Bulletin of the University of New Hampshire

University Catalogue Issue
1966-67
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University Calendar

SEMESTER I

September 18, Sunday 2 p.m. Residence Halls open
September 19, Monday First Faculty Meeting
September 20, Tuesday Registration
September 21, Wednesday 8 a.m. Classes begin
September 22, Thursday 1 p.m. Convocation
September 30, Friday 4:30 p.m. Last day to add courses
November 14, Monday 9 a.m. Midsemester Reports due
November 14, Monday 4:30 p.m. Last day to drop courses
November 22, Tuesday 7 p.m. Residence Halls close. Thanksgiving
November 27, Sunday 2 p.m. Residence Halls open
November 28, Monday 8 a.m. Classes resume
December 3 & 10, Saturdays AFROTC Officer Qualification Tests
December 16, Friday 7 p.m. Residence Halls close. Christmas
January 2, Monday 2 p.m. Residence Halls open
January 3, Tuesday 8 a.m. Classes resume
January 23, Monday 8 a.m. Semester I Final Examinations begin
February 1, Wednesday 6 p.m. Final Examinations end
February 1, Wednesday 8 p.m. Residence Halls close
February 8, Wednesday 2 p.m. Residence Halls open

SEMESTER II

February 9, Thursday Registration
February 11, Saturday Classes hold Tuesday schedule
February 20, Monday 4:30 p.m. Last day to add courses
March 24, Friday 7 p.m. Residence Halls, close, Easter
April 2, Sunday 2 p.m. Residence Halls open
April 3, Monday 8 a.m. Classes resume
April 10, Monday 9 a.m. Midsemester Reports due
April 10, Monday 4:30 p.m. Last day to drop courses
May 29, Monday 8 a.m. Semester II Final Examination begin
May 30, Tuesday Memorial Day — Holiday
June 6, Tuesday 9 a.m. Senior grades due
June 8, Thursday 6 p.m. Final Examinations end
June 8, Thursday 8 p.m. Residence Halls close
June 11, Sunday Commencement
Officers and Faculty
Trustees

His Excellency, JOHN W. KING, A.B., M.A., LL.B., LL.D., ex officio
Governor of New Hampshire

FRANK T. BUCKLEY, ex officio
Commissioner of Agriculture

PAUL E. FARNUM, B.S., M.S., ex officio
Commissioner of Education

JOHN W. McCONNELL, B.A., PH.D., D.SC., ex officio
President of the University

HAROLD E. HYDE, B.S., M.S., ED.D., ex officio
President of Plymouth State College

ROMAN J. ZORN, B.ED., PH.D., ex officio
President of Keene State College

FORREST M. EATON, B.S., Portsmouth (1959-1967)
Chairman of the Board

DEAN P. WILLIAMSON, B.S., Concord (1960-1968)
Vice Chairman of the Board

J. ARTHUR TUFTS, B.S., M.ED., Exeter (1962-1965)
Secretary of the Board

FRANK W. RANDALL, B.S., LL.D., Portsmouth (1936-1968)

MAURICE F. DEVINE, A.B., LL.B., LL.D., Manchester (1949-1966)

J. FRED FRENCH, Manchester (1961-1968)


JEAN A. WAGNER, B.A., Hampton Falls (1962-1966)

ALBERT R. FURLONG, B.E., M.E., Keene (1963-1967)

DOUGLAS L. ROBERTSON, B.ED., M.ED., Plymouth (1963-1967)

NORMAN C. BERUBE, B.A., M.D., Manchester (1963-1967)

RICHARD BLALOCK, Portsmouth (1963-1967)


EUGENE C. STRUCKHOFF, A.B., LL.B., Concord (1963-1967)


NORMAN S. WEEKS, B.S., Laconia (1965-1966)
Officers of Administration

JOHN W. McCONNELL, PH.D., President
JERE A. CHASE, M.ED., Executive Vice President
NORMAN W. MYERS, B.S., Vice President-Treasurer
ROBERT F. BARLOW, PH.D., Academic Vice President and Dean of the
Whittemore School of Business and Economics
ROBERT N. FAIMAN, M.S., PH.D., Dean of the College of Technology and
Director of the Engineering Experiment Station
HARRY A. KEENER, M.S., PH.D., Dean of the College of Agriculture and
Director of the Agricultural Experiment Station
EVERETT B. SACKETT, M.A., PH.D., Dean of the College of Liberal Arts
EUGENE S. MILLS, M.A., PH.D., Dean of the Graduate School and Coordinator
of Research
JOHN B. HRABA, PH.D., Associate Dean of the College of Technology
MATHIAS C. RICHARDS, PH.D., Associate Dean of the College of Agriculture
MELVILLE NIELSON, PH.D., Associate Dean of the College of Liberal Arts
WILLIAM H. DREW, PH.D., Associate Dean of the Graduate School
C. ROBERT KEESEY, B.A., Dean of Students
ELIZABETH A. McQUADE, A.M., Associate Dean of Students
RICHARD F. STEVENS, B.S., Assistant Dean of Students
JOSEPH J. PETROSKI, M.ED., ED.D., Director of University Extension Service
and Director of Summer Session
SAMUEL W. HOITT, M.S., Director of the Cooperative Extension Service
LESLIE L. LAFOND, M.ED., Director of Admissions
DONALD E. VINCENT, A.M.I.S., A.M., Librarian
OWEN B. DURGIN, M.A., Registrar
DANIEL A. FERBER, M.A., PH.D., Director of Development and Special
Assistant to the President
JAMES W. LONG, M.A., M.P.H., PH.D., Director of the Division of Physical
Education and Athletics
PIERRE D. BOY, B.S., Professor of Military Science
WILLIAM J. LUCKEY, B.A., Professor of Air Science
KEITH J. NICHBERG, B.A., Station Manager of WENH-TV, Channel 11
Faculty

As of February 1, 1966
* Indicates time devoted to Cooperative Extension Service.
† Indicates time devoted to Agricultural Experiment Station

ABELL, MAX F., Extension Associate Professor Emeritus of Agricultural Economics
B.S., Cornell University, 1914; Ph.D., ibid., 1924. (1926-

BABCOCK, DONALD C., Professor Emeritus of Philosophy
B.A., University of Minnesota, 1907; M.A., ibid., 1908; S.T.B., Boston University, 1912; D.H.L. (Hon.), University of New Hampshire, 1960. (1918-)

BARRACLOUGH, KENNETH E., Professor Emeritus of Forestry
B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940. (1926-)

BOWLES, ELLA S., Publications Editor Emeritus
Plymouth Normal School, 1905. (1943-)

BRACKETT, THELMA, University Librarian Emeritus
A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962. (1942-)

CAMPBELL, WILLIS C., Research Associate Emeritus, Engineering Experiment Station
B.S., New Hampshire College, 1906. (1938-)

CARROLL, HERBERT A., Professor Emeritus of Psychology
A.B., Bates College, 1923; A.M., Brown University, 1928; Ph.D., Columbia University, 1930. (1941-)

CORTIZ, 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-)

COUTER, CHARLES W., Professor Emeritus of Sociology
B.A., University of Toronto, 1908; B.D., Victoria College, 1909; M.A., Yale University, 1910; Ph.D., ibid., 1914. (1934-)

DEQUOY, RUTH W., Associate State 4-H Leader Emeritus
B.A., New Hampshire College, 1921; M.Ed., University of Maryland, 1953. (1929-)

ELLIS, ELIZABETH E., Extension Associate Professor Emeritus of Home Economics
B.S., Teachers College, Columbia University, 1927; M.A., ibid., 1929. (1929-)

GRINNELL, HAROLD C., Dean Emeritus, College of Agriculture and Professor Emeritus of Resource Economics
B.S., Cornell University, 1921; M.S., ibid., 1930; Ph.D., ibid., 1941. (1932-)

HENNESSY, WILLIAM G., Professor Emeritus of English
A.B., Boston University, 1916; A.M., ibid., 1924. (1923-)

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<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Education</th>
<th>Years</th>
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<tbody>
<tr>
<td>Hitchcock, Leon W.</td>
<td>Professor Emeritus of Electrical Engineering</td>
<td>B.S., Worcester Polytechnic Institute, 1908.</td>
<td>(1910-</td>
</tr>
<tr>
<td>Howes, Horace L.</td>
<td>Professor Emeritus of Physics</td>
<td>B.S., Syracuse University, 1905; Ph.D., Cornell University, 1915.</td>
<td>(1918-</td>
</tr>
<tr>
<td>Huddleston, Eric T.</td>
<td>Professor Emeritus of Architecture</td>
<td>B.Arch., Cornell University, 1910.</td>
<td>(1914-</td>
</tr>
<tr>
<td>Iddles, Harold A.</td>
<td>Professor Emeritus of Chemistry</td>
<td>B.S., Michigan State College, 1918; M.S., University of Iowa, 1921; Ph.D.,</td>
<td>(1929-</td>
</tr>
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<td></td>
<td></td>
<td>Columbia University, 1925.</td>
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<tr>
<td>Jackson, C. Floyd.</td>
<td>Professor Emeritus of Zoology</td>
<td>B.A., DePauw University, 1905; M.S., Ohio State University, 1907; D.Sc.</td>
<td>(1908-</td>
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<td></td>
<td></td>
<td>(Hon.), University of New Hampshire, 1961.</td>
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<tr>
<td>Johnson, Arthur W.</td>
<td>Professor Emeritus of Business and Economics</td>
<td>B.B.A., College of Business Administration, Boston University, 1922;</td>
<td>(1922-</td>
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<td></td>
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<td>M.B.A., ibid., 1929; C.P.A. (1920- )</td>
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<tr>
<td>Johnson, G. Reid.</td>
<td>Associate Professor Emeritus of History</td>
<td>A.B., Muskingum College, 1916; M.A., Princeton University, 1920; Ph.D.,</td>
<td>(1922-</td>
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<td></td>
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<td>University of Edinburgh, 1922.</td>
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<tr>
<td>Latimer L. Phelps.</td>
<td>Associate Professor Emeritus of Horticulture</td>
<td>B.S., University of California, 1921; M.S., ibid., 1922; Ph.D., ibid., 1926.</td>
<td>(1926-</td>
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<tr>
<td>Lavine, Irvin</td>
<td>Professor Emeritus of Chemical Engineering</td>
<td>B.S., University of Minnesota, 1924; Ph.D., ibid., 1930.</td>
<td>(1948-49,</td>
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<td>1951</td>
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<tr>
<td>Manton, Robert W.</td>
<td>Professor Emeritus of Music</td>
<td>Harvard University, 1918.</td>
<td>(1923-</td>
</tr>
<tr>
<td>Mills, Marian E.</td>
<td>Assistant Professor Emeritus of Botany</td>
<td>B.S., Teachers College, Columbia University, 1917; M.A., ibid., 1920.</td>
<td>(1927-</td>
</tr>
<tr>
<td>O'Brien, Daniel A.</td>
<td>County Agent Leader Emeritus</td>
<td>B.S., Cornell University, 1913.</td>
<td>(1920-</td>
</tr>
<tr>
<td>O'Connell, Elias M.</td>
<td>Instructor Emeritus in Mechanical Engineering</td>
<td>Graduate, Wentworth Institute, 1923; Graduate, two-year course in pattern</td>
<td>(1925-</td>
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<td>making, ibid., 1925.</td>
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<tr>
<td>O'Kane, Walter C.</td>
<td>Professor Emeritus of Economic Entomology</td>
<td>B.A., Ohio State University, 1897; M.A., ibid., 1909; D.Sc. (Hon.), ibid.,</td>
<td>(1932-</td>
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<td>Parker, Clifford S.</td>
<td>Professor Emeritus of Languages</td>
<td>A.B., Harvard University, 1912; A.M., ibid., 1914; Ph.D., Columbia University, 1925.</td>
<td>(1931-</td>
</tr>
<tr>
<td>Perry, Errol C.</td>
<td>Assistant Professor Emeritus of Farm Management</td>
<td>Thompson School of Agriculture, Mass. State College, 1920.</td>
<td>(1929-42,</td>
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<td>1946-</td>
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<tr>
<td>Phillips, Thomas G.</td>
<td>Professor Emeritus of Agricultural and Biological Chemistry</td>
<td>B.S., Ohio State University, 1912; M.S., ibid., 1913; Ph.D., University of Chicago, 1918.</td>
<td>(1925-</td>
</tr>
</tbody>
</table>
PRINCE, FORD S., Professor Emeritus of Agronomy and Agronomist Emeritus, Agricultural Experiment Station and Cooperative Extension Service
B.S., University of Illinois, 1913. (1925-

RASMUSSEN, EDWIN J., Extension Professor Emeritus of Horticulture
B.S., University of Wisconsin, 1927; M.S., ibid., 1929. (1929-36, 1947-

SEIBERLICH, JOSEPH, Research Professor Emeritus, Engineering Experiment Station
Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, ibid., 1928. (1941-

SMITH, TODD O., Research Assistant Professor Emeritus of Agricultural and Biological Chemistry
A.B., Indiana University, 1910; M.S., New Hampshire College, 1917. (1910-

SOLT, MARVIN R., Professor Emeritus of Mathematics
B.S., Lehigh University, 1918; M.S., ibid., 1925. (1926-

STEVENS, CLARK L., Professor Emeritus of Forestry
B.S., New Hampshire College, 1917; M.F., Yale University, 1926; Ph.D., ibid., 1930. (1919-

STEVENS, HENRY B., Director Emeritus of University Extension Service
A.B., Dartmouth College, 1912. (1918-

SWASEY, HENRY C., Associate Professor Emeritus of Physical Education and Athletics for Men
B.S., Amherst College, 1915; M.S., Indiana University, 1941. (1921-

THAMES, SARAH, Associate Professor Emeritus of Home Economics
B.S., Simmons College, 1930; M.A., Teachers College, Columbia University, 1942. (1945-

WALSH, JOHN S., Professor Emeritus of Languages
A.B., Harvard University, 1915; A.M., Boston University, 1928. (1922-

YALE, WILLIAM, Professor Emeritus of History
Ph.B., Sheffield Scientific School, Yale University, 1910; M.A., University of New Hampshire, 1928. (1928-

ABBOTT, HELEN D., Head Cataloger
A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939. (1943-

ABBOTT, MARGUERITE, Associate Professor of Occupational Therapy

AGENBROAD, JAMES E., Senior Cataloger
A.B., Miami University, 1956; M.L.S., Rutgers University, 1960. (1960-

ALLEN, BRUCE D., Instructor in English
B.A., Boston University, 1959. (1964-

†ALLEN, FRED E., Professor of Poultry Science and Veterinarian
B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936. (1940-
ALLISON, RICHARD C., Assistant Professor of Forest Technology, Thompson School of Applied Science
B.S., Pennsylvania State University, 1957; M.F., ibid., 1960. (1962-)

ALLMENDINGER, E. EUGENE, Associate Professor of Mechanical Engineering

AMELL, ALEXANDER R., Professor of Chemistry
B.S., University of Massachusetts, 1947; Ph.D., University of Wisconsin, 1950. (1955-)

AMMAN, WILLIAM, M.D., 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, South Africa. L.M.C.C., Canada, 1950. (1965-)

ANDERSEN, KENNETH K., Associate Professor of Chemistry
B.S., Rutgers University, 1955; Ph.D., University of Minnesota, 1959. (1960-)

ANDERSON, CHARLOTTE K., Assistant Librarian and Documents Librarian

ANDERSON, EDWIN J., Instructor in Geology
A.B., Cornell University, 1961; M.S., Brown University, 1964. (1965-)

†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. (1959-)

ANNIS, WILLIAM H., Assistant Professor of Agricultural Education

ARCHAMBAULT, RAYMOND R., Cataloger
B.A., University of Maine, 1949; M.S., Syracuse University, 1959. (1965-)

ATWOOD, JANET, Assistant Professor of Physical Education
B.S., Skidmore College, 1950; M.A., State University of Iowa, 1955. (1962-)

AUSTIN, GILBERT R., Assistant Professor of Education
B.S., Central Connecticut College, 1953; M.A.L.S., Wesleyan University, 1956; C.A.G.S., University of Hartford, 1959; Ph.D., University of Connecticut, 1965. (1965-)

AZZI, VICTOR D., Associate Professor of Mechanical Engineering
B.S., University of New Hampshire, 1955; D.Engr., Yale University, 1961. (1965-)

BACH, DIRK P., Instructor in The Arts

BAIER, LEE S., Assistant Professor of English
B.A., Reed College, 1948; Columbia University, 1952; Ph.D., ibid., 1965. (1960-)

13
BALDERACCI, ARTHUR E., Instructor in The Arts
A.B., Duke University, 1960; M.F.A., University of Georgia, 1965. (1965-)

BALOMENOS, RICHARD H., Assistant Professor of Mathematics

BARDWELL, JOHN D., Audio-Visual Coordinator and Lecturer in Education

BARLOW, ROBERT F., Academic Vice President, Dean of the Whittemore School of Business and Economics, and Professor of Economics
B.A., Colby College, 1950; M.A., Fletcher School of Law and Diplomacy, 1951; Ph.D., ibid., 1960. (1962-)

BARR, GEORGE E., Instructor in English
B.A., Baldwin Wallace College, 1963. (1965-)

†BARRETT, JAMES P., Assistant Professor of Forest Resources

BARRETT, PAULE., Instructor in Plant Science, Thompson School of Applied Science
B.S., University of New Hampshire, 1964. (1965-)

BARSTOW, THOMAS R., Instructor in Physical Education
B.S., St. Lawrence University, 1961; M.Ed., ibid., 1965. (1965-)

†BARTLEY, CLARA H., Research Associate in Microbiology
B.S., Miami University, 1923; M.A., University of Michigan, 1926; Ph.D., University of Kansas, 1935. (1945-)

BARTLEY, IRVING D., Associate Professor of Music and University Carillonneur
B.M., Syracuse University, 1935; M.M., ibid., 1938. (1945-)

BARTON, PHILIP S., Professor of Animal Science and Director, Thompson School of Applied Science
B.S., University of New Hampshire, 1928; M.Ed., ibid., 1938. (1939-)

BATCHELDER, GERALD M., Research Associate Professor, Engineering Experiment Station
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952. (1955-)

BATCHELLER, JOSEPH D., Associate Professor of Speech and Drama
A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; Ph.D., ibid., 1942. (1944-)

BATHO, EDWARD H., Associate Professor of Mathematics
B.S., Fordham University, 1950; M.S., University of Wisconsin, 1952; Ph.D., ibid., 1955. (1960-)

BEASLEY, WAYNE M., Research Assistant Professor, Engineering Experiment Station, and Adjunct Associate Professor of Materials Science

14
BECKETT, JOHN A., Forbes Professor of Management
B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946;

*+BECKMAN, JERE R., Research Associate in Animal Sciences
B.S., University of New Hampshire, 1956; M.S., ibid., 1959; D.V.M., Uni-
versity of California, 1963. (1964-

BECKWITH, MARION C., Chairman, Department of Physical Education for
Women, and Professor of Physical Education
(1935-)

BELL, R. VIRGINIA, Assistant Professor of Occupational Therapy
B.S., University of Michigan, 1953; Certificate O.T.R., Boston School of
Occupational Therapy, 1955. (1958-)

BERNEY, CHARLES V., Assistant Professor of Chemistry
B.S., Whitman College, 1953; Ph.D., University of Washington, 1962.
(1965-)

BINGHAM, SYLVESTER H., Professor of English
A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; Ph.D.,
Yale University, 1937. (1936-)

BJORKMAN, RUBEN E., Head Hockey Coach and Instructor in Physical
Education
B.S., University of Minnesota, 1951. (1964-)

BLANCHARD, FLETCHER A., JR., Associate Professor of Electrical Engineering
B.S., Union College, 1948; M.S. in E.E., Lehigh University, 1950. (1950-)

†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. (1938-41, 1946-)

BLOOD, EDWARD J., Assistant Professor of Physical Education and Athletics
B.S., University of New Hampshire, 1935. (1936-)

*+BLOOD, PAUL T., Associate Professor of Agronomy
B.S., New Hampshire College, 1921; M.S., University of New Hampshire,
1924. (1921-24, 1928-)

BOBICK, MELVIN T., Associate Professor of Sociology
(1958-)

BONNICE, WILLIAM E., Assistant Professor of Mathematics
B.A.E., Syracuse University, 1951; M.S., University of Washington, 1960;
Ph.D., ibid., 1962. (1962-)

BOROR, ARTHUR C., Assistant Professor of Zoology
B.S., Ohio State University, 1956; M.S., ibid., 1958; Ph.D., Florida State
University, 1961. (1961-)

†BOWRING, JAMES R., Professor of Resource Economics
B.S.A., University of Manitoba, 1936; M.A., University of Alberta, 1941;
Ph.D., Iowa State College, 1944. (1948-)
BOY, ANGELO V., Associate Professor of Education  
A.B., University of Notre Dame, 1953; Ed.M., Boston University, 1955;  

BOY, PIERRE D., Colonel, Professor of Military Science  
B.S., University of New Hampshire, 1939. (1965- )

*BOYNTON, C. HILTON, Professor of Dairy Science  
B.S., Iowa State College, 1934; M.S., ibid., 1940; Ph.D., Rutgers University,  
1962. (1945- )

BRAFF, ALLAN J., Associate Professor of Economics and Business  
A.B., University of Rochester, 1951; M.B.A., Columbia University, 1953;  
Ph.D., University of Wisconsin, 1959. (1965- )

BRATTON, KARL H., Professor of Music  
B.M., University of Kansas, 1931; M.A., Teachers College, Columbia Uni-
versity, 1945. (1945- )

BREEDING, CHARLES H. J., Instructor in Soils and Plant Science, Thompson  
School of Applied Science  
B.S., University of New Hampshire, 1949. (1963- )

BREGGS, JANET C., Instructor in Animal Science  
B.S., University of Massachusetts, 1962. (1963- )

BROCKELMAN, PAUL T., Assistant Professor of Philosophy  
A.B., Dartmouth College, 1957. (1963- )

BRONZINO, JOSEPH D., Instructor in Electrical Engineering  
B.S., Worcester Polytechnic Institute, 1959; M.S., U. S. Naval Postgradu-
ate School, 1961. (1964- )

