Drama 403 or permission of instructor. 4 credits.

673. Experimental and Descriptive
  Studies in Oral Communication
  An examination of experimental and descriptive studies in the field of speech,
  with emphasis upon the theoretical contributions which have evolved from such
  investigations. Methodological problems encountered in the literature under dis­
  cussion will also be considered. Mr. Sabatelli. 4 credits.

681. Theater Workshop for
  Teachers
  This is an intensive seminar-workshop for teachers in rehearsal techniques,
  theater production, and stage direction, including work in laboratory and in sum­
  mer repertory theater production as applicable to secondary school theater.
  June 22-July 17. Mr. Batcheller, Mr. Edwards and staff. To be arranged (classes,
  rehearsals, and performances). 4 credits.

682. Theater Workshop for
  Teachers
  The second half of Speech and Drama
  681. Speech and Drama 681 is not a
  Mr. Batcheller, Mr. Edwards, and staff.
  To be arranged (classes, rehearsals, and
  performances). 4 credits.

691. Laboratory or Field Experience
  An emphasis on communications. Taken in the senior year. Staff. 4 credits.

693. Theatre Management
  Theatre organization, public relations, business, and box office management
  with projects associated with University Theater activities. Special topics may be
  explored by the individual. Mr. Batch­
  eller. Prerequisite: four courses in theat­
  re. 4 credits. (Alternate years.)

697 (697). Senior Seminar I
  A review of the recent developments and trends in the oral communication
  arts and sciences. Stress will be laid up­
  on inter-relationships and varied methods
  of research. Students will prepare short
  written and oral research reports in
  preparation for their senior paper and / or
  project. Mr. Batcheller and staff. Pre­
  requisite: senior standing. Once a week
  for two hours; 2 credits.

698 (698). Senior Seminar II
  The development of an individual paper and / or project in a specific area
  of oral communication arts and sciences.
  Mr. Batcheller and staff. Prerequisite: senior standing. Meets individually and
  as a group. 2 credits.

704. Audiology
  Pathologies of the auditory system and
  their electrophysical measurement. Hear­
  ing conservation programs in the school,
  community, and industry are reviewed.
  Technique of pure-tone audiometry is
  the major focus. Prerequisite: speech
  and hearing science or permission of
  instructor. Staff. 4 credits.
Technology

705. Aural Rehabilitation
Principles, techniques, and materials involved in auditory training and speech reading instruction for the hard-of-hearing or deaf individual. Emphasis will be given to the psychology of the aurally handicapped person within the hearing world. Staff. Prerequisite: Speech and Drama 704 or permission of instructor. 4 credits.

795, 796. Independent Study
Application of the theory of specific speech communication areas in individual or group projects. May be repeated and taken for variable credits of 2, 4, 6, or 8. Could be combined with the senior experience (for majors) for a total of 12 credits in the same semester if the student wished to be free to study off-campus. Project is to be developed with supervising instructor. Staff.

Technology (79)

601. Statistical Methods in Engineering and Physical Science
Methods of organizing data and statistical techniques for data analysis as applied to problems in engineering and physical science. Elementary probability theory, probability distributions, tests of significance, correlation, and regression analysis. Design of experiments; completely randomized, randomized blocks; factorials, fractional factorials; process optimization. Introduction to quality control; construction and analysis of control charts for variables and attributes; statistical aspects of tolerance. 4 credits.

610. Introduction to Ocean Technology
This course will be conducted on a seminar basis. It will deal with engineering problems arising in various fields of current oceanographic interest. Typical areas will be marine biology, saturation diving systems, and physical oceanography. In addition to the engineering faculty directing this course, other knowledgeable members of the ocean community will be invited to participate. Prerequisite: Permission of instructor. 4 credits.

683. Environmental Aspects of Engineering Design
Consideration of the relationship of environment to the design of engineering systems. An examination of the impact of past technological developments on social, economic, and ecological systems. The influence of social and psychological mores on technological growth. The impact of hostile environments on design. A survey of current environmental problems and an assessment of some probable avenues of approach through technology to the solution. The decision process involved in the development of technology. Instruction is given by lectures and group discussions and through extensive reading assignments. Prerequisite: senior standing in the College of Technology or permission of instructor. Three 1-hour lecture or discussion periods and one small group seminar per week. 4 credits.

Zoology (70)

Chairman: Langley Wood

PROFESSORS: Edythe T. Richardson, emeritus; Lorus J. Milne, Wilbur L. Bullock, Paul A. Wright, Emery F. Swan, Philip J. Sawyer, Langley Wood,
ASSOCIATE PROFESSORS: Paul E. Schaefer, Marcel E. Lavoie, Arthur C. Borror, Frank K. Hoornbeek, John J. Sasner
ASSISTANT PROFESSORS: Robert A. Croker, Edward N. Francq, John E. Foret, Edward K. Tillinghast, Larry G. Harris

(412), 412. Principles of Zoology
Concepts of animal biology, including an introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Staff. 4 credits.
507-508. Human Anatomy and Physiology
An integrated presentation, by systems, of structure and function in the human body. Lectures are strongly oriented toward physiology. Weekly laboratories alternate between dissection of a preserved small mammal and physiological exercises, involving observations on living tissues. Mr. Lavoie. 4 credits.

518. Vertebrate Morphology
A study of the basic morphological features of the vertebrates. The structure of the major systems will be studied at both the macroscopic and microscopic levels. Mr. Bullock. Prerequisite: Zoology 412. 4 credits.