BROWNE, EVELYN, Professor of Physical Education  
A.B., University of California, 1943; M.A., Teachers College, Columbia Uni-

**BRUNS, PAUL E., Professor of Forest Resources  
A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D.,  
University of Washington, 1956. (1958- )

BRYCE, FORBES O., Lecturer in Sociology  
B.S., Massachusetts Maritime Academy, 1936; M.A., American University,  
1961. (1962- )

BULLOCK, WILBUR L., Professor of Zoology  
B.S., Queens College, 1942; M.S., University of Illinois, 1947; Ph.D.,  
ibid., 1948. (1948- )

BURKE, JAMES, JR., Instructor in Microbiology  
B.S., Merrimack College, 1961. (1965- )

BURTON, DAVID M., Assistant Professor of Mathematics  
B.A., Clark University, 1954; A.M., University of Rochester, 1956; Ph.D.,  
ibid., 1961. (1959- )

†BYERS, GORDON L., Associate Professor of Soil and Water Science  
B.S., McGill University, 1948; M.S.A., Ontario Agricultural College, 1950.  
(1956- )

16
CAHILL, Laurence J., Jr., Professor of Physics

Caldwell, S. Anthony, Instructor in English

Carbonneau, Lionel J., Coach of Freshman Football and Freshman Lacrosse and Instructor in Physical Education
B.A., University of New Hampshire, 1952. (1965- )

Carter, Gavin H., Chairman, Department of Physical Education for Men, and Associate Professor of Physical Education
B.S., Springfield College, 1952; M.S., ibid., 1953; Ph.D., University of Oregon, 1958. (1965- )

Casas, R. Alberto, Professor of Spanish
Ben L., Universidad de Barcelona, 1936; A.M., Columbia University, 1947; Ph.D., ibid., 1954. (1952- )

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

Chase, Jere A., Executive Vice President
B.S., University of New Hampshire, 1936; M.Ed., ibid., 1946. (1946- )

†Chesbro, William R., Associate Professor of Microbiology
B.S., Illinois Institute of Technology, 1951; M.S., ibid., 1955; Ph.D., ibid., 1959. (1959- )

Chittenden, David H., Assistant Professor of Chemical Engineering and Research Assistant Professor, Engineering Experiment Station

Chitwood, Garrett C., Jr., Instructor in English
B.S.E., Arkansas State Teachers College, 1952; M.A., University of Arkansas, 1958. (1965- )

Chough, Soon, Assistant Professor of Economics
A.B., Bowdoin College, 1960. (1965- )

*†Christensen, Robert L., Assistant Professor of Resource Economics
B.S., Michigan State University, 1958; M.S., University of Delaware, 1960. (1963- )

Chupp, Edward L., Associate Professor of Physics
A.B., University of California, 1950; Ph.D., ibid., 1954. (1962- )

Clark, David G., Associate Professor of Physics
B.A., Park College, 1938; M.S., Texas Agricultural and Mechanical College, 1940; Ph.D., Pennsylvania State College, 1947. (1947- )

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YARRINGTON, EUGENE N., JR., Assistant Professor of English
B.A., Boston University, 1949; M.A., ibid., 1951; Ph.D., University of Illinois, 1962. (1962-)

YEN, YIN-CHAO, Adjunct Assistant Professor of Chemical Engineering
B.S., National Taiwan University, 1951; M.S., Kansas State University, 1956; Ph.D., Northwestern University, 1960. (1965-)

YOUNT, JOHN A., Assistant Professor of English

YUKICA, JOSEPH M., Head Football Coach and Instructor in Physical Education
B.S., Pennsylvania State University, 1954; M.Ed., ibid., 1957. (1966-)

ZIMMERMAN, OSWALD T., Professor of Chemical Engineering
B.S.E., University of Michigan, 1929; M.S.E., ibid., 1931; Ph.D., ibid., 1934. (1938-)

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. (1958-)
Professional Staff

BALLARD, HORACE C., Agricultural Agent, Belknap County
  B.S., Cornell University, 1936. (1949- )

BOURNE, ELIZABETH, 4-H Youth Development Agent, Rockingham County
  Diploma, Framingham Normal School, 1924. (1926- )

BRECK, ROBERT W., Forester, Hillsborough County
  B.S., University of New Hampshire, 1940; M.F., Yale School of Forestry,
  1941. (1947- )

BUCK, CHARLES W., 4-H Youth Development Agent, Hillsborough County
  B.S., University of Maine, 1951. (1955- )

BUTTERFIELD, MARCIUS R., 4-H Youth Development Agent, Cheshire County
  B.S., University of Vermont, 1958. (1962- )

CLARK, VIRGINIA E., Associate 4-H Youth Development Agent, Merrimack County
  B.E., Keene State College, 1942. (1963- )

CLIFFORD, ROBERT L., 4-H Youth Development Agent, Belknap County
  B.S., University of New Hampshire, 1957. (1960- )

COLBY, PERLEY D., Agricultural Agent, Hillsborough County
  B.S., University of New Hampshire, 1952. (1953- )

COLBY, STANLEY W., Agricultural Agent, Sullivan County
  B.S., University of New Hampshire, 1934. (1940- )

COMERFORD, EDWARD V., Agricultural Agent, Cheshire County
  B.S., University of New Hampshire, 1937. (1945- )

CURRIER, MURIEL B., Extension Home Economist, Grafton County
  B.S., Farmington State Teachers College, 1939. (1951-52, 1953- )

CUTTER, ARTHUR H., Agricultural Agent, Strafford County
  B.S., University of New Hampshire, 1936; M.E., ibid., 1956. (1955- )

DAMON, JOHN F., Agricultural Agent, Carroll County
  B.S., University of New Hampshire, 1961. (1961- )

DANKO, THOMAS, Associate Agricultural Agent, Merrimack County
  B.S., University of Massachusetts, 1952. (1957- )

DAVIS, MARION S., Extension Home Economist, Sullivan County
  B.E., Keene Normal School, 1929. (1937- )

DENISON, ELLEN L., Extension Home Economist, Coos County
  B.S., Framingham Teachers College, 1928; M.P.H., Massachusetts Institute
  of Technology, 1930. (1955- )

DODGE, ARTHUR G., JR., Forester, Carroll County
  A.A., Boston University, 1950; B.S. in Forestry, University of Massachu-
  setts, 1953; M.S.F., Harvard University, 1961. (1960- )

EVANS, ROBERT E., Rural Civil Defense Coordinator
  B.S., Pennsylvania State University, 1938; M.S., ibid., 1946. (1963- )
FABRIZIO, RICHARD F., 4-H Youth Development Agent, Grafton County
B.V.A., University of Massachusetts, 1959. (1965-

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

Ferguson, John R., Jr., Forester, Cheshire County
B.S., University of New Hampshire, 1960. (1965-

George, Ernest A., Associate Agricultural Agent, Hillsborough County
B.S., University of New Hampshire, 1951. (1955-

Hall, James W., Associate Agricultural Agent, Coos County
B.S., University of New Hampshire, 1957. (1959-

Ham, Ruth S., Extension Home Economist, Strafford County
B.S., University of New Hampshire, 1924. (1927-33; 1942-44, 1955-

Harmon, M. Jean, Extension Home Economist, Merrimack County
B.S., Nason College, 1950. (1959-

Head, Ivan E., 4-H Youth Development Agent, Sullivan County
B.S., University of New Hampshire, 1951; M.Ag.Ed., ibid., 1959. (1963-

James, Jesse, State 4-H Youth Development Leader
B.S., University of Georgia, 1937; M.S., ibid., 1951. (1957-

Johnston, Ann E., Extension Home Economist, Cheshire County
B.S., University of Vermont, 1963. (1963-

Kennedy, Kevin B., Associate Agricultural Agent, Grafton County
B.S.A., Ontario Agricultural College, 1949. (1955-

Knowles, Stanley W., Forester, Rockingham County
B.S., University of New Hampshire, 1959. (1961-

Knox, Harry B., Associate 4-H Youth Development Agent, Rockingham County
B.S., University of New Hampshire, 1950. (1954-

Leighton, Roger S., Forester, Strafford County
B.S., University of New Hampshire, 1941. (1952-

Littlefield, Ralph B., State Agricultural Agent Leader
B.S., University of New Hampshire, 1927. (1940-

Michal, Carol A., Assistant 4-H Youth Development Agent, Grafton County
B.S., University of Connecticut, 1963. (1963-

Monahan, Daniel H., Forester, Belknap County
B.S., University of New Hampshire, 1961; M.F., Yale School of Forestry,
1962. (1963-

Nissen, Harriet J., Extension Home Economist, Hillsborough County
B.S., Nason College, 1941; M.Ed., Cornell University, 1953. (1956-

Pike, Radcliffe B., Horticulturist
A.B., Bowdoin College, 1950; M.S., University of New Hampshire, 1952.
(1963-

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PROUGH, ELIZABETH A., 4-H Youth Development Agent, Coos County
B.S., Pennsylvania State University, 1958. (1960-)

RICH, WAYNE S., 4-H Youth Development Agent, Merrimack County
B.S., University of Maine, 1934. (1946-)

ROPER, ELIZABETH R., 4-H Youth Development Agent, Carroll County
B.A., University of New Hampshire, 1928. (1928-)

RUTHERFORD, RICHARD R., Agricultural Agent, Grafton County
B.S., University of New Hampshire, 1940. (1940-42, 1948-)

SARGENT, JOHN E., Forester, Coos County
B.S., University of New Hampshire, 1959. (1960-)

SARGENT, LESLIE B., Jr., Forester, Grafton County
B.S., University of New Hampshire, 1943. (1954-)

SNELL, EDWARD A., 4-H Youth Development Agent, Strafford County
B.S., University of New Hampshire, 1962. (1962-)

STEARNS, JOSEPHINE S., Associate 4-H Youth Development Agent,
Hillsborough County
B.S., University of New Hampshire, 1958. (1960-)

STEVENS, ROBERT A., Program Specialist, 4-H Youth Development
B.S., University of New Hampshire, 1937. (1955-)

STEWART, EDWINA P., Assistant Extension Home Economist, Grafton County
B.S., Farmington State Teachers College, 1943. (1965-)

STILES, DWIGHT G., Agricultural Agent, Coos County
B.S., University of New Hampshire, 1942. (1958-)

STIMSON, RUTH G., Extension Home Economist, Rockingham County
B.S., University of New Hampshire, 1940; M.Ed., ibid., 1944. (1942-)

STOCKING, MARION I., Extension Home Economist, Carroll County
B.S., Simmons College, 1949. (1958-)

SZYMUKO, JOSEPH A., Forester, Sullivan County
B.S., University of New Hampshire, 1954. (1957-)

THOMPSON, WILBUR E., Forester, Merrimack County
B.S., University of New Hampshire, 1927. (1945-)

UPHAM, EDWARD F., Agricultural Agent, Rockingham County
B.S., University of Massachusetts, 1953; M.S., ibid., 1954. (1959-)

WYMAN, CHRISTINE C., Assistant 4-H Youth Development Agent,
Strafford County
B.S., University of New Hampshire, 1944. (1963-)
Administrative Staff

George W. Bamford, Alumni Fund Director
John D. Bardwell, Audio-Visual Coordinator, University Extension Service
Ronald C. Barrett, Director of Memorial Union
Doris Beane, Assistant for Institutional Studies
Kathleen R. Beckingham, Supervisor of Testing
Richard A. Bradbury, Alumni Activities Director
Richard M. Brayton, Director of Physical Plant Development
Burnell V. Bryant, Director of Alumni Affairs
Richard D. Cilley, M.D., Associate Physician, University Health Service
Robert G. Congdon, Director of Counseling and Testing Service
Henry W. Corrow, Jr., Editor, Cooperative Extension Service
William D. Crandall, M.D., Assistant Director of University Health Service
Edward Doherty, Assistant Director, University Extension Service
Francis H. Gordon, Manager, University Housing
W. Arthur Grant, News Editor
Jane E. Griswold, Director of Dining Services
L. Franklin Heald, Director of Informational Services
Charles H. Howarth, M.D., Director of University Health Service
Herbert E. Kimball, Business Manager
Reginald W. King, Manager, Printing Service
Eugene H. Leaver, Assistant Superintendent of Properties and Supervising Architect
Harold I. Leavitt, Superintendent of Properties
Richard E. LeClair, Director of Placement
W. Kent Martling, Assistant Treasurer
Harriet B. Nason, R.N., Supervisor of Nursing
Mary Lou O'Donnell, Assistant Director of University Extension Service and Conference Coordinator
Ronald W. Olmstead, Controller
Richard C. Plumer, Editor of The Alumnus
Frank W. Poland, Director of Non-Academic Personnel
General Information
Facts About the University

History
Founded in 1866, the University of New Hampshire began as the "New Hampshire College of Agriculture and the Mechanic Arts," located in Hanover as a part of Dartmouth College. In 1893 it moved to its present site in Durham. The new campus was made possible by Benjamin Thompson, a prosperous farmer who bequeathed his land and money to the State for this purpose. The estate was valued at $800,000 when it was made 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, and the Whittemore School of Business and Economics in 1962. A year later, the University became a "multi-versity" when two former teachers' colleges were brought under the same Board of Trustees as the Durham campus.

In 1966, its Centennial Year, the University at Durham had an enrollment of 5,500. The State Colleges at Keene and Plymouth had a combined enrollment of 2,500.

Physical Plant
The University campus in Durham is 156 acres in size. There are 35 buildings devoted to administration, instruction, and research; and 19 residence halls for men and women. Total University lands — including athletic fields, farms, and woodlots — comprise 2,830 acres. The book value is more than $31,000,000. Major construction projects of the past ten years:

University Library, housing 400,000 volumes, 2,800 periodicals, and a substantial microfilm collection.

Paul Arts Center, a $2,250,000 structure with separate wings for music, drama, and the arts.

Spaulding Life Science Building, with facilities for the departments of Biochemistry, Microbiology, and Zoology.

Physical Education Facility, with indoor track and pool, and Snively Arena, an indoor hockey rink, recently completed at a cost of $3,600,000.

Parsons Hall, now under construction in its first phase, to provide completely new facilities for the Department of Chemistry.

Other new buildings since 1946 include the University's engineering building, student recreation center, nutrition laboratory, twelve residence halls, a new dining hall, and a housing development for married students and faculty.
Service and Research

The Division of Industrial and Community Services coordinates the University's many service activities. One of the largest of the units engaged in such work is the Agricultural Experiment Station, which conducts research, publishes the results, and provides testing services for New Hampshire farmers. A similar service for New Hampshire industry is provided by the Engineering Experiment Station.

The Cooperative Extension Service, operating in conjunction with the U. S. Department of Agriculture, bridges the gap between campus research and the people of the state. Formal adult education is conducted by the University Extension Service, which offers credit and non-credit courses anywhere in the state where there is sufficient demand.

The University operates New Hampshire's educational television station, WENH-TV, which broadcasts in-school programs for elementary and secondary schools, as well as cultural and educational programs during the evening hours. The television station, together with the University Extension Service, will soon be housed in the New England Regional Center for Continuing Education. This facility will provide space for research and service activities to benefit the entire six-state region.

Other University units which place their resources at the service of the state: the Resources Development Center, which seeks to bring the talents and techniques of the social scientist into closer partnership with state and local governments; the Public Administration Service, which specifically helps town and city governments; the Water Resources Research Center, coordinating research projects to conserve and develop the state's water supply; and the Bureau of Educational Research and Testing. The New Hampshire State Entomologist and State Geologist are University faculty members with offices on campus.

Among the University's specialized research facilities are the Space Physics Center in DeMeritt Hall, the Ritzman Animal Nutrition Laboratory, and the Computation Center in Kingsbury Hall.

Cultural Activities

With two theaters, two art galleries, and auditoriums seating up to 5,000 persons, the University is a major cultural resource for New Hampshire. Numerous lecture series bring distinguished individuals to campus throughout the year. The Blue and White series brings leading concert artists to Durham, and the Allied Arts Series provides a varied program of drama, music, and dance. A student film society sponsors a program of classic films throughout the year. There is also a student FM radio station, and frequent student recitals and plays.

The University Library has music listening rooms for students and a collection of 2,800 records.
Admissions Procedure

University admissions policy 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 which ranks 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 Tests and the English Composition Achievement Test taken during the senior year. Achievement Tests in a language are required for all students entering the Whittemore School of Business and Economics and the College of Liberal Arts. Other Achievement Tests, though not required, are strongly recommended for applicants to the College of Agriculture and the College of Technology in an area or areas generally related to the student’s prospective major, e.g., Level I Mathematics Test for engineering.

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.

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 — $10.00 for residents of New Hampshire and $15.00 for non-residents — must accompany the application.
The University recommends the following secondary academic program for students applying to the several undergraduate colleges:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Agriculture</th>
<th>Liberal Arts</th>
<th>Technology</th>
<th>Whittemore</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4 units</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>
<td>3 units</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3 units†</td>
<td>3 units</td>
<td>4 units†</td>
<td>3 units</td>
</tr>
<tr>
<td>Laboratory Science‡</td>
<td>3 units</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>
<td>3 units</td>
</tr>
</tbody>
</table>

The University will consider applicants who have taken less than the recommended programs with the following minimums:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Agriculture</th>
<th>Liberal Arts</th>
<th>Technology</th>
<th>Whittemore</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4 units</td>
<td>4 units</td>
<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>
<td>2 units‡</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2 units</td>
<td>2 units</td>
<td>3½ units†</td>
<td>2 units</td>
</tr>
<tr>
<td>Laboratory Science‡</td>
<td>1 unit</td>
<td>1 unit</td>
<td>2 units§</td>
<td>1 unit</td>
</tr>
<tr>
<td>Social Studies</td>
<td>2 units</td>
<td>2 units</td>
<td>2 units</td>
<td>2 units</td>
</tr>
</tbody>
</table>

* Of a single foreign language.
† Including algebra I and II, plane geometry, and trigonometry.
‡ Excluding “General Science.”
§ Should include Physics and Chemistry.

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.

Interviews are not required as part of the admission process. They may, however, be requested by the Admissions Office if deemed necessary or desirable to make an equitable decision. Group interviews by appointment are frequently held on Saturday mornings. These group interviews are essentially opportunities for information exchange 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 University participates in the Regional Cooperation Program of the New England Board of Higher Education in which students from other New England states are given priority in certain curricula, as well as special tuition consideration. Information may be obtained from the New England Board of Higher Education, 31 Church Street, Winchester, Massachusetts, or from the admissions offices of the 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 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 also are 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 the 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, as well as 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.

A student desiring to transfer to the University must file an application at least two months prior to the opening of the semester for which he is attempting transfer.
Fees and Expenses

The cost for the freshman year at the University averages about $1,600 for a resident of New Hampshire and $2,200 for a non-resident.

Tuition is $480 ($1,125 for non-residents). As part of the regional cooperation program of the New England Board of Higher Education, many non-residents from certain states will be eligible for tuition at the in-state rate in selected curricula. The student must apply to the Registrar for this reduced tuition. Any student registering for eight credits or more per semester pays the full tuition. Any student registering for fewer than eight credits pays $22.50 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 $22.50.

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 this 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.

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.

Board is $400.00. All freshmen, and sophomores and juniors resident in University housing units (not including fraternities nor sororities), are required to board in University dining halls which include the new Stillings Dining Hall and the renovated Huddleston Dining Hall (formerly the Commons). The purpose of this regulation is to insure that the health of students is safeguarded by offering skilled dietetic supervision in the selection and preparation of well-balanced meals. There are cafeterias in University dining halls and at the Memorial Union for senior and graduate students.

Books and classroom supplies cost between $100 and $125. These may be purchased at the University Bookstore.

There is a Memorial Union assessment of $12, a recreational physical education fee of $30, and a student activity tax of $12.50, which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities. An athletic admissions fee of $10 is optional.

Personal expenses average $300. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incidentals, 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 deposit of $15 is required of each student to whom military equipment is issued.

A deferred payment plan allows a student to pay one-third of his college bills before registration and one-third at the end of each of the following two months. A $5 fee is charged for this service, and arrangements are made through the Business Office.

University Housing

Room rents average $280. The University has ten residence halls for women and nine for men. Undergraduate women are required to live in a residence hall or sorority house unless they live at home. Undergraduate men are not required to live in residence halls, but will be accommodated to the extent of the space available. Room rents range from $216 to $390.

Students living in University residence halls are required to sign room contracts covering the entire year beginning in September and ending in June. Housing applications will be sent to the student at the time of official admittance to the University. A ten dollar ($10.00) room deposit must accompany each application for a room. This deposit will be forfeited if the applicant fails to pay room rent by a stipulated date or cancels after that date. Upon occupancy the deposit is held as a damage deposit.

Assignments to University residence halls are made during July and August. A notice of room assignment and bill will be sent when assignment is complete. In the event of a late assignment, the deadline payment date for room rent will be extended as indicated on the Notice of Room Assignment and Bill. Failure to pay rent within the specified time will automatically cancel room reservation. No follow-up notice will be sent.

Room rent is payable in advance. For those attending the first semester, one-half of the year's rent must be paid not later than July 15. Rent for those attending the second semester must be paid not later than January 15.

A separate check payable to the University of New Hampshire should be forwarded to the Housing Office for room rent.

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 a written request to the Director of University Housing to hold the room until a later date. No room will be held for longer than 10 days after registration date.

An undergraduate woman student under 22 years of age is required to room in one of the women's residence halls or a sorority house, unless she is working for a room in a home approved by the Dean of Students or living with her family.
A financial aids program assists able and promising students who are unable to meet their educational expenses entirely from their own or their family’s resources.

**Tuition Grants and Scholarships**

A full-time student who is a resident of New Hampshire is eligible for consideration 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 to be considered for non-resident tuition grants; scholastic attainment, financial need, and participation in extra-curricular activities are the principal considerations.

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

A student may apply for financial aid at any time prior to February 15, but no awards are made until a student has been admitted to the University, has submitted an application for a grant or scholarship, and his parents have filed a parents’ confidential statement with the College Scholarship Service at Princeton, N. J. In-state students may obtain these forms from high school principals or guidance counselors. Out-of-state and transfer students may secure the application form from the Financial Aids Office, UNH, and the parents’ confidential statement from high school principals or guidance counselors. Applications are due February 15.

**Granite State Merit Scholarships** are awarded to 20 outstanding graduates of New Hampshire high schools. Recipients are recommended by high school principals, and are usually the highest ranking students planning to attend the University. The award is $100 each year providing a 3.0 (B) average is maintained.

The University sponsors two *National Merit Finalists*, one in-state and one non-resident, who have indicated UNH as the college of their choice. The awards vary from $250 to $1,500 ($1,700 for a non-resident) depending on the student’s financial need.

Two *Achievement Scholarships* are awarded, one to an in-state and one to a non-resident student. Awards are based on high achievement plus high aptitude or special talent recognized by appropriate state or regional groups. Awards vary from $500 to $1,200 ($1,700 for a non-resident) depending on financial need.

The *Valentine Smith Scholarship* of $100 a year is awarded to the incoming freshman who is judged to have the most thorough preparation for admission to UNH. The results of the College Entrance Examination Board examinations are used in making the selection.
Loans
Three loan funds are administered by the University: the UNH, the National Defense, and Nursing Student Funds. Financial need must be clearly demonstrated and loans may be used only for expenses incurred in pursuing a college education. Applications may be secured from the Financial Aids Office and should be filed by July 15.

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

Employment
Various types of employment are usually available to students wishing to work part time. The University participates in the College Work-Study Program under Title IC of the Economic Opportunity Act. The purpose of the program is to encourage students from low income families to attend institutions of higher education.

For information on the College Work-Study Program and other financial assistance, contact the Financial Aids Office, Thompson Hall.
The Colleges
University Academic Requirements

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 complete English 401-402 and History 401, 402; and one year of work (6 semester hours) in each of the following groups:

Group B
(Natural Sciences)
- Biology 401-402, 405
- Botany 411
- Chemistry 401-402, 403-404
- Geology 401-402
- Mathematics 407-408
- Physical Science 401-402
- Physics 401-402
- Zoology 412

Group C
(Social Sciences)
- Economics 401-402
- Geography 401, 402
- Government 405, 406, 408
- Psychology 401-402
- Sociology 400, 411, 540

Group D
(Humanities)
- Arts 475, 476
- English 513, 514, 515, 516
- Humanities 501-502
- Music 403, 404
- Language 501, 502
- Any specific foreign language, 503-504, 505-506
- German 501-502 or 605-606
- Russian 501-502 or 605-606
- Philosophy, any courses
- Speech and Drama 431, 436

All men students must complete Men's Physical Education 431-432; and all women students, Women's Physical Education 401, 402; 403, 404.

A student shall be considered as having satisfied the group requirement for any group in which he has received advanced placement standing with credit.

A student who has accumulated 30 or more credits in three or more areas in the field of a given group shall be considered as having satisfied the group requirement.
College of 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
Plant Science
Resource Economics
Soil and Water Science
Agricultural Engineering*
Hydrology
Mechanized Agriculture
Soil Science
Wildlife Management

BACHELOR OF SCIENCE
IN FORESTRY:
Forestry

BACHELOR OF SCIENCE
IN HOME ECONOMICS:
Family Life Education
Business and Community Services

* First Two Years at the University of New Hampshire.
Second Two Years at the University of Maine.
General Information

Purpose and Programs
The objectives of the College of 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 three undergraduate degrees: the Bachelor of Science in Agriculture, the Bachelor of Science in Forestry, and the Bachelor of Science in Home Economics.

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.

More than One Undergraduate Degree
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 desiring 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 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.
Many professional careers are open for our graduates. There are opportunities for people trained in resource development and conservation in rural areas 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, dairy, poultry, and general farming, state and federal governments, feed and fertilizer manufacturers, food processors, cooperatives, banks, and marketing and transportation industries employ graduates as price analysts, farm appraisers and managers, poultry specialists, and in dairy and livestock occupations as farmers, managers, and technologists.

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, the Foreign Agricultural Service, the Food and Agricultural Organization of the United Nations, and U. S. export and import firms hire economic growth and farm production experts, soil and water managers, market analysts, international trade economists, 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 63 and obtain a written recommendation for graduation from his adviser and department chairman.

Agricultural Education
The Agricultural Education curriculum provides for both a basic and liberal college preparation for those students who plan to teach agriculture or seek employment with the Cooperative Extension Service as agricultural or 4-H club 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 or the Extension Service preparation recommendations by one semester of off-campus experience in a student training center and or in a county Cooperative Extension Service office.

Students desiring to major in this curriculum should consult the professor in charge before the end of the sophomore year.

Students in other majors or areas of specialization who wish to minor in Agricultural or Cooperative Extension Education should consult their advisers and the professor in charge 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, nutrition, animal hygiene, processing, and management. The student also has an opportunity to further concentrate his studies in the fields of Animal, Dairy, or Poultry Science, or Pre-Veterinary Medicine.

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, breeding associations, sales and service work in allied industries and other areas of the diversified animal agricultural industry.

The department maintains Morgan horses for all phases of class work including riding. Herds of Milking Shorthorn, Hereford and Angus cattle, and 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 Rittman 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.

The University Poultry Farm facilities are available for instruction and for research and include laboratories for both teaching and research in poultry genetics, nutrition, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, and gas chromatograph, are available in Nesmith Hall, to provide the latest scientific training in the field of animal hygiene.

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. Although two years of pre-veterinary college work will meet the requirements of most
schools of veterinary medicine, 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 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. 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.

Botany

Students seeking a broad background in the plant sciences should consider majoring in Botany. The department offers a wide range of courses in the following areas: (1) Plant Pathology — the study of plant diseases, their causes and control; (2) Plant Physiology — the study of plant functioning with such practical applications as plant nutrition and requirements for plant growth; (3) Taxonomy — plant classification and plant identification; (4) Ecology — the relationship of the plant to its environment; (5) Morphology and Anatomy — the study of the anatomy, development, and cellular organization of plants, including histological techniques; (6) Cytology — the structure, physiology and development of cells; (7) Phycology — the study of algae, their morphology, life history, classification and ecology; and (8) Preparation for secondary-school teaching.

The course program for freshman and sophomore Botany majors is designed to acquaint them with the basic material in the field; specialization, usually begins in the junior year.

Students who graduate in Botany frequently pursue graduate work in Botany. Assistantships, research positions, and full-time teaching jobs are widely available. Opportunities for able botanists also exist in government
work. Positions as technicians or secondary-school teachers may be obtained with a B.A. or B.S. degree.

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 many positions open to those qualified in Entomology. There are opportunities for employment in public institutions and with commercial and industrial firms.

Students are given a fundamental training in Entomology and related fields. Those who wish to specialize in the chemical control of insects, and who plan to take graduate work leading to a professional degree, will follow a program outlined as Insect Toxicology. These students will be expected to take advanced courses in mathematics and chemistry.

Students planning a career in Entomology may select elective courses best suited to their needs and interests.

General Studies

This curriculum is offered for the student who wishes to secure a broad non-specialized background in several areas of the College or University 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 B.S. degree in the General Studies curriculum.

Plant Science

Students with an interest in economically important plants and their use for food, feed, fiber, recreation, or ornamental purposes should consider specialization in Plant Science. Because of the diversity of employment possibilities, the Plant Science 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. Three options are available as informal guides for curriculum development — science, management, and agribusiness. In addition, the student may wish to concentrate his attention toward either horticultural or agronomic crops.

The science option should be followed by students preparing for advanced study. Additional course work in chemistry, physics, and mathematics will provide an excellent foundation upon which the student can build his research or teaching career.

Management encompasses production and marketing of farm or ornamental crops and establishment and maintenance of turfgrass or nursery stock. 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 will select production and applied courses to support the basic core of study.

Agribusiness will expose 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 will prepare students for sales and brokerage positions in wholesale or retail marketing or for positions in industry.

Plant Science is a curriculum for city as well as farm men and women. Departmental programs are often conducted in cooperation with New Hampshire plant industries. This cooperation offers the student an opportunity to associate scientific principles with industry practice, thereby extending the scope of his training.

Students interested in a Plant Science major may consult with the Department Chairman, Professor L. C. Peirce.

Resource Economics
This department offers courses in the following subject matter areas: Resource Economics, including public resource policy, resource management, conservation economics, and 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, and administrators of governmental agencies. In addition, the student is encouraged to take courses which will lead to a broad university education. 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. 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 selective courses in the Whittemore School of Business and Economics.

Many students majoring in the various social science and agricultural departments of the University have found it to their advantage to elect some courses 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, consumer economics and natural resource policy for social science majors.

Students who major in the department of 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, and land use
policy; agricultural extension, resident teaching; and for farm managers. 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. The Resource Economics department offers a Master’s degree to meet these needs and in addition, has been very successful in placing its own Bachelor degree recipients in other graduate schools.

Soil and Water Science

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 three majors described below or develop a program combining elements of the three.

SOIL SCIENCE: This includes the study of chemical and physical properties of soils in relation to their formation, classification, absorptive capacities for chemical elements and compounds, engineering properties, and ability to support microorganisms and higher forms of plant and animal life. Students obtain a basic knowledge in the physical and biological sciences to prepare for graduate study, for employment by commercial enterprises, or work for various state and federal agencies. Those who continue their education and obtain advanced degrees find professional positions available in teaching and research.

Based upon experiences of alumni employment, opportunities are found in college teaching, research at universities, with chemical companies, the U. S. Department of Agriculture, soil survey and soil conservation, as Extension specialists and in county agent work, land appraisal, forestry, and foreign service, such as technical assistance programs and the Peace Corps.

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 physiology, 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 for those broadly trained in hydrology will continue to expand.
Persons trained in hydrology are qualified to seek employment with the United States' Bureau of Reclamation, Geological Survey, Corps of Engineers, and Soil Conservation Service; public utility companies, federal and state forestry services, state highway departments, recreation groups, community resource planning boards, international organizations, scientific or educational institutions, or for self-employment.

MECHANIZED AGRICULTURE: This major is designed to provide instruction and training in the fundamentals of agricultural science with particular emphasis on the technical phases. The program of study prepares graduates for self-employment and for commercial positions in the agricultural industry.

Mechanized Agriculture majors may find employment selling or servicing agricultural building materials, labor-saving mechanical equipment, irrigation systems, tractor, and field machinery. Graduates are qualified for positions as agricultural extension workers, as soil conservationists, or as rural use advisers with electric utility companies. They may also find employment with farm insurance companies or agricultural management organizations.

As farming becomes more intensive and the mechanization of our farms more complete, there will be even greater opportunities for graduates with this type of training.

AGRICULTURAL ENGINEERING, COOPERATIVE PROGRAM: A major in Agricultural Engineering is offered in cooperation with the Agricultural Engineering department, an accredited program at the University of Maine. A student completes the first two years of course work at the University of New Hampshire and then transfers to the University of Maine to complete the junior and senior requirements to receive a Bachelor of Science degree in Agricultural Engineering.

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 needed for research and teaching assignments.

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.
Bachelor of Science in Forestry

The primary objectives of this program are to help the student develop as a person and as a professional forester. His courses in Forestry form the foundation through which he will be professionally prepared.

Bachelor of Science degree graduates are employed in all phases of supply, growth, and utilization of raw materials from the forest. Many graduates eventually become specialists in the wildlife, grazing, watershed, and recreational aspects of land management. One-fifth of the population in New Hampshire engaged in manufacturing is employed in forest based industries. Lumber and paper production are among the top ten industries in the United States.

A comprehensive education emphasizing the biological, physical, and social sciences is provided in the undergraduate curriculum to give a sound base for embarking on a professional career or for entering graduate schools to obtain specialization in specific areas of forestry.

Field work is carried out during the academic year on woodlands adjacent to the campus which are managed by the Department of Forest Resources. In June each year a two-week field session is held in the northern hardwood forests of New Hampshire for all students who have completed their sophomore year of studies. There is no additional summer camp. Forestry majors are assisted and encouraged to obtain summer employment during which time the student’s performance and progress receive guidance and appraisal.

In addition to the normal University fees and tuition, Forestry students are required to meet transportation and meal charges in connection with regularly planned fields trips and the June field session.

The Department of Forest Resources is accredited by the Society of American Foresters, the national accrediting agency for forestry schools.

Wildlife Management

Information on the undergraduate program leading to a B.S. with a major in Wildlife Management will be found on the preceding page.

Curriculum

The curriculum that follows includes the University academic requirements and also the departmental requirements for the B.S. in Forestry degree. The forestry science group requirement is a minimum of 8 credits selected from the following sciences: physics, biochemistry, genetics, plant physiology, zoology (other than Zool 412), statistics beyond introductory statistics.
### FRESHMAN YEAR

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<tr>
<th>Course Code</th>
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<tr>
<td>Chem. 403, 404</td>
<td>General Chemistry</td>
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<tr>
<td>Bot. 411</td>
<td>General Botany</td>
<td>4</td>
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<tr>
<td>Agr. 401</td>
<td>Introduction to College</td>
<td>1</td>
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<tr>
<td>For. Res. 425, 426</td>
<td>Dendrology; Wood Technology</td>
<td>3</td>
</tr>
<tr>
<td>Math. 405 and Math. 421, or Math. 407-408</td>
<td>Introduction to College Mathematics</td>
<td>4</td>
</tr>
<tr>
<td>Math. 405 and Math. 421, or Math. 407-408</td>
<td>Fundamental Mathematics</td>
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<td>Zool. 412</td>
<td>Principles of Zoology</td>
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<td>Engl. 401, 402</td>
<td>Freshman English</td>
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<tr>
<td>P.E. 431-432</td>
<td>Physical Education</td>
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**Total Credits:** 18 1/2

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### SOPHOMORE YEAR

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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
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<tr>
<td>For. Res. 527, 528</td>
<td>Silvics; Applied Statistics</td>
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<tr>
<td>S. and W. 501</td>
<td>Introductory Soils</td>
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<td>Econ. 401</td>
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<td>For. Res. 544</td>
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<td>Ent. 506</td>
<td>Forest Entomology</td>
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<tr>
<td>Math. 401</td>
<td>Computer Programming</td>
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<tr>
<td>C. E. 501</td>
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**Total Credits:** 14
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<th>SPRING FIELD SESSION (JUNE)</th>
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<td>5 3</td>
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<td>For. Res. 629, 660 Silviculture; Forest Protection</td>
<td>3 3</td>
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<tr>
<td>Gov. 405 or Elements of Political Science</td>
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<td>Gov. (406) Principles of American Government</td>
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<td>Business Administration</td>
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<td>For. Res. 661, 746 Forest Management</td>
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<td>S. and D. 501 Public Speaking</td>
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<td>Business Administration</td>
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<tr>
<td>Free Electives</td>
<td>3 6</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>16 16</strong></td>
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</table>
Bachelor of Science in Home Economics

The purpose of the undergraduate program in Home Economics is two-fold:

1. To provide, through the facilities of the Department and the total University, a broad liberal education with study in depth in the social sciences or natural sciences; and

2. 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 curriculum within the Department of Home Economics relates basic knowledge to an understanding of the needs of people with regard to food, clothing, shelter, management of resources, and interpersonal and family relationships.

Programs of Study

A candidate for the degree of Bachelor of Science in Home Economics completes 128 credit hours of required and elective courses, including the University requirements for graduation as listed on page 63 of this catalogue.

During the freshman year a student selects courses from the various groups listed under the University requirements and takes two or three courses within the Department of Home Economics. In the sophomore year a student selects a concentration in either the social sciences or the natural sciences and by the end of the sophomore year makes a decision regarding the professional major within Home Economics.

The major areas of study in Home Economics are:

FAMILY LIFE EDUCATION, preparing students for teaching in the junior or senior high schools, home economics cooperative extension, and family relations education and/or work with children in community organizations and agencies.

BUSINESS AND COMMUNITY SERVICES, preparing students for hospital dietetics and food service management, food and nutrition in business, home economics cooperative extension, clothing and textiles in business, and work with families and children in community organizations and agencies.
Curriculum

UNIVERSITY REQUIREMENTS

For all students graduating from the University of New Hampshire, see page 63.

HOME ECONOMICS CORE (required of all home economics majors)

One course in each of the following areas:
- family relations
- child development
- management and decision making
- food and nutrition
- clothing and textiles

BASIC DISCIPLINES

Each student in the Department of Home Economics selects either the social sciences or physical and biological sciences for study in depth. This choice is dependent on the student's interest and professional objectives.

SOCIAL SCIENCES
- psychology
- sociology
- economics

PHYSICAL AND BIOLOGICAL SCIENCES
- biology
- botany
- biochemistry
- chemistry
- zoology
- microbiology

Some courses from Group B and Group C of the University requirements may partially fulfill requirements in the social science or natural science sequences above.

PROFESSIONAL SEQUENCES

At the end of the sophomore year the student selects one of the following two majors:

1. FAMILY LIFE EDUCATION: based on social science concentration. Courses to be selected in these areas:
   (a) family relations and child development, 9 credits
   (b) management, consumer problems and housing, 9 credits
   (c) education and home economics education, 18 credits
   (d) one course in speech (recommended), 3 credits

Workshops for skill development in clothing construction and food preparation will be available when needed for a particular professional competency.
2. BUSINESS AND COMMUNITY SERVICES: based on either social science or natural science sequence, depending on the student's interest and professional goal. The student also selects one of the three areas of specialization:

(a) FOODS AND NUTRITION (dietetics, food service, business)
Courses in foods and nutrition, 18 credits

(b) CLOTHING AND TEXTILES (business, industry)
Courses in clothing, textiles, and art, 18 credits

(c) CHILD DEVELOPMENT AND FAMILY LIFE
(community agencies)
Courses in child development, family relations, and management, 18 credits

An additional 18 credits to be selected from:
- business administration
- communications
- education
- any other group selected by the student and adviser to strengthen professional objectives

At least nine credits must be in one of the above groups.

ELECTIVES approximately 25 credits
To complete a total of 128 credits.

Sufficient flexibility is provided to permit combinations suited to individual needs. Electives may be used to build strong combinations with other fields of interest such as journalism, business, art, etc., or to explore several areas of interest to broaden the general education background.

A junior or senior student in the department may attend The Merrill-Palmer Institute in Detroit, Michigan, for one semester, with full transfer of credit. The Department of Home Economics is affiliated with The Merrill-Palmer Institute which was founded in 1920. 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.

This curriculum is open to men and women. A program leading to the Master of Science degree in Home Economics is outlined in the Graduate catalogue.
Thompson School of Applied Science

PHILIP S. BARTON, Director

The Thompson School is the two-year division of the College of 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 two summers of supervised placement, lead to the degree of Associate in Applied Science.

The Thompson School offers the following curriculums: Animal Science; Commerce Technician, Food Service Management; Forest Technician, General; Plant Science; Soil, Water and Construction Technician.

Applicants desiring 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. It is strongly recommended that each prospective applicant take the College Board Scholastic Aptitude Test during his senior year in high school.

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

EVERETT B. SACKETT,  
Dean

MELVILLE NIELSON,  
Associate Dean

MRS. CLAIRE WRIGHT,  
Academic Counselor

Departments

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

Cooperating Depts.

COLLEGE OF AGRICULTURE:
Botany
Entomology

COLLEGE OF TECHNOLOGY:
Chemistry
Mathematics
Physics

DIVISION OF PHYSICAL EDUCATION AND ATHLETICS:
Physical Education for Men
Physical Education for Women
Programs of Study

BACHELOR OF ARTS:
The Arts
  Painting and Graphics
  Crafts
  History of Art
Biology
Botany
Chemistry
Elementary Education
English Literature
English Teaching
Entomology
French
General Physical Science
Geography
Geology
German
History
Latin
Mathematics
Microbiology
Music
  Music History
  Applied Music
  Music Theory
Philosophy
Physics
Political Science
Psychology
Sociology
Spanish
Speech and Drama
  General Speech
  Drama
Zoology

Supplementary Non Major Programs:
  Pre-Dental
  Pre-Medical
  Pre-Law
  University Teacher Preparation Program

BACHELOR OF SCIENCE:
Art Education
Medical Technology
Music Education
Nursing
Occupational Therapy
Physical Education for Men
Physical Education for Women
Recreation Education
Social Service

BACHELOR OF MUSIC:
Piano
Organ
Voice
Strings, Woodwind, Brass or Percussion
Theory
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 several programs of study which are intended to provide preparation for professional life. They are arranged in such a manner as to permit considerable specialization while providing a broad cultural education for the students enrolled in them. Bachelor of Science Curricula are offered in the fields listed above. Requirements for the Bachelor of Science degree, and information regarding these curricula, are presented in the section entitled Bachelor of Science Curricula and Bachelor of Music Curriculum.

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 Science Curricula and 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 crowding 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.

Minor Option
Each student in the College of Liberal Arts may apply during his final term for a minor, to be shown on his transcript. A student should declare
his intent to earn a minor as early as possible but no later than the end of his junior year. The minor may be in any discipline in the College of Liberal Arts or any discipline in which a student may earn a Bachelor of Arts degree. A minor is 18 semester hours with C or better in subjects that count for major credit or other courses approved by the minor department. No more than six credits used to satisfy major or curriculum requirements shall be used for a minor.

Special Programs of Study
Although pursuing his studies in the College of Liberal Arts in one of the listed major 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. The Faculty of the College has established a Pre-Medical Advisory Committee to handle the advisement 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 Professor 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 courses considered most helpful 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.

Preparation For Teaching

The University of New Hampshire offers two types of undergraduate programs for secondary school teacher preparation and one undergraduate program for elementary school teacher preparation.

All of the teacher education programs are selective. For details about the standards of selection, see the prerequisites for the courses in Education.

SECONDARY SCHOOL TEACHER EDUCATION

UNIVERSITY TEACHER PREPARATION PROGRAM. Bachelor of Arts Program. students preparing to teach in secondary schools may follow an advisory program of studies called the University Teacher Preparation program. A student in this program will take Education 481 in the sophomore year, Education 757 and 758 in the junior year, Education 759 and the Education 791 course in the major teaching field in the first semester of the senior year. The second semester of the senior year is devoted to student teaching. Variations in this sequence are possible if circumstances make it desirable.