527. Vertebrate Physiology
Designed to complement Zoology 518 in comparing the functioning of vertebrate organ systems. Mr. Wright. Prerequisite: Zoology 412. 4 credits.

530. Zoological Techniques
A functional background of specialized procedures useful for research and study in zoological areas. Topics will include preservation, fixation, sectioning, staining, microscopy, photomicrography, and use of such instrumentation as is available and depending on the needs of the students enrolled. Mr. Schaefer and Mr. Milne. Prerequisite: Zoology 412 and permission of instructor. 4 credits.

542. Ornithology
Birds, their identification, migration, life histories, and economic importance, with special reference to those of eastern North America. Mr. Borror. Prerequisite: one semester of biology. 4 credits.

604. Principles of Genetics
An introduction to the chemical and physical basis of inheritance; genes as units of mutation, structure and function in heredity and development. Organization of the genetic material. Taught by Genetics faculty from departments of Biochemistry, Microbiology, and Zoology. Prerequisite: Zoology 412 or equivalent. 4 credits.

606. Neurology
Practical study of morphology, physiology, and histology of the human nervous system, for students in occupational therapy. Mr. Milne. Prerequisite: Zoology 508. 4 credits.

618. Introductory Invertebrate Zoology
A lecture and laboratory survey of the invertebrate phyla with emphasis on their systematics, morphology, phylogeny, and natural history. Mr. Harris. Prerequisite: Zoology 412 or equivalent. 4 credits.

(700). Research Concepts and Methods
A workshop introduction to the process of biological investigation. Includes presentations of current research by members of the Zoology faculty; critical discussions of the philosophy of science generally and of biological concepts specifically; methods and practice in literature-search and the handling of bibliographic data; lectures and laboratories in scientific writing. Each student will prepare both written and oral presentations of a review of a selected biological topic. Required of all beginning zoology graduate students. Mr. Wood and Staff. 4 credits.

703. Genetics
A course intended for students desiring a more detailed training in fundamental genetics. Required for genetics students; elective for others. Mr. Hoornbeek. Prerequisite: Zoology 604 or equivalent. 4 credits. (Not offered 1970-71).

704. Comparative Endocrinology
The various endocrine organs are considered in their relationship to control of the internal environment, growth, development, and adaptation to the external environment. Mr. Tillinghast. Prerequisite: vertebrate anatomy and physiology; organic chemistry. 4 credits.
711. Natural History of Cold-Blooded Vertebrates
The various classes of poikilothermic vertebrates, their habits, habitats, and life histories, with special reference to those occurring in eastern North America. Mr. Sawyer. Prerequisite: general zoology and Zoology 518. 4 credits.

(712). Mammalogy
The origin and diversification of mammals, their ecology and economic importance. Laboratories will emphasize techniques of the mammalogist and identification of local forms. Mr. Francq. Prerequisite: general zoology and Zoology 508. 4 credits.

(713). Animal Behavior
Individual and group behavior of animals, including the role of anatomy, physiology and prior experience, and the ecological significance of these patterns. Techniques and the practical application of the study of animal behavior. Mr. Francq. Prerequisite: one year of zoology. 4 credits.

715. Natural History of Marine Invertebrates
A field and laboratory course designed to acquaint the student with the inshore marine invertebrate metazoan animals of northern New England. Emphasis will be on identification, classification, habitat preferences, and behavior of these animals. Field work (collection and observation) will constitute a major part of the course and the student must be prepared to assume some travel expense. Staff. Prerequisite: general zoology. 4 credits. (Offered in Summer 1970).

721. Parasitology
An introductory course on some of the more important parasites causing disease in man and animals. Living materials will be used as far as possible. Mr. Bullock. Prerequisite: one year of zoology. 4 credits.

723. Cell Physiology
Application of the principles of chemistry and physics to the understanding of cell structure and function. Metabolic reactions and their control are considered in relation to cell organization. Treatment is also given to the genesis and function of specialized cells. Mr. Tillinghast. Prerequisite: organic chemistry. 4 credits.

(725). General Physiology
A study of some of the physical and chemical phenomena common to all biological systems. Special emphasis is placed on membranes, permeability, excitability, conductivity, contractility, and bioenergetics. Mr. Sasner. Prerequisite: organic chemistry, physics, and one year of zoology. 4 credits.

729. Vertebrate Morphogenesis
The fundamental principles of vertebrate growth and development including embryology, metamorphosis, and regeneration. Mr. Foret. Prerequisite: general zoology. 4 credits.

772. Fisheries Biology
Designed to introduce the student to some of the information and techniques used by the freshwater fisheries biologist. Emphasis on freshwater fisheries, but many of the techniques and some of the reading pertain as well to salt water fisheries. Mr. Sawyer. Prerequisite: Zoology 711 or equivalent, and permission of instructor. 4 credits.

795, 796. Special Problems in Zoology
Election of one or more sections of this course provides opportunity for advanced study. Work may involve reading, laboratory work, organized seminars, and/or conferences. Section numbers and subject-matter fields are: (1) Biological Oceanography, (2) Ecology, (3) Endocrinology, (4) Evolution, (5) Developmental Biology, (6) Genetics, (7) Histology, (8) History of Zoology, (9) Invertebrate Zoology, (10) Physiology,
### ENROLLMENT STATISTICS — FALL SEMESTER — DURHAM CAMPUS ONLY

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