Students following this program do not major in the Department of Education. They major in the subject-matter department and elect the courses in this program. Students interested in this program should consult with the Supervisor of the subject-matter major and with Professor Roland B. Kimball, Chairman of the Department of Education, during the freshman year.

BACHELOR OF SCIENCE CURRICULA IN TEACHER EDUCATION. There are curricula for preparing teachers in the fields of Agriculture, Art, Home Economics, Music, and Physical Education. The curricula in Agriculture Education and Home Economics Education are described in the College of Agriculture section; the curricula in Art Education, Music Education, and Physical Education are described under Bachelor of Science Curricula.
Students interested in one of these programs should consult with the Supervisor of the curriculum during the freshman year.

Elementary School Teacher Education
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.

Courses in Supervised Teaching
The work in Supervised Teaching is under the joint direction of the Coordinators of Student Teaching who are the faculty members for the special methods courses offered by the various subject matter departments, the Director of Student Teaching and other members of the faculty of the Department of Education. Student teaching is done under the immediate supervision of selected teachers in schools approved by the University.

In the Supervised Teaching courses the student participates in the conduct of class exercises and in the control of the classroom, at first chiefly as an observer, but gradually entering into teacher responsibilities until complete charge of the classroom is assumed.

A course in Supervised Teaching is required in the University Teacher Preparation Program. It is open only to students approved by the Department of Education and the Coordinators of Student Teaching for the subject or subjects which the student desires to teach. Applications for first semester student teaching assignment must be filed in the office of Department of Education during the week prior to April 7 of the preceding academic year. Those for second semester student teaching must be filed during the week prior to November 7 of the preceding semester.

To be eligible for student teaching the student must have completed the prerequisite sequences of courses in the appropriate Curriculum in Teacher Education or must have completed the sequence of Education courses in the University Teacher Preparation Program and an appropriate sequence of courses in the subject matter department concerned. In addition, the student must have an overall grade point average of 2.2, a grade point average of 2.5 in the subjects or fields he will student teach, and a grade point average of 2.5 for all professional education courses taken.

Accreditation and Certification
The teacher preparation programs of the University are accredited by the National Council for 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 programs of the University qualify a student for certification as a teacher in most states. There are a few which have unusual requirements for certification. The Chairman will be glad to advise students regarding these 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 401-402, History 401, 402, and Political Science 405, 406, 408, and 515. 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.

To date, the following departments have adopted honors programs: English, French and Italian, German and Russian, History, Political Science, Psychology, Sociology, and Spanish and Classics. 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 6 credits of independent study and a senior for a total of 12 credits (of which no more than 9 are in his major field of concentration) during the academic year. This work would be done in the 695, 696 course in the relevant 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. Further information may be obtained from the Director of the Honors Program.

The Ford Foundation Program

A limited number of juniors are selected each year from those who apply for a special three-year program leading to the B.A. and M.A. degrees. The program is limited to superior students who expect that their chosen vocation shall be teaching at the college level. The regular requirements for the B.A. degree and the Graduate School requirements for the M.A. degree are basic requirements. In addition the student is expected to attend a special seminar in the junior year and to engage in independent study
in the senior year. During the graduate year of the program, he will be assigned to his major department as an intern in teaching.

Students should apply during their sophomore year. Further information may be obtained from the director of the program who may be contacted through the office of the Dean of the College of Liberal Arts.

Dual Degree Programs
Under certain conditions it is possible for a student to earn two different bachelor degrees. 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 degrees and who can reasonably allocate the additional time and effort needed for the 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 three 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.

Bachelor of Arts Program

The Bachelor of Arts Program provides a broad liberal education with a concentration involving at least 24 credits in a major field.

Degree Requirements

Satisfaction of these requirements ensures satisfaction of the University Academic Requirements.

These requirements apply to all students who enter the College of Liberal Arts between July 1, 1966, and June 30, 1967, and are seeking a Bachelor of Arts degree.

1. 128 semester-hour credits.

2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
3. Physical Education: men students — two semesters; women students — four semesters.

4. English 401-402.

5. History 401, 402.

6. Biological Science: Biology 401, 402 or Botany 411, Zoology 412.

7. Physical Science: One of the following two-semester sequences, not in student's major department: Chemistry 401-402, 403-404; Geology 401-402; Mathematics 407-408; Physical Science 401-402; Physics 401-402.

8. Social Science: Any three courses selected from the following, not in student's major department: Economics 401-402; Geography 401 or 402 (only one course in Geography may be used in satisfying this requirement); Political Science 405, 406; Psychology 401-402; Sociology 400, 411, 540.

9. Humanities: One of the following two-semester sequences, not in student's major department: Any two Philosophy courses; Arts 475, 476; English 513, 514 or 515, 516; Humanities 501-502; Languages 501-502; French 503-504 or 505-506; German 501-502 or 605-606; Greek 503-504; Italian 503-504; Latin 503-504 or 505-506; Russian 501-502 or 605-606; Spanish 503-504 or 505-506; Music 403-404; Speech and Drama 431, 436.

10. Special 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 completion of beginning courses in language at the University of New Hampshire (French 401-402, German 401-402, Greek 401-402, Italian 401-402, Latin 401-402, Russian 401-402, Spanish 401-402). 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. The Special Language requirement should be satisfied no later than the sophomore year.

11. Major Requirements: A student must complete at least 24 semester credits of major work with grades of C or better. The major department may specify certain required courses and may require a senior paper or project and/or a comprehensive examination. These requirements are given in the listing of majors that follows. (A Major may be selected at the end of the student's freshman year and must be selected prior to the junior year.)
More than 50 semester credits in courses in the major department constitutes excessive concentration and neither the supervisor nor the Dean of the College may approve schedules that reveal over-specialization.

Time Sequence for Requirements

The requirements in the Bachelor of Arts Program are to be satisfied in the appropriate class years as indicated in the following schedule:

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<th>FRESHMAN YEAR</th>
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<td>P. E. 401, 402 Physical Education (Women)</td>
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<tr>
<td>P. E. 431-432 Physical Education (Men)</td>
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<td>Hist. 401, 402 Introduction to Contemporary Civilization</td>
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<td>Humanities</td>
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<td>Major courses and electives</td>
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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.

* Students electing a Biological Science during their freshman year must elect a Physical Science during their sophomore year or vice versa.
The Arts

It is the belief of the Department of The Arts that art is best taught with a practical center. An experimental arts laboratory (the Student Workshop) and a continuing series of exhibitions of art are therefore basic factors in this department. The courses offered 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.

The Department of The Arts offers three options leading to the degree of Bachelor of Arts, major in The Arts. (The Department also offers a Curriculum in Art Education leading to the Degree of Bachelor of Science). Students majoring in The Arts must complete the following courses: Arts 431-432, Basic Design and Drawing, and Arts 475-476, Introduction to The Arts. The student majoring in The Arts has the choice of three optional programs: (1) Painting and Graphics, (2) Crafts, (3) History of Art. The optional programs offered in the Department are as follows:

OPTION I. PAINTING AND GRAPHICS

Introductory courses in design, drawing, graphics, painting and photography, followed by a comprehensive workshop integrating all these disciplines, form the core of this option. Other courses to be pursued include art history, sculpture, and the crafts. Students will be prepared for continued professional study in the fields of painting, photography, sculpture, and design. Those students seeking careers in college or secondary school teaching will be qualified to enter a program of graduate study leading to the Master of Arts or Master of Arts in Teaching degrees. The student is required to take the following courses: Arts 541, 542, 536, 451, 650, and one upper level course within the option. Interested students should consult with the supervisor, Professor John W. Hatch.

OPTION II. CRAFTS

Introductory courses in ceramics, jewelry, metalsmithing, weaving, and woodworking are offered in this option to acquaint the student with the basic crafts. Within this option the student is required to choose one area for concentration. The areas open are the following: ceramics, metal, and wood. The aim of this option is to provide the student with the opportunity to explore the craft field, and, by developing techniques and familiarity with materials, be adequately prepared for further study at an advanced level. Twenty-four credits in crafts courses are required in this option, with a concentration of 12 credits in one of the available areas (ceramics, metal, or wood). Interested students should consult with the supervisor, Professor Winifred Clark.
OPTION III. HISTORY OF ART

The arts of the eastern and western parts of the world amount to a rich legacy. The courses of study in this option are designed to serve a two-fold purpose. First they make available for students in the liberal arts programs, and elsewhere in the University, an opportunity for a full historical survey of the subject. Second the courses provide a foundation in fact, theory, and historical problems for a student who desires to continue the study of this subject on the graduate level. The very number of artistic objects and the variety of creative subjects which these objects exemplify make the survey of more than one historical period necessary for competence in this subject. A student electing to major in the history of art is required to take a minimum of five survey courses (classical, modern, medieval or Renaissance, northern painting or baroque art, Oriental or American art). In addition, the student is required to take one seminar, preferably in his senior year, Arts 797, Seminar in Art History, which deals with further refinement of problems the student has already discovered, as well as advanced critical and bibliographical tools. The student is expected to take courses in at least one European language, and in related areas in the liberal arts: philosophy, history, and literature. Creative talent in any area of art is not a prerequisite in this option. However, the familiarity with the techniques of the various arts and crafts offered in the department is strongly suggested. This option is designed to prepare a student for further work in three professional areas: teaching, museum work, conservation. Interested students should consult with the supervisor, Professor James A. Fasanelli.

Biology

Students who are interested in a broad background in the life sciences are advised to major in Biology. Such students will be required to take courses in botany, entomology, microbiology, and zoology in building up a program. The field, however, is so inclusive that the majority of students will find it desirable to include one or two additional courses in one of the subdivisions, such as Botany, Microbiology, or Zoology. In addition to students who desire to study Biology for general education, it is suggested that those who are interested in Applied Biology and Secondary-School Teacher Preparation register as Biology majors.

TEACHER PREPARATION

Students who are planning to teach Biology in secondary schools are urged to plan for practice teaching during the senior year. As 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.
Students preparing for positions which involve the application of the science of Biology, such as those frequently listed by the federal civil service, the state governments, and industry, should follow the general program of Biology majors and should elect one or two additional courses in fields of Applied Biology. The Division is well fitted to assist in the preparation of students for work in fish and game research, conservation education, and in state departments of conservation. Students preparing for professions in this group should plan to secure advanced degrees, since positions in these fields are difficult to secure without graduate study. Students who are interested in hospital laboratory work should consult the Medical Technology curriculum.

Satisfactory completion of the requirements of a Biology major will generally qualify students for admission to graduate schools to specialize in Biology or in one of its major subdivisions. Students planning to major in Biology should elect, as prerequisite, Biology 405 (or Botany 411) and Zoology 412.

The minimum course requirements for Biology majors will include: Microbiology 503; Botany 503 and one other course selected from Botany 506, 742, or 756; Entomology 402; 7 credits in Zoology (beyond Zoology 412, excluding Zoology 795, 796). Additional courses will be selected from those offered in the Division to total at least 24 semester credits with a grade of C or better. Biology majors are also required to complete (in addition to the 24 hours of major credit) Chemistry 403-404 and eight hours in physical science (further Chemistry, Geology, Mathematics, Physical Science 401-402, or Physics).

Students interested in majoring in Biology are advised to consult with the supervisor, Professor Paul E. Schaefer.

Students who are interested in plant life are advised to consider registration as majors in Botany. Botany majors with suitable undergraduate backgrounds may enter the field of secondary education or become research technicians. Botany majors, other than those whose interest is secondary-school teaching, research technique, or a general education, should expect to continue in graduate study here or elsewhere. Government work, institutional research, certain types of industrial positions, and college teaching are open to Botany students with advanced preparation. The principal fields of concentration in Botany are: (1) Pathology, (2) Physiology, (3) Taxonomy, (4) Ecology, (5) Morphology and Anatomy, (6) Cytology, (7) Phycology (Algology).

Students who major in Botany must complete courses offered by the Department to a total of 24 semester credits with grades of C or better. Credits from courses in other departments closely related to the major
courses may be included as part of the required credits with the consent of the major supervisor. A broad background in chemistry and other biological sciences is considered essential for most students who major in Botany.

The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

Students interested in majoring in Botany are advised to consult with the supervisor, Professor Albion R. Hodgdon.

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 or 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 521; 547-548; 661-762; 683-684; and at least one Chemistry course in each semester of the senior year; Physics 401-402 (Physics 404, 501-502 desirable for the capable student); Mathematics 421 or 425 (Mathematics 422, 523 or 426 strongly recommended for the capable student); German (at least 4 credits) with Russian a possible alternate. 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 very 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 on graduate study.

Students who plan to major in Chemistry are advised to consult with Professor Alexander R. Amell of the Department of Chemistry as early in their college program as possible.
Economics
A major in Economics, with requirements quite similar to those for a Bachelor of Arts degree in the College of Liberal Arts, is offered by the Whittemore School of Business and Economics. Interested students should consult the Dean of that School.

Education
The University offers undergraduate programs to prepare teachers for both elementary and secondary schools. General information about these programs is given in the section on Preparation for Teaching.

Students planning to teach in secondary school do not major in the Department of Education. They major either in the subject-matter department in the Bachelor of Arts Program, electing the courses in the University Teacher Preparation Program (see section entitled Preparation for Teaching) or they elect one of the curricula in teaching (see section entitled Bachelor of Science Curricula).

Students planning on teaching in elementary schools do major in the Department of Education as Elementary Education majors. This major is an unusual one 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. During these years the student must satisfy all of the College requirements, complete 18 semester credits of planned study in a selected liberal arts subject, pass Education 481 or Home Economics 425 with a grade of C or better (no additional Education course may be taken), 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 Professor Roselmina Indrisano as early as the sophomore year.

Several courses in Education are designed to be of interest to the general student as well as to the prospective teacher. Courses in child growth and development, educational psychology, and principles of education are substantive rather than procedural and thus are appropriate for any student who wishes to gain a better understanding of the American public school system.

English
The Department of English offers two programs of study: the English Literature major and the English Teaching major.

The English Literature major must complete English 513 and must earn grades of C or better in 24 semester credits in literature courses numbered
above 750; 6 credits must be in Shakespeare (English 757, 758), 6 credits in American literature (this requirement may be satisfied by English 515, 516, but the 6 credits thus earned cannot be counted toward the 24 major credits), and an additional 12 credits in at least three centuries of English literature prior to the twentieth.

The English Teaching major must meet the state certification requirements for teaching. He must also take the following courses, which must be passed with an average of 2.5 or better:

English 501
English 513, 514
English 516
English 705
English 709, 710, 711
English 757 or 758
English Education 791
Speech 504, 658, or English 521
Speech 508

Students who are interested in majoring in English should consult with the supervisor, Professor John C. Richardson.

Entomology
The Department of Entomology offers various courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are many fields open to those qualified in Entomology. There are opportunities for employment in public institutions and organizations, and in addition, there are many opportunities for employment with commercial and industrial firms which frequently employ college graduates who have majored in this field of study. Graduate study is desirable for the student who seeks high achievement in Entomology.

Students who major in Entomology are expected to complete successfully courses offered by the Department, to a total of 24 semester credits, with grades of C or better. Courses in other departments may be counted with the consent of the major supervisor.

Outlines of specific suggested programs of study are available to the student upon request to the supervisor, Professor James G. Conklin.

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 24 credits. French 401-402, 503-504, and 514 do not count toward a major. French 790 is required of majors. The student will be encouraged to take courses in related fields such as English, history, art, music, and philosophy.
In addition to the regular major program, the Department offers an Honors Program which consists of a senior seminar and a senior research project and paper (French 695, 696).

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 who major in General Physical Science must complete each of the following courses and achieve in them an overall grade point average of 2.3 or better: Mathematics 407-408 and either 421, 422, or 425, 426; Chemistry 403-404 and 521; Geography 473 and 570; Geology 401-402; and Physics 401-402 and 406. Students who are interested in choosing General Physical Science as a major should consult with the supervisor, Professor Herbert Tischler.

**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 interprets 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 that are significant to understanding the character of areas or places. Because its integrating character brings it into contact with many other fields of knowledge, geography forms an excellent core discipline for a liberal education. Thus, students who have a basic curiosity about areas or the regions of the world, and desire a liberal education can effectively obtain one 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 training 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 can only increase. In addition, many geographers now find employment for their skills in various branches of the Federal and state governments, in regional and city planning, and in market research and plant location services for business and industry.

Students who major in geography are required to take Geography 401 and 402, and additional courses in Geography or related fields approved by
their supervisor to a total of 24 semester credits with grades of C or better. The 24 credits should include Geography 481; 471, 472; nine credit hours of intermediate level courses; the seminar in geography; and three credit hours of Geography 795.

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

Geology

The aim of the geological sciences is 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, and an interpretation of changes in life and the 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 increase in the teaching of earth science in the secondary schools throughout the country.

Positions as mining geologists, petroleum geologists, mine operators, federal and state survey geologists, and university and college professors of geology and mineralogy 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, some in fields where their geologic preparation is useful.

Students who major in Geology are expected to complete Geology 401-402, and, in addition, courses in Geology or related courses approved by the supervisor to a total of 24 semester credits with grades of C or better. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

At the end of the senior year, a student who majors in Geology must, after consultation with his supervisor, submit either a thesis or pass a written comprehensive examination.

Students who are interested in majoring in Geology or who wish to teach Earth Science in secondary school are advised to consult with the supervisor, Professor Herbert Tischler. After a student's major interest is determined, the advice, assistance, and counsel of one or more additional members of the Department will be sought where a special area of concentration is contemplated by the student.

German

The Department of German and Russian offers a major in German only. The supervisor for majors is Professor Hermann W. Reske. This program is designed to be of interest to the following groups 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 German language and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

A major must comprise a minimum of 24 major credits in the German language and literature. German 401-402 cannot be counted for major credit.

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, as well as 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 an 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 who major in history must earn 24 semester credits in courses in History (exclusive of History 401, 402) with grades of C or better. These 24 credits should include a minimum of six semester credits each from Group I, Group II, and Group III (see the description of courses offered by the Department), and 12 semester credits of the 24 should be in courses numbered above 600. A student who majors in History must prepare a satisfactory paper in his field of concentration or take a comprehensive examination. If the student writes the paper, he must secure approval of the
subject chosen from the Chairman of the Department before December 15 of the student's senior year, and the completed paper must be filed with the Chairman before April 15 of the year in which the degree is to be granted. If a student wishes to take the comprehensive examination instead of writing the thesis, he must notify the Chairman of the Department of his decision by December 15; the examination will be given on a pre-arranged day shortly before April 15.

Students planning 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 or 421-422-523, 527, 528, 531, 761-762, 767-768, and two 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 Mathematics courses are designed to meet these demands: 425-426 or 421-422-523, 531, 542, 761-762, 755, 791 and 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 24 semester credits, with grades of C or better. A course is Organic Chemistry also required by Microbiology majors, but cannot be counted as part of these 24 major credits. 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 in personal conference.

Students interested in majoring in Microbiology are advised to consult with the supervisor, Professor William R. Chesbro.

Music

Studies in the major program in Music, such as history, literature, and appreciation of music, endow the student with cultural values which enrich his entire life. Instruction offered in the Department is designed to develop musicianship, the ability to perform and capacity to teach, supplemented by the general liberal arts program offered by the College. The broad scope of subjects available within the Department equips the student with a basis for professional competency and at the same time provides the foundation and stimulus for graduate study.

Instrumental and vocal instruction are given in private lessons, while class instruction provides for the pursuit of academic studies. Student recitals, instrumental and vocal ensembles, Men’s and Women’s Glee Clubs, the University Concert Choir, Symphony Orchestra, and Symphonic Band afford both laboratory and concert experience in a variety of performance settings.

The expanding and dynamic force which music is fast becoming in contemporary American society is reflected by increased demands for teachers of music, performers, music librarians, radio, recording, and television musicians, music therapists, and higher standards of quality and performance of music in places of worship.

(The Department of Music also offers a Curriculum in Music Education leading to the Bachelor of Science degree, and a Bachelor of Music degree allowing for concentration in Applied Music and in Theory).

A major in Music is offered with three options in concentration. All students must complete the requirements of the basic theory courses: Music 421-422, 521-522, and 523-524, and the basic history-literature course, Music 405-406. In addition, the specific requirements of each option are given below:

I. Music History: advanced theory (4 credits); advanced history and literature (12 credits); Music 570 and/or Music 573 (8 credits).
II. Applied Music: qualified students may major in voice, piano, organ, strings, woodwind or brass (a student choosing this option must pass a performance examination before the Department of Music staff); advanced theory or literature (4 credits) and applied music (16 credits — 2 credits per semester). Voice majors must take the following languages to graduate in this program: Italian 401; German 401; French 401. A senior recital also must be presented.

III. Theory: emphasis on musical composition; advanced theory (12 credits), advanced history (4 credits), and Music 570 (8 credits).

Students majoring in Music must earn grades of C or better in all required Music courses.

The Department of Music is a Member of the National Association of Schools of Music.

Prospective majors in Music are advised to consult with the Chairman, Professor Donald E. Steele.

Philosophy

The Greeks understood philosophy as the love of wisdom, that ardent desire to know which Aristotle called the natural aspiration of all men. From this original impulse toward knowledge the sciences and the humanities developed. The goal of the special sciences is the detailed study of limited fields of inquiry. Philosophy aims at a comprehensive knowledge of the whole, a single perspective which will include things as seemingly diverse as matter, space, time, spirit, society, beauty, and the divine. And since wisdom is not quite the same thing as knowledge, philosophy also seeks to bring together the discoveries of the special sciences, to assess their significance, and to apply this knowledge to the conduct of life.

Courses in Philosophy, taken early in a student’s program of study, provide an introduction to some of the dominant themes in the history of ideas and enable the student to get a view of the forest in which he will later examine the trees. Taken near the end of his studies, such courses afford a perspective of where the student has been and how much he has left unexplored. Philosophy 410 at the introductory level, is designed to present such an inclusive view as well as to acquaint the student with the specific nature of philosophic inquiry and with some of the fundamental philosophic problems. Courses in the intermediate group provide for more systematic inquiry in the history of philosophy and in some of the more important branches of the subject in which problems common to philosophy and other disciplines, such as art, literature, religion, and psychology, can be investigated. The advanced courses are for majors and for other students willing to acquire the necessary background for such work. In most cases, such background can be acquired by taking Philosophy 500, 501.

Students who major in Philosophy must earn grades of C or better in the following courses in Philosophy: 400, 500-501; two of the following three
courses, 610, 615, 620; and eight hours of work in the following group, 700, 701, 795, 796.

At the end of the senior year, students majoring in Philosophy must pass a comprehensive written-oral examination covering the History of Philosophy and some field of systematic study (e.g., ethics, aesthetics, metaphysics). A student majoring in Philosophy will present to the Department by February 1 of his senior year a senior paper on a topic of his own choice in consultation with the Department. The comprehensive oral examination will be based in part on the senior paper.

Students interested in majoring in Philosophy should consult with the supervisor, Professor Robert P. Sylvester.

Physics

The major in Physics is intended to prepare students for a diversity of interests in the application of this fundamental science. Broad in scope, the program provides electives so that a student may supplement his work in physics by that in other fields, such as mathematics and the allied sciences. The intermediate courses are intended to give the student a thorough grounding in fundamentals in a particular branch of physics. Opportunity is given in the senior year for the major student to do some elementary investigation of his own choosing under guidance. Graduates of this major will find opportunities for employment in the various industrial, government, and armed services laboratories. If particularly proficient in their undergraduate work, they may elect graduate study leading to advanced degrees.

Students are required to complete 24 semester credits, in addition to the introductory courses, with grades of C or better. A student must elect physics 501-502, preferably in the sophomore year, as an introductory course. If Physics 401-402 is elected in the freshman year, a student may be placed in an advanced section of Physics 501-502. If Physics 404 is elected in the freshman year, the regular sequence may be taken in the sophomore year. 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 407 has been passed with a grade of B or higher, students in the College of Liberal Arts may be admitted to Physics 404 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 required to participate in a colloquium, Physics 611-612.

The Department is able to furnish the preparation necessary for teaching physics in secondary schools. As very 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. The student interested in such a program should
consult with the chairmen of the departments of Education and Physics. Students who wish to major in Physics are advised to consult the Department Chairman early in their college program.

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 on local, state, national, and international levels. Basic courses are intended to contribute to a liberal education. More advanced courses afford preparation for professional work and also lead to specialization in the fields of political science, law, government, public administration, or political theory.

Government, professional consultants, educational institutions, and research organizations as well as the foreign service, civil service, and others seek graduates of Political Science programs. Students who are preparing to teach government courses in the secondary schools should coordinate their study program with the Department of Education. Students desiring to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Details may be obtained from the Political Science Department.

Political Science majors interested in gaining practical experience and knowledge in public affairs may subscribe to a program affording an opportunity to work as an intern in an approved public or private agency. Enrollment in Social Science 681 requires the permission of the Chairman.

Political Science majors interested in international affairs may designate the International Relations Option with the permission of the Chairman of the Department. The option will normally comprise 36 credits in Political Science courses and 18 credits from related fields. Since this emphasis will require additional course work outside of the Department, the candidate should carefully review his preparation and program with the departmental coordinator before making application.

Majors in Political Science are required to take Political Science 405 and 406 with grades of C or better. Students who expect to major in Political Science are advised to register for these courses during the freshman or sophomore year. Students majoring in Political Science are also required to complete a research paper approved by the staff. A major consists of a minimum of 24 semester credits of work with grades of C or better in Political Science and in any related courses which may be approved by the supervisor. The 24 semester credits should include not less than 12 in courses above 600. Not more than 9 credits earned as an intern in Social Science 681 may be counted toward the completion of the major requirements. Each student will be counseled individually and his program of study planned for his needs. Opportunity is available for the more able student to share in a program of Independent Study within the Department and in an Honors Program.
Students interested in electing Political Science as a major should meet with the Chairman of the Department.

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. It is intended that the experiences provided by the major will help to develop the broad viewpoint that is so highly valued as a characteristic of the liberal arts graduate. It is hoped that, by majoring in Psychology, the student will develop an appreciation of the role of scientific methods in studying behavior and at the same time achieve a better understanding of the complex and simple behavior of both humans and non-humans. Some students may wish to major in Psychology in order to prepare themselves for graduate study and a career in one of the following fields: college teaching and research, clinical practice, counseling and guidance in secondary schools and colleges, full-time research with private or governmental agencies, personnel work in industry or government; psychological testing and supervision in mental hospitals, juvenile courts, public schools, or child guidance clinics. For nonmajors, the study of psychology will be helpful in 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 who major in Psychology are required to complete 24 semester credits with grades of C or better in courses in Psychology or in such related courses as may be approved by the department. Each student majoring in Psychology must complete nine credits from the following group: Psychology 567, 757, 758, 776, 778, 783. He must also complete six credits from Psychology 537, 544, 654, 663, 760, 780. Finally, all majors must take Psychology 697 and pass a departmental comprehensive, which is offered as part of this course. Psychology 697 must be passed with a grade of C or better.

Psychology 695 is an honors course that is open to seniors who have a 3.0 grade point average in Psychology courses and who are sponsored by a member of the staff. Any Psychology major who plans to go on to graduate work should take Psychology 567 and 757.

Students who wish to major in Psychology should consult with the Chairman, Professor Raymond L. Erickson.

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; students who intend to do graduate work in sociology; or students who plan to attend a graduate school of
social work but prefer a different choice of undergraduate electives than the Social Service curriculum permits.

(The Department also offers a Bachelor of Science Curriculum in Social Service which, with its field experience and its concentration on pre-professional courses, not only prepares students to enter graduate schools of social work but also has been quite successful, for a number of years, in preparing them for junior positions in social work.) 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 24 semester credits with grades of C or higher in Sociology (or in any related course approved by the supervisor). Sociology 711, 712, 698, 701, 702, and 640, 641, 642, are required. During the second semester of the senior year majors must pass a written comprehensive examination.

The Department offers an Honors Program to give the superior student an unusual opportunity to perform scholarly research in the field of Sociology and Anthropology. Sociology or Social Service majors may be admitted to the program if they have a University grade point average of 3.0 or higher and a similar average in Sociology courses. Honor Program students will take Sociology 695, 696, in their junior year and Sociology 795, 796, in their senior year.

Students who are interested in choosing Sociology as a major should consult with Professor Stuart Palmer.

Spanish and Classics

The Department of Spanish and Classics offers majors in Latin and Spanish. The supervisor for majors in Latin is Professor John C. Rouman; and for majors in Spanish, Professor Charles H. Leighton. These programs are designed to be of interest to the following groups of students:

1. Those who have a special interest in one of these languages and the literature written in it.

2. Those who intend to enter professions in which a background in one of these languages and its literature is desirable.

3. Those who plan to teach one of these languages in secondary school. Such students must plan their programs carefully so as to include the requisite courses in education and a minor in another subject.

4. Those who intend to go on to graduate study in Latin or Spanish. Such graduate study is requisite to teaching at the college level and to other specialized work involving these languages, their culture, or their literature.
Students majoring in the Department of Spanish and Classics must designate either Latin or Spanish as their particular major. A major must comprise a minimum of 24 credits in the particular language and its literature. The following courses cannot be counted for major credit: Latin 401-402 and Spanish 401-402.

The Department offers Honors programs in both languages for its majors. Participation in the Honors Program entails:

1. Satisfaction of the regular major requirements.

2. Additional work in the junior and senior years to be done in connection with courses numbered 641 and above. The Honors candidate must take at least five three-credit courses at this level and do additional work equivalent to one semester-hour in connection with each.

3. A senior research project and paper (695, 696 courses) to be the equivalent of six semester-hours.

4. A comprehensive examination on the major language and its literature.

A candidate's performance will be evaluated by a committee appointed by the supervisor under whom the student is working. It will include the members of the section in question plus a member of some other department in the Humanities Division. The latter will be chosen on the basis of his direct concern with the field in which the candidate has specialized.

Speech and Drama
The Department of Speech and Drama offers a major with two options: General Speech and Drama. A major in either General Speech or Drama makes an excellent focal point for those students desiring a liberal education combining course work in the humanities, literature, the arts and social sciences. The purpose of this major is to offer a broad program for students interested in: a liberal education stressing the speech arts; a pre-professional background for careers in such fields as public service, teaching, law, ministry, public relations, social administration, and personnel work; basic preparation for the teaching of speech and drama, direction of debate, drama and other speech activities in secondary schools, community theater direction, and professional training for television, theater, and speech correction.

Courses in speech and drama may also be elected for their cultural value by students pursuing other majors.

Those seeking a major in General Speech should acquire a good background in English language and literature, history, government, philosophy, and psychology. They should be able to speak and write well, and they should acquire a reasonable proficiency in public speaking and oral reading.
Those seeking a major in Drama should combine that study with a wide variety of liberal arts courses in such fields as history, dramatic literature, philosophy, the arts, music, and psychology.

The following three-credit courses are required of all Speech and Drama majors: Basic Speech (without major credit), Speech Communication (without major credit in General Speech), and Introduction to Theater (without major credit in Drama).

For majors in the General Speech option, the following three-credit courses are required: either Discussion or Debate, Theater and Its Drama, Rhetoric in the Western World, Stagecraft, and Speech Correction. Six credits are also required in specific courses in literature in related departments as approved by the major adviser and not also used to satisfy College, or University requirements. Each student's individual program will be considered with regard to breadth and individual needs in assigning courses in related departments. Approval must be secured in advance of registration for credit for courses in this area. Individual students may be allowed to substitute Television and Radio Workshop for Stagecraft with the approval of the major adviser. Stagecraft will contribute considerable background for the course in Television and Radio Workshop.

For majors in the Drama option, the following three-credit courses are required: Theater and Its Drama, Stagecraft, Acting, Directing, and Scenic Design and Lighting. Six credits are also required in specific courses in dramatic literature in related departments with the same provisions as in the General Speech option.

All majors will be required to write a satisfactory paper and/or satisfactorily complete a special project during their senior year. The student must secure approval of the subject of the paper and/or the special report from his major adviser before the Christmas vacation of his senior year and file the completed paper and/or project with the major adviser before the 15th of May of the year in which his degree is to be granted.

To count for major credit the courses required must be completed with a grade of C or better.

Students who wish to major in Speech and Drama should consult with the supervisor, Professor Joseph D. Batcheller.

Zoology

Zoology, the science of animal life, is the study of the structure, functions, development, and classification of the various animal forms. The student may major in Zoology: because of a general educational interest in the subject; because of his avocational interest in nature study; or to prepare for professional work in pure science or in applied zoology. Fish and game research, important in the conservation of our natural resources, is an example of applied zoology. Students who are interested in entering the fields of applied zoology should plan to secure advanced degrees since positions
in these fields are difficult to obtain without graduate study. Undergraduate preparation for students who are interested in applied zoology generally should parallel that of any students planning to enter graduate work in zoology.

The University's location on tidewater and near the open ocean provides an unusual opportunity for the study of marine zoology and marine ecology.

Students planning to major in Zoology should elect, as prerequisite, Biology 405 (or Botany 411) and Zoology 412.

All Zoology majors must earn grades of C or better in 24 semester credits of intermediate and advanced work in Zoology, except that 6-8 hours in related departments may be counted for major credit with the consent of the supervisor. The Zoology major shall include Zoology 507-508, 706, and 729. In addition to the 24-hour major credits, Zoology majors must complete Botany 503 or 506, Chemistry 403-404, a course in organic chemistry (Chemistry 545, 651-652, or Biochemistry 501), and a semester of college physics.

Students who are interested in a Zoology major should consult the supervisor, Professor Philip J. Sawyer.

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**Bachelor of Science Curricula and Bachelor of Music Curriculum**

The Bachelor of Science Curricula permit considerable specialization in preparation for several professional activities while conserving and developing the breadth and general culture of the students enrolled in them. Curricula are offered in: Art Education, Medical Technology, Music Education, Nursing, Occupational Therapy, Physical Education (men), Physical Education (women), Recreation Education, Social Service.

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.

**Degree Requirements**

These requirements apply to students who enter the College of Liberal Arts between July 1, 1966, and June 30, 1967, and who are seeking a Bachelor of Science degree or a Bachelor of Music degree.

1. 128 semester-hour credits (134 in the Nursing Curriculum).
2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
3. Physical Education: Men students — two semesters; Women students — four semesters.

4. English 401-402.

5. History 401, 402.

(Note that in the following groups specific courses may be required in a particular curriculum.)

6. Group B (Natural Sciences): Two courses selected from Biology 401, 402; Botany 411; Chemistry 401-402, 403-404; Geology 401-402; Mathematics 407-408; Physical Science 401-402; Physics 401-402; Zoology 412.

7. Group C (Social Sciences): Two courses selected from Economics 401-402; Geography 401, 402; Political Science 405, 406, 408; Psychology 401-402; Sociology 400, 411, 540.

8. Group D (Humanities): Two courses selected from Arts 475, 476; English 513, 514, 515, 516; Humanities 501-502; Music 403, 404; Languages 501, 502; any specific foreign language 503-504, 505-506 (German 501-502 or 605-606, Russian 501-502 or 605-606); Philosophy, any courses; Speech and Drama 431, 436.

9. Specific Curricula Requirements: These are presented in the detailed listing of the Curricula. Note that some Curricula have special quality requirements. Courses are to be completed generally in the sequence in which they are arranged.

More than 66 semester hour credits in professional courses in a Bachelor of Science curriculum constitutes excessive concentration and neither the supervisor nor the Dean of the College may approve schedules that reveal over-specialization.
Art Education Curriculum

This curriculum is designed to prepare teachers and supervisors of art in the public schools. It is based upon the demands for teachers who possess developed skills in the arts and a broad general culture in addition to a specialized preparation in Art Education. The satisfactory completion of the curriculum will satisfy the initial certification requirements for teachers of art in the public schools in New Hampshire and in other states.

Freshmen who plan to enter this curriculum should elect Arts 431-432 Basic Design and Drawing and Design in their first year program.

A cumulative grade point average of 2.2; a grade point average of 2.5 in all Art courses, and a grade point average of 2.5 in all Education courses, including Art Education 791, 792; are required to be eligible for Education-Art 794, Supervised Teaching.

Students seeking to transfer to the University of New Hampshire from other accredited collegiate institutions must arrange an appointment with the supervisor of the curriculum or the Department Chairman prior to admission to the curriculum in order that the applicant may be fully aware of the program to be followed in completing the requirements for the degree.

Interested students should consult with the supervisor, Professor George R. Thomas.
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<td>Art-Ed. 791 Problems of Teaching Art in Secondary Schools</td>
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<td>Ed-Art 794 Supervised Teaching</td>
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<td>H.E. 765 (or) History of Costume</td>
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111
Medical Technology Curriculum
There is now 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 year's 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 (Microbiology 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 $700 (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 756.

Students who in their junior year decide not to take the training program at the Mary Hitchcock Memorial Hospital School of Medical Technology will find it possible to transfer to a major in the Bachelor of Arts Program, such as Microbiology or some other biological science. In such case, they would have to satisfy requirements of the Bachelor of Arts Program.

Students interested in the curriculum in Medical Technology are advised to consult with the supervisor, Professor Theodore G. Metcalf.
### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Credits</th>
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<tbody>
<tr>
<td>P.E. 431-432</td>
<td>Physical Education (Men)</td>
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</tr>
<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
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<tr>
<td>Biol. 405</td>
<td>Principles of Biology</td>
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</tr>
<tr>
<td>Bot. 411</td>
<td>General Botany</td>
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<tr>
<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>Engl. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>Math. 407-408</td>
<td>Fundamental Mathematics</td>
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### SOPHOMORE YEAR

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<td>Physical Education (Women)</td>
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<tr>
<td>Microb. 503</td>
<td>General Microbiology</td>
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<tr>
<td>Microb. 702</td>
<td>Pathogenic Microbiology</td>
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<tr>
<td>Chem. 517</td>
<td>Introductory Quantitative Analysis</td>
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<td>Chem. 545</td>
<td>Organic Chemistry</td>
<td>5</td>
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<td>Hist. 401, 402</td>
<td>Introduction to Contemporary</td>
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<tr>
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### JUNIOR YEAR

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<th>Course Code</th>
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<tr>
<td>Bio. Ch. 756</td>
<td>Physiological Chemistry</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>Mammalian Anatomy and Systemic</td>
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<td>Physiology</td>
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<td>Group C</td>
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### SENIOR YEAR

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<tbody>
<tr>
<td>Microb. 761-762</td>
<td>Clinical Laboratory Methods†</td>
<td>16</td>
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</table>

† 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.

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Music Education Curriculum

This curriculum is designed to prepare teachers of music for the public schools. It is based on the demands for teachers possessing sound musicianship and a broad general culture in addition to a specialized preparation in music education. This program is fully accredited by the State Department of Education and complies with standards set up for certification of teachers and supervisors of music in most states. Training for teaching in both the elementary and secondary schools is included in the program. The Department is also actively affiliated with the Music Educators National Conference.

To be admitted to this curriculum the student must give evidence of having a sound musical background. Freshmen who plan to enter this curriculum must elect Music 421-422 and four hours of Applied Music in their first year program.

A cumulative grade point average of 2.2; a grade point average of 2.5 in all Music courses; and a grade point average of 2.5 in all Education courses, including Music-Education 791, 792; are required to be eligible for Education-Music 793, 794, Supervised Teaching.

Public school music teachers must maintain a satisfactory standing musically with other professional musicians in the community and should be able to play or sing acceptably. For this reason 16 semester credits in Applied Music are required before graduation. Students will be encouraged to accumulate up to eight semester credits in one instrument or in 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 years. The minimum instrumental standards may be met by special examination, or may be demonstrated during the time the candidate is registered for Applied Music in these instruments. Details of minimum standards of performance may be obtained from the Supervisor of the Music Education curriculum.

Students who are interested should consult with the supervisor, Professor John B. Whitlock.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>Hist. 401, 402</td>
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<tr>
<td><strong>Group B</strong></td>
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<tr>
<td>Natural Sciences</td>
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<tr>
<td>Applied Music*</td>
<td>2</td>
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<tr>
<td><strong>Mus. 421-422</strong></td>
<td>3</td>
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<tr>
<td>Theory I</td>
<td>3</td>
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<tr>
<td>Music Laboratory</td>
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<tr>
<td>Recitals† and Electives</td>
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</tbody>
</table>

† Recitals include a variety of performances such as solo, duet, or group recitals, depending on the program and the availability of performers. Students are expected to participate in these performances as part of their curriculum.

* Applied Music includes both instrumental and vocal courses, designed to provide students with practical experience in music performance and instruction.
<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 403, 404</td>
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<td>Applied Music* 2 2</td>
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<td>Educ. 481</td>
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<tr>
<td>Mus. 523-524</td>
<td>Harmony II 2 2</td>
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<td>Mus. 521-522</td>
<td>Sightsinging, Ear Training, Dictation II 1 1</td>
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<td>Mus. 405-406</td>
<td>Music History and Literature 3 3</td>
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<td>Mus. 525-526</td>
<td>Conducting Methods; Band &amp; Orchestra 1 1</td>
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<td>Group C</td>
<td>Social Sciences 3 3</td>
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<td>Educ. 757</td>
<td>Principles of Human Learning 3</td>
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<td>Mus. 725-726</td>
<td>Orchestration and Chorestration 2 2</td>
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<td>Mu.-Ed. 792</td>
<td>Problems in the Teaching of Elementary School Music 3</td>
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<td>Techniques and Methods in:</td>
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<td>Woodwind Instruments, or 3</td>
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<td>Mu.-Ed. 553</td>
<td>Brass and Percussion Instruments, or 3</td>
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<td>Mu.Ed. 751, 752</td>
<td>Choral Music† 3 3</td>
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<td>Techniques and Methods in String Instruments‡ 2</td>
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<td>Supervised Teaching of:</td>
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<td>Ed.-Mu. 793</td>
<td>Elementary School Music 7</td>
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<td>Ed.-Mu. 794</td>
<td>Secondary School Music 7</td>
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<td>Recitals† and Electives</td>
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* A minimum of 16 semester credits in Applied Music must be offered by students in this curriculum.

† Recitals — Students enrolled in this curriculum must accumulate a minimum of 24 points in the sophomore, junior, and senior years. Attendance at each concert or recital constitutes one point.

‡ Any combination of three Techniques courses fulfill curriculum requirements.
Nursing Curriculum

The need for more and better nursing care for all people and for more well-qualified nurses to give such care is both 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. The graduate of this program will receive a Bachelor of Science degree and will be eligible to take State Board examinations to become a Registered Nurse. Modern nursing offers a great range of job opportunities. Professional nurses are at work wherever the prevention and cure of illness and the promotion of health are of concern. They are members of today’s health team working with people from many health fields. If the nurse wants to direct and coordinate nursing as a supervisor or administrator, teach nursing, become a clinical specialist, or do nursing research, she may continue her education to prepare for these positions of responsibility.

The Nursing Faculty of the University of New Hampshire will be responsible for the Nursing courses. Learning experiences (nursing laboratory) will be arranged in hospitals in the area, a medical center, public health and other health agencies. Starting with the second semester of the junior year, a calendar year will be devoted to nursing courses including nursing experience. For part of this year it will be necessary for the student to live off campus.

The student will purchase uniforms in the sophomore year at a cost of approximately $60.00. Other expenses will be the same as for other students. Special scholarships and loans will be available for the students.

Students in the Nursing Curriculum must obtain a grade-point average of 2.2 or better for the required courses: Zoology 507-508, Psychology 401-402, Nursing 503-504, 602, 610, 621. This Curriculum requires 134 credits for graduation.

Students interested in the program are encouraged to talk with the Chairman of the Department of Nursing.
<table>
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<td>Hist. 401, 402</td>
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<tr>
<td>Engl. 401-402</td>
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<tr>
<td>Hist. 401, 402</td>
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<td>Biol. 405</td>
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<td>or Bot. 411</td>
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<tr>
<td>Zool. 412</td>
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<td>Chem. 403-404</td>
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<tr>
<td>Nurs. 401-402</td>
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<tr>
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<td>Zool. 507-508</td>
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<td>Group D</td>
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<td>Nurs. 503-504</td>
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<td>Nurs. 551</td>
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<td><strong>SUMMER SESSION (8 weeks)</strong></td>
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<td>Nurs. 610</td>
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<td>Nurs. 701</td>
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<tr>
<td>Nurs. 702</td>
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</table>
Occupational Therapy Curriculum

An ally to the medical profession, occupational therapy is any activity, mental or physical, prescribed by a physician and administered by a registered therapist to aid in the recovery or the rehabilitation of the patient.

The successful practice of occupational therapy requires not only thorough academic preparation but also suitable personality combined with judgment, dependability, tact, tolerance, patience, and will to serve. A high degree of mental and physical health is essential. Occupational therapy requires physical vitality and emotional stability.

Both men and women may be admitted if they meet minimum entrance requirements. Minimum requirements include sophomore standing, 2.0 cumulative grade point, Biology 405 (or Botany 411) and Zoology 412, Psychology 401-402, Arts 431, 432, and an approval interview with the department committee*. The student should also take the series of Occupational Therapy Aptitude Tests in the semester preceding selection of the program. Declaration of this major may be made at the end of the freshman year, or the first semester, sophomore year. Students seeking to transfer to the University of New Hampshire from other accredited collegiate institutions must consult with the department chairman, prior to admission to the curriculum, in order that the applicant may be fully aware of the problems involved in completing the requirements for the degree. Due to the highly specialized nature of the Occupational Therapy curriculum, students are advised to enter the program at the beginning of the sophomore year. In most instances transfer students from other universities require an additional semester in order to meet the requirements for the Bachelor of Science degree.

Students who are registered in the curriculum must obtain grades of C or better in the following courses: Zoology 507, 610, 510; P.E.M. 652; Occupational Therapy 411, 412, 522, 524, 526, 702, 681, 682, 683, 698.

The curriculum in Occupational Therapy is designed to satisfy the American Occupational Therapy Association curriculum requirements, and the Council on Education of the American Medical Association, as well as to offer a four-year course leading to the Bachelor of Science degree. This includes the theoretical subjects needed in medical fields, a wide range of skills and crafts used as therapeutic modalities, as well as preclinical observation of patient treatment under University staff supervision in the junior and senior years.

Following completion of the four-year degree program the student will spend a minimum of nine months in student affiliation in approved A.H.A. hospitals or services under the direction of a registered occupational therapist.

The occupational therapy student is expected to take the nine months' clinical affiliation period in a continuous sequence after receiving his B.S. degree directly upon receiving his assignments from the director of the cur-
riculum. When this internship is satisfactorily completed, the student is entitled to a Certificate of Occupational Therapy. The student is then qualified to take 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 $30.00 is required by the Association for each examination. While the present demand for qualified therapists is far in excess of the supply, there are relatively few opportunities for those who have not completed the requirements for and entered the Registry of the American Occupational Therapy Association.

A student affiliation fee of $95 for residents of New England and $200 for non-residents of New England is payable in advance to the University by those students who enter the clinical affiliation program.

The minimum of nine months of student affiliation in approved hospitals is divided as follows:

- O.T. 711 General Medicine, Surgery, and Pediatrics — three months
- O.T. 712 Psychiatry — three months
- O.T. 713 Physical Disabilities — three months

The American Medical Association requires a physical examination including a tuberculin test prior to hospital affiliation.

Expenses vary during the period of student affiliation. Room, board, and laundry are usually provided students by the psychiatric hospitals; meals only in other hospitals. In all cases, the University must approve living arrangements for students affiliates. Students will furnish six (6) regulation white uniforms which are required for student affiliation. Students should be prepared to meet all of their living and traveling expenses during the clinical affiliation of nine months. The University does not guarantee maintenance.

Students interested in the curriculum are advised to consult the Chairman of the Department, Professor Marguerite Abbott, and to attend the several occupational therapy assemblies which occur during the academic year.

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*Freshmen considering an Occupational Therapy program must follow the freshman program as outlined in the Occupational Therapy Curriculum.*
### FRESHMAN YEAR

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<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
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<tbody>
<tr>
<td>P.E. 431-432</td>
<td>Physical Education (Men)</td>
<td>½</td>
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<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
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<tr>
<td>Biol. 405</td>
<td>Principles of Biology</td>
<td>4</td>
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<td>Bot. 411</td>
<td>General Botany</td>
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<tr>
<td>Zool. 412</td>
<td>Principles of Zoology</td>
<td>4</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
<td>3</td>
</tr>
<tr>
<td>Arts 431, 432</td>
<td>Basic Design; Drawing and Design</td>
<td>2</td>
</tr>
<tr>
<td>Psych. 401, 402</td>
<td>General Psychology</td>
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### SEMESTER CREDITS

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### SOPHOMORE YEAR

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<td>H.E. (425) or Psych. 437</td>
<td>Child Development</td>
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<td>O.T. 411</td>
<td>Introduction to Occupational Therapy</td>
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<td>O.T. 412</td>
<td>Therapeutic Crafts</td>
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<td>Zool. 510</td>
<td>Functional Anatomy and Neurology</td>
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<td>Zool. 507</td>
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<td>Zool. 610</td>
<td>Introduction to Pathology</td>
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<td>Soc. 400</td>
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<td>O.T. Group II†</td>
<td>Skills (Select 1)</td>
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### SEMESTER CREDITS

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<td>JUNIOR YEAR</td>
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<tr>
<td>O.T. 515  Therapeutic Crafts, Advanced</td>
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<tr>
<td>O.T. 522  Application of O.T. in General Medicine</td>
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<td>O.T. 681  General Medical Lectures</td>
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<td>O.T. 682  Orthopedic Medical Lectures</td>
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<td>Psych. 654 Psychopathology</td>
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<td>P.E.M. 652 Kinesiology</td>
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<td>O.T. Groups Skills and Techniques (select 3)</td>
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<tr>
<td>I and II†</td>
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<tr>
<td>O.T. Group I* Skills and Techniques</td>
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<td>O.T. 524  Application of O.T. in Psychiatry</td>
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<td>O.T. 526  Application of O.T. in Physical</td>
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<td>Disabilities</td>
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<td>O.T. 683  Medical Lectures, Psychiatry</td>
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<td>O.T. 698  Advanced Reading Seminar of Treatment</td>
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<td>O.T. 713  Physical Disabilities</td>
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† OT Group I - required crafts as follows: Arts 425, Woodworking, 3 cr.; Arts 401, Ceramics, 3 cr.; Arts 419, Weaving, 3 cr.; and Home Economics 405, Sewing, 3 cr.
† OT Group II - skill courses in various departments, selected from an approved list available in the Occupational Therapy office. E.g., The Arts, Home Economics, Business Administration, etc.
‡ Social Sciences: Economics 401-402; Geography 401, 402; Political Science 405, 406, 408; any History.
Physical Education Curriculum for Men

In addition to the basic Physical Education Curriculum, an Academic Subject Teaching Option is offered under this curriculum.

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 431-432 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; a grade point average of 2.5 in all Physical Education courses; and a 2.5 average in all Department of Education courses, and including P.E. 656 and P.E.-Educ. 792; are required to be eligible for Ed.-P.E. 790, Directed Teaching of Physical Education.

* A more intensive introduction would be obtained by electing Biol. 405 (or Bot. 411) and Zool. 412, 4 cr. each.

† Students must complete at least six of these Theory and Applied Technique courses and no more than two of the six may be Problems of Coaching: P.E. 521, Problems of Coaching Basketball; P.E. 522, Problems of Coaching Football; P.E. 523, Theory of Teaching Dance; P.E. 524, Problems of Coaching Baseball; P.E. 525, Theory of Teaching Team Sports for Men; P.E. 526, Theory of Teaching Individual Sports for Men; P.E. 527, Theory of Teaching Aquatics; P.E. 528, Problems of Coaching Track and Field; P.E. 529, Theory of Teaching Gymnastics and Tumbling.
### FRESHMAN YEAR

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<td>Biol. 401, 402*</td>
<td>Man and the Living World</td>
<td>3</td>
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<td>Engl. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
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### SOPHOMORE YEAR

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<td>Personal and Community Health</td>
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<td>Educ. 481</td>
<td>An Educational Psychology of Development</td>
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<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
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<td>P.E. 521; 553; 525; 527; 529 (select one)†</td>
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### JUNIOR YEAR

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<td>Principles of Education</td>
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<td>P.E. 520</td>
<td>Physiology of Exercise</td>
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<td>P.E. 652</td>
<td>Kinesiology</td>
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<td>P.E. 656</td>
<td>Problems of Health Education</td>
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### SENIOR YEAR

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<td>Administration of Physical Education in Secondary Schools</td>
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<tr>
<td>P.E. 668</td>
<td>Measurement Procedures in Physical Education</td>
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<td>P.E.-Ed. 792</td>
<td>Problems of Teaching Physical Education in the Elementary School</td>
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<td>P.E. 622</td>
<td>First Aid-Safety; Athletic Training</td>
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<td>Directed Teaching of Physical Education</td>
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<td>Electives</td>
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Physical Education for Men, Academic Subject Teaching Option

The Academic Subject Teaching Option is offered for students who are planning to teach an academic subject in addition to teaching Physical Education and coaching in secondary schools. In this Option there is greater emphasis upon preparation and directed teaching of the elected academic subject. The same courses listed above are required for freshmen students. Students in this Option must be certain to satisfy all course and quality requirements necessary for admission to practice teaching in the selected academic subject. They must consult with the chairmen of the subject-matter department and the Department of Education as early as possible in their academic careers. A cumulative grade point average of 2.2; a grade point average of 2.5 in the academic subject; and a 2.5 average in all Education courses, including the — Ed. 791 course in the academic subject; are required to be eligible for the Ed. — 794 course in Supervised Teaching.

* A more intensive introduction would be obtained by electing Biol. 405 (or Bot. 411) and Zool. 412, 4 cr. each.
† Electives approved after consultation with the proper Liberal Arts department must qualify students for supervised teaching in another academic subject.
‡ Students must complete at least four of these courses, not including more than two of the Problems of Coaching courses.
### FRESHMAN YEAR

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<th>Semester Credits</th>
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<td>Introduction to Contemporary Civilization</td>
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<td>Engl. 401-402</td>
<td>Freshman English</td>
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<td>An Educational Psychology of Development</td>
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<td>P.E. 521; 553; 525; 527; 529</td>
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<td>P.E. 582</td>
<td>Personal and Community Health</td>
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### JUNIOR YEAR

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<td>Ed. 791</td>
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| Electives† |                  |

**SEMESTER CREDITS**

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<td>Freshman English</td>
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<td>Mammalian Anatomy and Systemic Physiology</td>
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<tr>
<td>Supervised Teaching of the Academic Subject in the Secondary School</td>
<td>6 or 14</td>
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Physical Education Curriculum for Women
For women students who plan to prepare themselves for positions as teachers of physical education, the University has organized the Physical Education Curriculum for Women. 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 satisfactorily completed the freshman year and are 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.

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.

For students in this curriculum, the following courses offered by other departments are suggested as valuable electives: Arts 408, Microbiology 501, Speech 403, Humanities 501-502, Music 403, 404, Psychology 537, Sociology 400, Sociology 560. Physical Education 454 is also recommended. Students are advised to choose non-professional electives whenever possible. Those planning to enter graduate study should elect a foreign language.

A cumulative grade point average of 2.2; a grade point average of 2.5 in all Physical Education courses; and a 2.5 average in all Department of Education courses, and including P.E. 656 and P.E.-Ed. 792; are required to be eligible for Ed.-P.E. 790; Directed Teaching of Physical Education.

Under Physical Education 411, 412, 421, 422 (freshmen); 413, 414, 423, 424 (sophomore); 415, 416 (juniors) and 417 (seniors), Physical Education curriculum students take sections especially reserved for them. During the four years the student will generally have the following: movement fundamentals, soccer, skiing, lacrosse, swimming, basketball, volleyball, tennis (int.), hockey, stunts and tumbling, figure skating, elementary games, folk and square dance, modern dance, badminton, outdoor education, archery, golf, folk and square dancing, modern dance (int.), track and field, apparatus and gymnastics.

For those who are highly skilled in the activities mentioned above, substitutions are made with the approval of the supervisor. Further dance and other activities not listed above are included in courses in the curriculum.

Students interested in majoring in Physical Education should consult one of the Supervisors: Professor Janet Atwood or Professor Marion C. Beckwith.

* Freshmen considering this curriculum should also elect P.E. 421, 422.
† A more intensive introduction would be obtained by electing Biol. 405 (or Bot. 411) and Zool. 412. 4 cr. each.
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<thead>
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<td>P.E. 411, 412*</td>
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<td>Introduction to Contemporary Civilization</td>
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<td>P.E. 520</td>
<td>Physiology of Exercise</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 656</td>
<td>Problems of Health Education</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 563, 564</td>
<td>The Theory of Teaching Team Sports for Women</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 652</td>
<td>Kinesiology</td>
<td>3</td>
</tr>
<tr>
<td>Group C</td>
<td>Social Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Ed.-P.E. 790</td>
<td>Directed Teaching of Physical Education</td>
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<tr>
<td>P.E. 655</td>
<td>Remedial Gymnastics</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 765</td>
<td>Administration of Physical Education in Secondary Schools</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 668</td>
<td>Measurement Procedures in Physical Education</td>
<td>2</td>
</tr>
<tr>
<td>P.E. 573, 574</td>
<td>The Theory of Teaching Individual Sports for Women</td>
<td>2</td>
</tr>
<tr>
<td>P.E.-Ed. 792</td>
<td>Problems of Teaching Physical Education in the Elementary School</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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</tr>
</tbody>
</table>
Recreation Education Curriculum

The need for professionally trained leaders and administrators in the recreation field far outreaches the supply. The men and women graduates in this program will receive a Bachelor of Science degree after successfully completing the listed curriculum requirements. A cumulative average of 2.2 must be accomplished in order to schedule the practicum field work. The permission of the recreation adviser is required before a student may enter this curriculum.

In addition to the printed curriculum, the student is encouraged to acquire additional skills in camping, art, sports, music, drama, and leadership experiences. Experience in some recreation job (playground, resort, camp, hospital, etc.) as a summer position is recommended for all recreation majors. A written report of this experience will be presented to the Department. The following electives are recommended: Music 403, Speech 503, Sociology 411, Music Education 754, Psychology 544, 663, and first aid. For further information, contact Professor Patricia Farrell or Professor Robert E. Wear.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 411, 412* or P.E. 441, 442</td>
<td>Physical Education Activity Courses for Women</td>
</tr>
<tr>
<td>Biol. 401, 402†</td>
<td>Man and the Living World</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
<tr>
<td>P.E. 453</td>
<td>Principles of Physical Education Electives</td>
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<th>SOPHOMORE YEAR</th>
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<tbody>
<tr>
<td>P.E. 413, 414</td>
<td>Physical Education Activity Courses for Women</td>
</tr>
<tr>
<td>P.E. 423, 424, or P.E. 443, 444</td>
<td>Physical Education Activity Courses for Women</td>
</tr>
<tr>
<td>P.E. 455</td>
<td>Introduction to Community Recreation</td>
</tr>
<tr>
<td>Educ. 481</td>
<td>An Educational Psychology of Development</td>
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<tr>
<td>P.E. 582</td>
<td>Personal and Community Health</td>
</tr>
<tr>
<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
</tr>
<tr>
<td>Arts 408</td>
<td>Crafts</td>
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<td>Humanities Electives</td>
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### Junior Year

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<td>P.E. 415, 416</td>
<td>Physical Education Activity Courses for Women</td>
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<tr>
<td>P.E. 525</td>
<td>Theory of Teaching Team Sports for Men</td>
<td>2</td>
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<tr>
<td>P.E. 521, 524, 527, 529</td>
<td>Problems and Theory of Teaching Sports Courses for Men (Select one)</td>
<td>2</td>
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<tr>
<td>Speech 459</td>
<td>Stagecraft</td>
<td>3</td>
</tr>
<tr>
<td>Educ. 757</td>
<td>Principles of Human Learning</td>
<td>3</td>
</tr>
<tr>
<td>For. 538</td>
<td>Nature Education</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 454</td>
<td>Organized Camping</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 526 or Theory of Teaching Individual Sports for Men</td>
<td>2</td>
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<tr>
<td>P.E. 573, 574</td>
<td>Theory of Teaching Individual Sports for Women</td>
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<tr>
<td>P.E. 553, 554†</td>
<td>The Theory of Teaching Dance</td>
<td>2</td>
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<tr>
<td>Soc. 400, 540</td>
<td>Introductory Sociology; Social Problems</td>
<td>3</td>
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<td>Group D</td>
<td>Humanities</td>
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### Senior Year

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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>Speech 658</td>
<td>Directing</td>
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<tr>
<td>Music 403§</td>
<td>Introduction to Music Literature</td>
<td>3</td>
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<td>P.E. 665</td>
<td>Administration of Physical Education in Secondary Schools</td>
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<tr>
<td>P.E. 788</td>
<td>Recreation Field Work</td>
<td>6</td>
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<tr>
<td>P.E.-Ed. 792</td>
<td>Problems of Teaching Physical Education in the Elementary School</td>
<td>3</td>
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<tr>
<td>Soc. 500</td>
<td>Social Psychology</td>
<td>3</td>
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<td>Group C</td>
<td>Social Sciences</td>
<td>3</td>
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<tr>
<td>Electives</td>
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</table>

*Women Recreation Education students should also plan to take P.E. 421 and 422.
† A more intensive introduction would be obtained by electing Biol. 405 (or Bot. 411) and Zool. 412, 4 cr. each.
‡ Second Semester Modern Dance not required for men.
§ If Music has already been taken, three additional hours in Group D must be taken.
Social Service Curriculum

Social Service includes the following fields: state public welfare work; child welfare services; school social work; marital and family counseling; medical, psychiatric, and correctional casework; social group work; community organization; social research; social action and administration.

For full recognition in social service, it is important for a man or woman to have completed the two-year professional course in a graduate school of social work. The best preparation for admission to such a graduate school is either a broad liberal arts education with 40 to 60 hours of credit in the social sciences, including a major in Sociology, or the Social Service curriculum. For able students, scholarship aid toward meeting expenses of graduate study is often available.

There is a continuing serious shortage of qualified workers in nearly all branches of social work. For this reason, a number of students who complete the Social Service curriculum find employment each year, in public welfare, group work, etc. Students registered in it must obtain a grade of C or better in 24 semester hour credits from the following courses: Sociology 520, 500, 703, 621, 622, 701, 702, and 631; and Psychology 402 and 654.

Interested students are advised to consult with the Supervisor, Professor Pauline Soukaris, Department of Sociology.
<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
</tr>
<tr>
<td>P.E. 431-432</td>
<td>Physical Education (Men)</td>
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<tr>
<td>Biol. 401, 402</td>
<td>Man and the Living World</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
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<tr>
<td>Soc. 400</td>
<td>Introductory Sociology</td>
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<tbody>
<tr>
<td>P.E. 403, 404</td>
<td>Physical Education (Women)</td>
</tr>
<tr>
<td>Microb. 501</td>
<td>Public Health and Sanitation</td>
</tr>
<tr>
<td>Psych. 401-402</td>
<td>General Psychology</td>
</tr>
<tr>
<td>Soc. 520</td>
<td>The Family</td>
</tr>
<tr>
<td>Soc. 500 or Soc. 544</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>Psych. 544</td>
<td>Psychology of Personality</td>
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<td>Group D</td>
<td>Humanities</td>
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<tbody>
<tr>
<td>Soc. 703</td>
<td>Criminology</td>
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<tr>
<td>Soc. 621-622</td>
<td>Introduction to Social Welfare</td>
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<tr>
<td>Group B</td>
<td>Physical Sciences*</td>
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<tr>
<th>SENIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Psych. 654</td>
<td>Psychopathology</td>
</tr>
<tr>
<td>Soc. 701-702</td>
<td>Statistics; Social Research</td>
</tr>
<tr>
<td>Soc. 631</td>
<td>Social Welfare Field Experience</td>
</tr>
</tbody>
</table>

* Must be satisfied by a Physical Science sequence.
Bachelor of Music Curriculum

This professional degree is offered to students who wish to major in applied music and theory and who wish to develop their talent in performance and composition to a high professional standard. The majority of the courses are in Music. Standards of performance are maintained which are the equivalent of those offered by conservatories of music. To be admitted to this program, candidates must demonstrate a flare for performance or strong creative ability, and in the case of applied music, must have had solid prior training in their instrument.

In initiating this program this year, the Department of Music is accepting chiefly only freshman students. Transfer students must consult with the Chairman of the Music Department before being accepted.

Bachelor of Music Curriculum offers concentrations in the following:

OPTION 1, Piano
OPTION 2, Organ
OPTION 3, Voice
OPTION 4, Strings, woodwinds, brass or percussion
OPTION 5, Theory
# FRESHMAN YEAR

<table>
<thead>
<tr>
<th>FOR ALL OPTIONS</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 401-402</td>
<td>Physical Education (Women)</td>
</tr>
<tr>
<td>P.E. 431-432</td>
<td>Physical Education (Men)</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
<tr>
<td>Mu. 421-422</td>
<td>Theory I</td>
</tr>
<tr>
<td></td>
<td>Electives*</td>
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</tbody>
</table>

**OPTION 1**
- Music 570, 6 cr.

**OPTION 2**
- Music 571, 6 cr.

**OPTION 3**
- Music 573, 6 cr.
- Music 570, 2 cr.
- Music Laboratory (choral), 2 cr.

**OPTION 4**
- Applied Music (major instrument), 6 cr.
- Music 570, 2 cr.
- Music Laboratory (instrumental), 2 cr.

**OPTION 5**
- Music 570, 2 cr.

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# SOPHOMORE YEAR

<table>
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<tr>
<th>FOR ALL OPTIONS</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 403, 404</td>
<td>Physical Education (Women)</td>
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<td>Group B</td>
<td>Natural Sciences</td>
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<td>Group C</td>
<td>Social Sciences</td>
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<tr>
<td>Mu. 521-522</td>
<td>Sightsinging, Ear Training, Dictation II</td>
</tr>
<tr>
<td>Mu. 523-524</td>
<td>Harmony II</td>
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**OPTION 1**
- Music 570, 6 cr.

**OPTION 2**
- Music 571, 6 cr.

**OPTION 3**
- Music 573, 6 cr.
- Music 570, 2 cr.
- Music Laboratory (choral), 2 cr.

**OPTION 4**
- Applied Music (major instrument), 6 cr.
- Music 570, 2 cr.
- Music Laboratory (instrumental), 2 cr.

**OPTION 5**
- Music 570, 2 cr.
- Music 405-406, 6 cr.
- Applied Music (strings) 1 cr., (brasses) 1 cr., (woodwinds) 1 cr.

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* Students must take enough electives to average 16 credits per semester for a total of 128 credits required for graduation.
JUNIOR YEAR

FOR ALL OPTIONS

Foreign Language

<table>
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<tr>
<th>Option</th>
<th>Semester Credits</th>
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<tbody>
<tr>
<td>Selected</td>
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<tr>
<td>Electives*</td>
<td>4</td>
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</tbody>
</table>

**OPTION 1**
Group D, Humanities, 6 cr. Music 570, 6 cr. Music 719-720, 4 cr. Music 405-406, 6 cr. Ensemble, 4 cr.

**OPTION 2**
Group D, Humanities, 6 cr. Music 571, 6 cr. Music Laboratory (choral), 2 cr. Music 405-406, 6 cr. Music 719-720, 4 cr. Music 525-526, 2 cr. Performance Classes, 0 cr.

**OPTION 3**
Music 573, 6 cr. Music 570, 2 cr. Music 405-406, 6 cr. Music Laboratory (choral), 2 cr. The Art Song, 2 cr. The Lied, 2 cr. Ensemble (vocal), 4 cr. (Italian to be the foreign language.)

**OPTION 4**
Applied Music (major instrument), 6 cr. Ensemble (instrumental), 4 cr. Music 405-406, 6 cr. Music 525-526, 2 cr. Music Laboratory (instrumental), 2 cr. Group D, Humanities, 6 cr.

**OPTION 5**
Music 719-720, 4 cr. Music 723-724, 4 cr. Music 725-726, 4 cr. Form and Analysis, 4 cr. Music 570, 2 cr. Group D, Humanities, 6 cr.

SENIOR YEAR

FOR ALL OPTIONS

<table>
<thead>
<tr>
<th>Option</th>
<th>Semester Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives*</td>
<td></td>
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</table>

**OPTION 1**
Music 570, 8 cr. Ensemble, 4 cr. Music 709, 710, 4 cr. Form and Analysis, 4 cr. Advanced Music Literature or Theory Courses, 4 cr.

**OPTION 2**
Music 573, 4 cr. Music 571, 8 cr. Form and Analysis, 4 cr. Liturgical Music, 2 cr. Organ Literature Class, 4 cr. Performance Class, 0 cr. Music Laboratory (choral), 2 cr.

**OPTION 3**
Music 573, 8 cr. Music 570, 2 cr. Music 707-708, 4 cr. Music Laboratory (choral), 2 cr. French, 4 cr. German, 4 cr. Ensemble (vocal), 4 cr. Form and Analysis, 4 cr. (Group D requirement satisfied by 30 hours in 3 areas in the Humanities.)

**OPTION 4**
Applied Music (major instrument), 8 cr. Form and Analysis, 4 cr. Music 719-720, 4 cr. Music 725-726, 4 cr. Music Laboratory (instrumental), 2 cr. Ensemble (instrumental), 4 cr. Literature of Major Instrument, 4 cr.

**OPTION 5**
General Information

The College of Technology offers its students a vigorous professional education in engineering, the physical sciences, or 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 catalogue.

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. (Note: Graduation credit requirements as established by departments may range from 128 to 145).

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 curricular 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 curricular 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.

University-wide requirements including Physical Education, History 401-402, and six semester hours each from Groups C and D (see page 63) are a part of each curriculum. In the freshman and sophomore years, male students may elect Basic Air Force or Army ROTC, or substitute six credits of humanistic-social courses. A total of six hours of ROTC credit may be applied to the total required for graduation in all curricula.

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.
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.

The minimum credits required for graduation in June, 1967, with the degree of Bachelor of Science in Chemical Engineering, is 145. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses which average 18 credit hours per semester.
### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Credits</th>
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<tbody>
<tr>
<td>P.E. 431, 432</td>
<td>Basic Physical Education</td>
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<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
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<tr>
<td>Chem. 405-406</td>
<td>General Chemistry</td>
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<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>Math. 425-426</td>
<td>Calculus A 1 and A 2†</td>
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<tr>
<td>M.E. 405</td>
<td>Engineering Drawing</td>
<td>0-3</td>
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<tr>
<td>Phys. 404</td>
<td>General Physics I</td>
<td>4</td>
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<tr>
<td>Tech. 401</td>
<td>Problems in Engineering</td>
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### SOPHOMORE YEAR

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Credits</th>
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<tbody>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
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<tr>
<td>Chem. 547-548</td>
<td>Organic Chemistry</td>
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<tr>
<td>Ch.E. 511-512</td>
<td>Chemical Engineering Principles I and II</td>
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<tr>
<td>Hist. 401-402</td>
<td>Introduction to Contemporary</td>
<td>3</td>
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<tr>
<td>Math. 527, 528</td>
<td>Differential Equations and Multi-</td>
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<td>dimensional Calculus</td>
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<tr>
<td>Phys. 501-502</td>
<td>General Physics II and III</td>
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### JUNIOR YEAR

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<td>Chem. 683-684</td>
<td>Physical Chemistry</td>
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<tr>
<td>Ch.E. 613-614</td>
<td>Chemical Engineering Principles III</td>
<td>4</td>
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<td>and IV</td>
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<td>Ch.E. 622</td>
<td>Chemical Engineering Thermodynamics</td>
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<td>M.E. 523</td>
<td>Mechanics of Solids</td>
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<td>Approved Technical Elective</td>
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### SENIOR YEAR

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<tbody>
<tr>
<td>Ch.E. 615</td>
<td>Chemical Engineering Principles V</td>
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<tr>
<td>Ch.E. 617</td>
<td>Chemical Engineering Principles VI</td>
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</tr>
<tr>
<td>Ch.E. 631</td>
<td>Chemical Engineering Kinetics</td>
<td>4</td>
</tr>
<tr>
<td>Ch.E. 641</td>
<td>Physical Metallurgy</td>
<td>4</td>
</tr>
<tr>
<td>Ch.E. 622</td>
<td>Chemical Engineering Economics and Plant Design</td>
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<td>Ch.E. 696</td>
<td>Chemical Engineering Project or Approved Elective</td>
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<td>E.E. 533</td>
<td>Fundamentals of Electrical Engineering</td>
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<td>University Group C or D</td>
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<tr>
<td>Elective</td>
<td>Approved Technical Elective</td>
<td>( )</td>
</tr>
</tbody>
</table>

*All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.

† Students whose Mathematics Background Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.
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 give a good 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.

The minimum credits required for graduation, with the degree of Bachelor of Science in Chemistry, is 140. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses.
<table>
<thead>
<tr>
<th>Year</th>
<th>Course Description</th>
<th>Semester Credits</th>
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</thead>
<tbody>
<tr>
<td>Freshman</td>
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<tr>
<td></td>
<td>P.E. 431-432 Basic Physical Education</td>
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<tr>
<td></td>
<td>Chem. 405-406 General Chemistry and Qualitative Analysis</td>
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</tr>
<tr>
<td></td>
<td>Engl. 401-402 Freshman English</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Math. 425-426 Calculus A 1 and A 2†</td>
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<td>Phys. 404 General Physics I</td>
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<td><strong>Total:</strong></td>
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<tr>
<td>Sophomore</td>
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<td></td>
<td>R.O.T.C. Air Force or Army, or Elective*</td>
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</tr>
<tr>
<td></td>
<td>Chem. 547-548 Organic Chemistry</td>
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<tr>
<td></td>
<td>German 401 Elementary German or Russian</td>
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</tr>
<tr>
<td></td>
<td>Hist. 401, 402 Introduction to Contemporary Civilization</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Math. 527 Differential Equations or Elective</td>
<td>4</td>
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<tr>
<td></td>
<td>Phys. 501-502 General Physics II and III</td>
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<td><strong>Total:</strong></td>
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<tr>
<td>Junior</td>
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<tr>
<td></td>
<td>Chem. 661-762 Analytical Chemistry</td>
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<td>Chem. 683-684 Physical Chemistry</td>
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<td>Chem. 685-686 Physical Chemistry Laboratory</td>
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<td>Chem. 755-756 Organic Chemistry</td>
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<tr>
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<td>Chem. 697 Chemical Literature</td>
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* All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.

† Students whose Mathematics Background Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.
Civil Engineering

J. Harold Zoller, Chairman

The profession of civil engineering, the oldest of the major branches of engineering practice, embraces the functions of planning, design, and construction of buildings, bridges, dams, transportation projects, and public works in general.

The curriculum includes a study of the basic sciences which are essential to the practice of civil engineering, and the application of these principles in the classroom, design room, and laboratory. Additional work is provided in the social-humanistic fields to produce a graduate who is technically competent and well adjusted to his social environment.

The minimum credits required for graduation in June, 1967, with the degree of Bachelor of Science in Civil Engineering, is 144. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses which averages 18 credit hours per semester.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 431-432</td>
<td>Basic Physical Education</td>
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<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Math. 425-426</td>
<td>Calculus†</td>
</tr>
<tr>
<td>M.E. 405</td>
<td>Engineering Drawing</td>
</tr>
<tr>
<td>Phys. 404</td>
<td>General Physics I</td>
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<tr>
<td>Tech. 401</td>
<td>Problems in Engineering</td>
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<tr>
<td>SOPHOMORE YEAR</td>
<td>SEMESTER CREDITS</td>
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<tr>
<td>R.O.T.C.</td>
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<tr>
<td>C.E. 505-506</td>
<td>Surveying I and II 3 3</td>
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<td>Hist. 401, 402</td>
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<td>Math. 527-528</td>
<td>Differential Equations and Multidimensional Calculus 4 4</td>
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<td>M.E. 523-524</td>
<td>Mechanics of Solids, Dynamics 4 4</td>
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<td>Phys. 501-502</td>
<td>General Physics II and III 4 4</td>
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<th>JUNIOR YEAR</th>
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<td>C.E. 517</td>
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<td>C.E. 620</td>
<td>Transportation Engineering 3 3</td>
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<td>C.E. 642</td>
<td>Fluid Mechanics 4 4</td>
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<tr>
<td>C.E. 681-685</td>
<td>Theory of Structures I and II 4 4</td>
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<td>E.E. 533</td>
<td>Electrical Engineering Fundamentals 4 4</td>
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<tr>
<td>Engl. 523</td>
<td>Writing of Technical Reports† 2 2</td>
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<tr>
<td>Geol. 407</td>
<td>General Geology‡ 2 2</td>
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<tr>
<td>M.E. 533</td>
<td>Thermodynamics 3 3</td>
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<td>Elective</td>
<td>University Group C or D 3 3</td>
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<tr>
<td>C.E. 643</td>
<td>Water Supply and Treatment 4 4</td>
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<td>C.E. 644</td>
<td>Sewerage and Sewage Treatment 4 4</td>
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<tr>
<td>C.E. 665</td>
<td>Soil Mechanics and Foundations 4 4</td>
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<tr>
<td>C.E. 692</td>
<td>Steel Design 3 3</td>
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<td>C.E. 693</td>
<td>Reinforced Concrete Design 3 3</td>
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<tr>
<td>Approved Elective</td>
<td>( ) (6)</td>
</tr>
<tr>
<td>Elective</td>
<td>University Group C or D 3 3</td>
</tr>
</tbody>
</table>

* All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.

† Students whose Mathematics Background Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

‡ Or approved elective.
Electrical Engineering

A. L. Winn, Chairman

Electrical engineers seek to provide solutions to real problems involving man’s needs for the processing of information or for the utilization of electrical power. By conversion of information in audible, visual, digital, thermal, or mechanical form 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, or 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, whereas in the fourth year laboratory and application courses which develop experience in the practice of measurement, analysis, and design of electrical devices and systems are emphasized.

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 137.

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.

The minimum credits required for graduation in June, 1967, with the degree of Bachelor of Science in Electrical Engineering, is 144. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses which average 18 credit hours per semester.

* All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.
† Students whose Mathematics Background Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.
‡ Electives are selected with the advice and consent of the adviser.
<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 431, 432</td>
<td>Basic Physical Education</td>
</tr>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Math. 425-426</td>
<td>Calculus A1 and A2†</td>
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<tr>
<td>M.E. 405</td>
<td>Engineering Drawing</td>
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<tr>
<td>Phys. 404</td>
<td>General Physics I</td>
</tr>
<tr>
<td>Tech. 401</td>
<td>Problems in Engineering</td>
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<table>
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<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
</tr>
<tr>
<td>E.E. 501-502</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
<tr>
<td>Math. 527-528</td>
<td>Differential Equations and Multi-dimensional Calculus</td>
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<tr>
<td>M.E. 523-524</td>
<td>Mechanics of Solids, Dynamics</td>
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<tr>
<td>Phys. 501, 502</td>
<td>General Physics II and III</td>
</tr>
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</table>

<table>
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<tr>
<th>JUNIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>E.E. 513-514</td>
<td>Applied Electromagnetics</td>
</tr>
<tr>
<td>E.E. 515</td>
<td>Electric Circuits</td>
</tr>
<tr>
<td>E.E. 609-510</td>
<td>Physical Electronics and Linear Active Circuits</td>
</tr>
<tr>
<td>E.E. 522</td>
<td>Electronics Laboratory</td>
</tr>
<tr>
<td>E.E. 555, 556</td>
<td>Student Branch I.E.E.E.</td>
</tr>
<tr>
<td>E.E. 523-524</td>
<td>Electrical Laboratory</td>
</tr>
<tr>
<td>M.E. 533-536</td>
<td>Thermodynamics, Fluid Mechanics</td>
</tr>
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<td>M.E. 537</td>
<td>Mechanical Laboratory</td>
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<td>Elective</td>
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<th>SENIOR YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
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<td>Engl. 523</td>
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<td>E.E. 557, 558</td>
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<td>E.E. 525, 526</td>
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<td>E.E. 645, 646</td>
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<td>M.E. 534</td>
<td>Thermodynamics</td>
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<td>M.E. 591</td>
<td>Engineering Economy</td>
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<td>University Group C or D</td>
</tr>
<tr>
<td>Approved Elective†</td>
<td>( )</td>
</tr>
</tbody>
</table>

145
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.

The minimum credits required for graduation in June, 1967, with the degree of Bachelor of Science in Mathematics, is 138. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses.
<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E. 431, 432</td>
<td>Basic Physical Education</td>
</tr>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Hist. 401</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
<tr>
<td>Math. 425-426</td>
<td>Calculus A1 and A2</td>
</tr>
<tr>
<td>Phys. 404</td>
<td>General Physics I</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>SEMESTER CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
</tr>
<tr>
<td>French 401</td>
<td>Elementary French</td>
</tr>
<tr>
<td>Hist. 402</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
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<td>Math. 527-528</td>
<td>Differential Equations and Multidimensional Calculus</td>
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<td>Math. 531</td>
<td>Introduction to Set Theory and Number Systems</td>
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<td>Math. 542</td>
<td>Probability</td>
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<td>Phys. 501, 502</td>
<td>General Physics II and III</td>
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<th>SEMESTER CREDITS</th>
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</thead>
<tbody>
<tr>
<td>German 401-402</td>
<td>Elementary German</td>
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<tr>
<td>Math. 629</td>
<td>Methods of Applied Mathematics I</td>
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<td>Math. 755</td>
<td>Fundamental Concepts of Geometry</td>
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<tr>
<td>Math. 761-762</td>
<td>Higher Algebra I and II</td>
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<tr>
<td>Elective</td>
<td>University Group C or D</td>
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<tr>
<td>Approved Elective†</td>
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<th>SENIOR YEAR</th>
<th>SEMESTER CREDITS</th>
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<td>Math. 784</td>
<td>Introduction to Topology</td>
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<td>Math. 788</td>
<td>Complex Analysis</td>
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<tr>
<td>Math. 767-768</td>
<td>Real Analysis I and II</td>
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<tr>
<td>Math. 698</td>
<td>Senior Seminar</td>
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<tr>
<td>Elective</td>
<td>University Group C or D</td>
</tr>
<tr>
<td>Approved Elective†</td>
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</tr>
</tbody>
</table>

* All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.
Mechanical Engineering

R. W. Corell, Chairman

Mechanical Engineering is a challenging profession since it encompasses a broad spectrum of activity. It contributes to the development and design of space vehicles, under-water vessels and instrumentation, nuclear and conventional power plants, various other thermodynamic systems, and general industrial products. It also makes its contributions in the analysis of material behavior and in the applied mechanics sciences.

The curriculum in Mechanical Engineering is designed to prepare the graduate either for more advanced studies or for beginning a professional career as a mechanical engineer. To accomplish these objectives, the program of study provides a foundation in basic physical sciences, applied mechanics science, thermal sciences, materials science, and design. Flexibility in the curriculum enables a student to gain additional competence in any one of these areas. Each of these areas will develop his ability in experimentation and engineering design. The curricula includes elective courses in the humanities and the social sciences and gives the student a liberal education.

This program in Mechanical Engineering challenges the student to develop his creative potential so that he can meet the increasingly complex needs of industry, government and education, and so that he can recognize and understand the role of technology in our modern society.

The student, with the assistance of his adviser, should plan a program based on the following distribution of courses which averages 16-17 credit hours per semester, but totaling not less than 134 for the eight semesters.
**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
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<td>Basic Physical Education</td>
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</tr>
<tr>
<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
<td>( )</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
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</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>Math. 425-426</td>
<td>Calculus†</td>
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<tr>
<td>M.E. 405</td>
<td>Engineering Drawing</td>
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<td>Phys. 404</td>
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**SEMESTER CREDITS**

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<td></td>
<td><strong>FRESHMAN YEAR</strong></td>
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<td></td>
<td><strong>UNIVERSITY-WIDE REQUIREMENTS</strong></td>
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<td><strong>SEMI</strong></td>
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<td></td>
<td><strong>JUNIOR AND SENIOR YEARS</strong></td>
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</tbody>
</table>

The student will complete the general departmental requirements which include M.E. 533, 536, 537, E.E. 539, 641. The remaining credits 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 in Mechanical Engineering.

* All freshman and sophomore male students in these two years will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.

† Students whose mathematical background test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

‡ University-wide requirements include Engl. 401-402, Hist. 401-402, and six (6) credits in Group C (Social Sciences) and six (6) credits in Group D (Humanities).

§ Area of interest or elective courses will be selected in consultation with a departmental adviser.
Technology Curriculum in Physics

J. A. LOCKWOOD, 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 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 advance 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 128 semester hours is required for graduation with a Bachelor of Science degree in Physics. Students entering earlier than September, 1963, must satisfy the 144 credit requirement then in effect adjusted for credit changes in required courses. Departmental advisers should be consulted on specific programs accomplishing this.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>P.E. 431, 432</td>
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<td>Air Force or Army, or Elective*</td>
<td>(       )</td>
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<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
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</tr>
<tr>
<td>Math. 425-426</td>
<td>Calculus A1 and A2†</td>
<td>4</td>
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<tr>
<td>Phys. 404</td>
<td>General Physics I</td>
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### Sophomore Year

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<thead>
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<td>R.O.T.C.</td>
<td>Air Force or Army, or Elective*</td>
<td>(       )</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary</td>
<td>3</td>
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<tr>
<td></td>
<td>Civilization</td>
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<tr>
<td>Math. 527, 528</td>
<td>Differential Equations and Multi-</td>
<td>4</td>
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<tr>
<td></td>
<td>dimensional Calculus</td>
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</tr>
<tr>
<td>Phys. 501-502</td>
<td>General Physics II and III</td>
<td>4</td>
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<tr>
<td>Approved Foreign Language</td>
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### Junior and Senior Years

To meet the major requirements the student must take Physics 601-602, 503, 703-704, 605-606, 701, 609 or 610, and 607 or 608. (Note that Math. 629-630 is a prerequisite for many of these courses.) 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 the foreign language. A student interested in applied physics should elect courses in electrical and mechanical engineering and chemistry.

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* All freshman and sophomore male students, in these two years, will enroll in either Air Science or Military Science or in 6 credits of approved elective courses.

† Students whose Mathematics Background Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.
Curricula

Business Administration
Economics
Hotel Administration

Programs of Study

BACHELOR OF ARTS:
Economics

BACHELOR OF SCIENCE:
Business Administration
Hotel Administration
General Information

The Whittemore School of Business and Economics was established as a separate degree-granting school at the University of New Hampshire on July 1, 1962.

The basic purpose of the School in its undergraduate curricula is to provide for its students a broad academic background, with professional training in one of the disciplines of business administration, economics, or hotel administration. Undergraduate students are required to take a substantial part of their course work in other colleges of the University.

Although upon graduation a student will have a certain degree of professional competence in the area in which he chooses to concentrate, he will shortly discover that from the point of view of his future development substantial familiarity with a myriad of other academic disciplines is necessary. In particular, students will be encouraged to elect courses in the social sciences, mathematics, the natural sciences, and the humanities. The student who pursues study in the relatively broad curricula of business 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 offered by the School will be candidates for the degree of Bachelor of Science. Each candidate for a degree must satisfy all general 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 catalogue becomes effective on July 1 of each year. For information concerning advanced degrees, see the Graduate School catalogue.

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 credit allowed ranges from 6 semester hours for juniors up to
12 semester hours for seniors. To be eligible the student must (a) have a cumulative academic average of 3.0 or better and (b) submit at least sixty 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 submit independent-study credits in whole or in part for required-course credits in the economics curriculum or for elective credits in either of the prescribed curricula.

Students with superior academic records who pursue independent-study programs 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 advised by a member of the faculty of his major area of concentration. 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.

The Ford Foundation Scholarship Program
A limited number of juniors each year are selected from those who apply for a special three-year program leading to the B.A. and M.A. degrees in economics. The program is limited to superior students who expect that their chosen vocation shall be teaching at the college level. The regular Whittemore School requirements for the Bachelor of Arts degree and the Graduate School requirements for the Master of Arts degree are basic requirements. In addition, the student is expected to attend special seminars. During the last year of the program he will be assigned to duties as an intern in teaching economics.

Minor Program
A minor is not required in the Economics, Business 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 18 semester hours in the minor department with grades of C or better in courses which count for major credit. No more than 6 credits used to satisfy area of concentration requirements shall be used for a minor.
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.

University and School Group Requirements
Course requirements stated below apart from Physical Education requirements shall be considered to fulfill both the School and University academic requirements.

Students admitted to the University for the first time in 1966-67 are required to complete successfully English 401-402, History 401, 402, and Mathematics 407-408* as well as the indicated semester hours in each of the following groups:

**GROUP B (NATURAL SCIENCES)**
Six hours from: Biology 401-402; Botany 411; Chemistry 401-402; Chemistry 403-404; Geology 401-402; Physical Science 401-402; Physics 401-402; Zoology 412.

**GROUP C (SOCIAL SCIENCES)**
Twelve hours from: Geography 401 or 402; Political Science 405, 406, 408; Psychology 401-402; Sociology 400, 411, 540.

**GROUP D (HUMANITIES)**
Twelve hours from: Arts 475, 476; English 513, 514, 515, 516; Humanities 501-502; Music 403-404; Foreign Languages 501-502 or 503-504; any course in Philosophy; Speech and Drama 431, 436.

All Whittemore School students are required to take Mathematics 401-Computer Orientation, (1 cr.), by the end of the sophomore year. All Business Administration students are required to take Sociology 500 which can be used to fulfill 3 hours in the Group C requirements.

Completion of 30 or more credits in three or more areas in a given group shall satisfy the requirements of that group. Advanced placement with credit in any one of these groups shall satisfy the requirements of that group.

* Students who do not have the mathematics prerequisites for Mathematics 407-408 must take Mathematics 302 or Mathematics 303 as determined by the Mathematics Department (0 credit) to be eligible for Mathematics 407-408.
Curricula

Business Administration

The Business Administration program has been designed as an integrated program. The student may, in his senior year, undertake a modest amount of specialization in one of the several sub-areas of business, but it is the intent of the program that the graduate shall have a broad education in terms of basic principles, concepts and analytical tools to embark upon a career in management. The objective is to provide the student with the preparation requisite to a business and economic climate characterized by rapid change.

In addition to integrated professional preparation the program provides the student with a good grounding in the liberal arts and sciences. Consequently, the amount of work which the student can take in the major field is limited.

The integrated program is structured so that students take the required courses and business electives in the sequence and at the times specified in the program. The required courses in each semester build upon those that precede. The courses given concurrently are also related and integrated as much as possible. From time to time classes will meet jointly and assignments involving more than one course will be given. The Management Laboratory required of all business administration majors is, in part, provided to make such joint work possible.

Students who contemplate the possibility of transferring into Business Administration are urged to elect Math. 407-408 and Economics 401-402 and should attempt to take the other prerequisites in the Sophomore year before attempting to transfer.

Upon graduation students will be qualified either to continue with advanced study in economics or business or to become members of the business community. They will have not only the requisite skills of business management but also a broad academic background, which is becoming increasingly important for business achievement.

Students in this curriculum must obtain a cumulative academic average of 2.0 or better in the required courses in business and economics as listed in the curriculum. Of the required courses in business administration and economics, at least 18 semester credits shall be earned at the University of New Hampshire.

* Students in the Business Administration curriculum must elect at least nine hours of Business Administration courses. With the approval of his adviser the student may substitute closely related courses in Economics, Mathematics, Psychology, or Sociology. Students in this program may not elect in excess of 18 semester hours of Business Administration courses.
<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
</tr>
<tr>
<td>P.E. 431, 432</td>
<td>Physical Education (Men)</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
</tr>
<tr>
<td>Engl. 401, 402</td>
<td>Freshman English</td>
</tr>
<tr>
<td>Econ. 401, 402</td>
<td>Principles of Economics</td>
</tr>
<tr>
<td>Math. 407, 408</td>
<td>Fundamentals of Mathematics</td>
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<tr>
<td>Group C</td>
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<td><strong>Total</strong></td>
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<th>SEMESTER CREDITS</th>
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<tr>
<td>P.E. 403, 404</td>
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<td>Econ. 431, 432</td>
<td>Business and Economic Statistics</td>
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<td>Financial Accounting</td>
</tr>
<tr>
<td>Soc. 500</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>Math. 401</td>
<td>Computer Orientation</td>
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<td>Group C</td>
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<td>Group D</td>
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<th>JUNIOR YEAR</th>
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<tr>
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<td>Personnel Administration</td>
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<tr>
<td>B.A. 607</td>
<td>Managerial Control</td>
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<tr>
<td>B.A. 675</td>
<td>Managerial Economics</td>
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<td>B.A. 672</td>
<td>Corporation Finance</td>
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<tr>
<td>B.A. 625</td>
<td>Principles of Marketing</td>
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<tr>
<td>B.A. 643</td>
<td>Production Management</td>
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<td>B.A. 697-698</td>
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<tr>
<td>B.A. 701</td>
<td>Organizational Concepts and Structures</td>
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<td>B.A. 774</td>
<td>Business Policy</td>
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<tr>
<td>B.A.</td>
<td>Elective*</td>
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</tbody>
</table>
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, business and economic 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 on taking 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 excellent 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 in this curriculum are required to complete 30 semester credits in economics with a cumulative academic average of 2.0 or better. Of these 30 semester credits, a minimum of 18 credits must be in courses in economics numbered 601 or higher. Major credit toward the 18 semester hours required in courses numbered 601 or higher 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, of the required courses in economics at least 18 semester credits shall be earned at the University of New Hampshire.

Special Language Requirement for Economics Majors (B.A. degree):

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 completion of beginning courses in a language at the University of New Hampshire (French 401-402, German 401-402, Italian 401-402, Latin 401-402, Russian 401-402, Spanish 401-402, Greek 401-402.). 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. The special language requirement should be satisfied no later than the sophomore year.
<table>
<thead>
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<th><strong>FRESHMAN YEAR</strong></th>
<th><strong>SEMIESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
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<td>P.E. 431, 432</td>
<td>Physical Education (Men)</td>
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<tr>
<td>Engl. 401, 402</td>
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<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
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<td>Math. 407, 408</td>
<td>Fundamentals of Mathematics</td>
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<td>Group C</td>
<td>Electives</td>
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<th><strong>SOPHOMORE YEAR</strong></th>
<th><strong>SEMIESTER CREDITS</strong></th>
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<tr>
<td>P.E. 403, 404</td>
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<td>Econ. 401, 402</td>
<td>Principles of Economics</td>
</tr>
<tr>
<td>Econ. 431, 432</td>
<td>Business and Economic Statistics</td>
</tr>
<tr>
<td>Group B</td>
<td>3 or 4</td>
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<td>Electives</td>
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<th><strong>JUNIOR YEAR</strong></th>
<th><strong>SEMIESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>Econ. 673</td>
<td>Intermediate Economic Analysis</td>
</tr>
<tr>
<td>Econ. 675</td>
<td>National Income Analysis</td>
</tr>
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<td>Group D</td>
<td>Electives</td>
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<th><strong>SENIOR YEAR</strong></th>
<th><strong>SEMIESTER CREDITS</strong></th>
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<tbody>
<tr>
<td>Electives: Economics courses 601 and above*</td>
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<tr>
<td>Group D</td>
<td>Electives</td>
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</table>

* For 6 credits of electives in economics a student may substitute 6 credits in resource economics (courses numbered above 600) or business administration (courses numbered above 600), with the permission of the Dean.
Hotel Administration

Students concentrating in Hotel Administration will receive basic preparation for careers in professional management and technical specialist positions in the hotel, motel, club, and institutional food service areas. They will be candidates for a Bachelor of Science degree. To insure that graduates know both the basic skills as well as the broad field of hotel administration, each student is required to complete at least two summers of on-the-job experience. Transfer students and others may satisfy part or all of this practical-experience requirement by presenting evidence of having performed similar work.

Additionally, the program of study will include a substantial amount of work in economics and general business management and other courses outside the particular area of hotel administration in order to insure the students' having as broad a professional background as possible.

Students in the Hotel Administration curriculum must obtain a cumulative academic average of 2.0 or better in the required courses given in the Whittemore School.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>SEMESTER CREDITS</th>
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<tbody>
<tr>
<td>P.E. 401, 402</td>
<td>Physical Education (Women)</td>
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<td>Freshman English</td>
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<td>Math. 407, 408</td>
<td>Fundamentals of Mathematics</td>
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<td>Math. 401</td>
<td>Computer Orientation</td>
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<tr>
<td>H.A. 401</td>
<td>Introduction to Hotel Management</td>
</tr>
<tr>
<td>H.A. 410</td>
<td>Lectures on Hotel Management</td>
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<tr>
<td>Group C</td>
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## SOPHOMORE YEAR

<table>
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<tr>
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<th>Credits</th>
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<td>P.E. 403, 404</td>
<td>Physical Education (Women)</td>
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</tr>
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<td>Econ. 401, 402</td>
<td>Principles of Economics</td>
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<tr>
<td>Econ. 431</td>
<td>Business and Economics</td>
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<tr>
<td>B.A. 502</td>
<td>Financial Accounting</td>
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<tr>
<td>H.E. 418</td>
<td>Principles of Food Selection and Preparation</td>
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<tr>
<td>H.A. 412</td>
<td>Lectures on Hotel Management</td>
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<tr>
<td>Biol. 401-402</td>
<td>(Group B)</td>
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<td>Group D</td>
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## JUNIOR YEAR

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
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<td>Hotel and Restaurant Accounting and Control Systems</td>
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</tr>
<tr>
<td>B.A. 675</td>
<td>Managerial Economics</td>
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<tr>
<td>B.A. 672</td>
<td>Corporation Finance</td>
<td>3</td>
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<td>Meat and Its Products</td>
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## SENIOR YEAR

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<td>H.A. 667</td>
<td>Stewarding and Catering</td>
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### PRACTICAL EXPERIENCE

To be eligible for graduation a student in the Hotel Administration curriculum must have had approved on-the-job allied work for two summers or satisfy the Department Head that satisfactory equivalent experience has been completed.
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Boston, Massachusetts
The 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.

Degrees

Graduate programs are offered in the following disciplines: Agricultural Education, Animal Science, Biochemistry, Botany, Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Entomology, Forestry, Genetics, Home Economics, Mathematics, Mechanical Engineering, Microbiology, Physics, Plant Science, Resource Economics, Soil and Water Science, and Zoology leading to the Master of Science degree; Economics, English, Foreign Languages and Literatures, Government, History, Psychology, and Sociology leading to the Master of Arts degree; and Education leading to the Master of Education degree. Programs also are available leading to the Master of Agricultural Education degree, to the Master of Public Administration degree, and to the Master of Science for Teachers degree. Graduate programs leading to the Doctor of Philosophy degree are offered in the departments of Botany, Chemistry, Genetics, Mathematics, Microbiology, Physics, Plant Science, Psychology, and Zoology.

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, and the Alumni Fellowship program available to graduate students in the social sciences and the humanities. There are also a number of fellowship programs sponsored by outside agencies such as National Aeronautics and Space Administration, National Science Foundation, and the National Defense Education Act of 1958.

Information

Detailed information about admission, requirements for degrees, courses, fellowships, scholarships, and assistantships are to be found in the Graduate School catalogue which may be obtained by writing to the Dean of the Graduate School.
Description of Courses
# IBM Key Codes

The following numbers are used extensively in machine processed data to identify department or program.

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| The Graduate School                      | An asterisk preceding department number indicates those departments which offer Graduate programs. |
Explanation of Arrangement

The title of the course is given in small capital letters; the Arabic numeral designates the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses normally offered in the second semester. Arabic 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, e.g., (404) indicates an even-numbered course offered in the first semester.

Following the title is the course description. The next section gives the following information in the order indicated: (1) prerequisites, if any; (2) 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, recitations either 50 minutes or 80 minutes in length.

Abbreviations have been employed to indicate the number of hours of work required of students in lecture, recitation, and laboratory, and the number of credits given for satisfactory completion of each course. The abbreviations should be interpreted as follows:

- Cr. Semester hour credit
- Lab. Laboratory
- Lec. Lecture
- Prereq. Prerequisites
- Rec. Recitation

NLG following a course description indicates that the course carries no letter grade, being marked “P” for passing or “Cr” for credit.

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 numerals designating a course running through both semesters 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 catalogue description of a course.

The system of numeric designation of courses is as follows:

- 200–299 Courses in the Thompson School of Agriculture.
- 300–399 Non-credit courses, e.g., Mathematics 301.
400-499 Introductory courses not carrying prerequisites and courses generally falling within University-wide and college-wide 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 class standing (may under some conditions be taken for graduate credit by non-majors only).

700-799 Advanced-level undergraduate courses (may be taken for graduate credit).

800-899 Courses which carry graduate credit only.

Description of courses numbered 800 or above, which are for graduate credit only, will be found in the Graduate School Catalogue.

**Accounting** (See Business Administration)

**Agriculture (20)**

Dean's Office, College of Agriculture

401. **INTRODUCTION TO COLLEGE**
A non-departmental course offering matters not ordinarily reviewed in other courses of instruction. Attention will be given to selected student rules and regulations, scholarships, campus organizations and facilities, opportunities in agriculture as a science, and to programs of study. Also, federal aid as related to land-grant colleges and universities will be discussed. Mr. Richards. For first semester freshmen in Agriculture and Forestry. 1 cr. NLG.

**Agricultural Education (22)**

**WILLIAM H. ANNIS, Assistant Professor and Chairman**

650. **PRINCIPLES OF AGRICULTURAL AND EXTENSION EDUCATION**
The technical and professional qualifications of teachers of agriculture, county agricultural agents, and 4-H club agents. The history, philosophy, and legislation affecting these programs. Special emphasis will be placed on program planning. Mr. Annis. 3 cr.

651, 652. **METHODS OF TEACHING FARM MECHANICS IN VOCATIONAL AGRICULTURE**
The organization and presentation of farm mechanics subject matter, supervision and direction of farm mechanics projects, and the preparation
Agricultural Education

and presentation of demonstrations. The first semester deals with fundamental farm mechanics skills and the second semester with farm machinery maintenance and operational techniques of instruction. Mr. Gilman. Required of majors in Teacher Education curriculum. 1 lab; 1 cr.

(792). 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 Ag. Ed. 794 and 795. Mr. Annis. Prereq: Ag. Ed. 650 or permission of instructor. 4 cr.

(794). SUPERVISED PRACTICE
Supervised practice in the specific and related problems of agricultural education. Students will be placed in Vocational Agriculture Centers and County Cooperative Extension Service Centers. Mr. Annis. Prereq: Ag. Ed. 650 or permission of instructor. 2-11 cr.

795. PREPARATION FOR CONDUCTING AND SUPERVISING ADULT EDUCATION PROGRAMS
The techniques of adult education in terms of indentifying needs, program planning, methods of teaching, supervision, and evaluation. Mr. Annis. Prereq: Ag. Ed. 650 or permission of instructor. 3 cr.

796. SEMINAR IN AGRICULTURAL AND EXTENSION EDUCATION
Library and reference work and the preparation of papers for various phases of agricultural and extension education. Mr. Annis. Prereq: Supervised Practice or 6 hours in Agricultural Education. 1 cr.

798. SUPERVISION AND ADMINISTRATION OF VOCATIONAL EDUCATION
The Federal and State requirements for vocational education programs in the secondary schools. 2-3 cr.

799. PHILOSOPHY OF VOCATIONAL EDUCATION
The development of vocational education in the United States with emphasis on the socio-economic influences responsible for its establishment. Its relationship with general education, together with the coordination of instructional programs in the various fields. 2-3 cr.

Animal Sciences (25) (Animal, Dairy, Poultry)

Winthrop C. Skoglund, Professor and Chairman; Fred E. Allen, Professor; C. Hilton Boynton, Professor; Walter M. Collins, Professor; Nicholas F. Colovos, Professor; William R. Dunlop, Professor; Harry A. Keener, Professor; Kenneth S. Morrow, Professor; Richard C. Ringrose, Professor; Loring V. Tirrell, Professor; Alan C. Corbett, Associate Professor; Herbert C. Moore, Associate Professor; Gerald L. Smith, Associate Professor; Richard G. Strout, Associate Professor; James B. Holter, Assistant Professor; Samuel C. Smith, Assistant Professor; Janet C. Briggs, Instructor.
401. FUNDAMENTALS OF DAIRYING
A general survey of the dairy industry; the selection, feeding, and management of dairy cattle; the composition and properties of milk and other products; dairy manufacturing processes; market milk. Mr. Morrow and Mr. Moore. 2 lec; 1 lab; 3 cr.

402. INTRODUCTION TO THE LIVESTOCK INDUSTRY
Origin, history, development, characteristics, and adaptability of the different types of horses, cattle, sheep and swine, with practice in judging. Mr. Tirrell. 2 lec; 1 lab; 3 cr.

403. POULTRY PRODUCTION
The general principles of poultry science and their practical application. Factors of culling, breeding, housing, feeding, marketing, diseases and parasites, incubation, and management. Mr. Skoglund. 2 lec; 1 lab; 3 cr.

405, (405). HORSEMANSHIP
Instruction in riding using University owned Morgans under supervision of a riding instructor. It may be possible for a limited number of students to stable their horses at the University upon proper authorization. Any student wishing to use this course to satisfy an activity requirement in Physical Education for Women will register for Physical Education 401, 402, 403, or 404. Three hours of riding per week for which a fee of $35.00 per quarter is charged. Mrs. Briggs. 1 cr.

501. ANIMAL ANATOMY AND PHYSIOLOGY
The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 cr.

502. ANIMAL DISEASES
The prevention, control, and treatment of the bacterial and parasite diseases of domestic animals. Mr. Allen. Prereq: An. Sci. 501 or permission of instructor.

503. FUNDAMENTALS OF ANIMAL NUTRITION
Scientific principles of nutrition in both ruminants and non-ruminants. Mr. Ringrose. 3 cr.

504. MEAT AND ITS PRODUCTS
Slaughtering, meat cutting, curing, and identification of cuts, livestock markets, Trips are taken to packing plants and retail outlets. Mr. Smith. 2 lec; 1 lab; 3 cr.

505. LIGHT HORSE SCIENCE
Origin, history, development, judging, selection, feeding, breeding and management of light horses. Special emphasis will be placed upon saddle-horse selection, the show ring classes, and judging. Horse show management will be discussed. Mr. Tirrell. 2 lec; 1 lab; 3 cr.

507, (507). THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE
The psychological development, control and education stressing bitting, longeing, collection. Mrs. Briggs. Prereq: An. Sci. 405 or equivalent and permission of instructor. 1-3 credits. May be repeated.
508. **DAIRY BACTERIOLOGY**
The application of bacteriology principles to the production and processing of milk and other dairy products. Mr. Moore. 2 lec; 2 lab; 4 cr.

509. (510). **PRINCIPLES OF JUDGING**
The student can specialize in dairy cattle, dairy products, livestock or poultry. The principles of judging and selection of various animals and products. Mr. Morrow, Mr. Moore, Mr. Smith, Mr. Collins. Elective only after consultation with instructor in charge. 1 cr. May be repeated.

602. **LIVESTOCK MANAGEMENT**
Selection, feeding, breeding, management and preparation for the showing of beef cattle, swine, and sheep, with special reference to New England conditions. Mr. Tirrell and Mr. Smith. 2 lec; 1 lab; 3 cr.

604. **APPLIED ANIMAL NUTRITION**
Application of scientific principles of nutrition to practical feed formulation and feeding system for poultry and livestock. Mr. G. Smith and other Staff members. 2 lec; 1 lab; 3 cr.

605. **PHYSIOLOGY OF REPRODUCTION**
A study of physiology, embryology, endocrinology reproduction and lactation in domestic animals and birds. Staff. 2 lec; 1 lab; 3 cr.

607. **MARKET MILK**
The producing, handling and distribution of market milk; dairy farm inspection; control of milk supply. Mr. Moore. 2 lec; 1 lab; 3 cr.

608. **ICE CREAM, BUTTER, AND CHEESE**
The making, handling, and marketing. Mr. Moore. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

609. **DAIRY CATTLE BREEDING PRINCIPLES**
Purebred dairy cattle, breed history, pedigrees; family lines and methods of outstanding breeders; the application of the principle of genetics to the improvement of dairy cattle herd analysis. Mr. Morrow. 2 lec; 1 lab; 3 cr.

610. **POULTRY MANAGEMENT**
The application of successful business principles to poultry production; study of surveys and production costs. Visits are made to numerous poultry farms in order to study various types of enterprise. Mr. Skoglund. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

612. **AVIAN DISEASES**
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, Mr. Dunlop, and Mr. Strout. 3 lec; 1 lab; 4 cr. (Alternate years; offered in 1966-67.)

697-698. **ANIMAL SCIENCES SEMINAR**
A survey of recent literature and research in the Animal Sciences. Staff. 1 cr. May be repeated.
703. ANIMAL GENETICS
Mendelian and quantitative inheritance in animals; principles and systems of selection. Prereq: 3 credits of genetics or permission of instructor. Mr. Collins. 2 lec; 1 lab; 3 cr.

708. ADVANCED DAIRY SCIENCE
Basic data, fundamental observations, and discussions of research contributing to the present status of the dairy industry. Mr. Moore. Prereq: Adequate preparation in chemistry and bacteriology. 2 cr. (Alternate years; offered in 1966-67.)

710. DAIRY CATTLE NUTRITION AND MANAGEMENT
Feeding and management of dairy animals, calf feeding; raising young stock, and feeding for economical milk production. Mr. Holter. 2 lec; 1 lab; 3 cr.

711-712. INVESTIGATIONS IN DAIRY, LIVESTOCK, POULTRY
1. GENETICS: Mr. Gerald Smith, Mr. Collins, Mr. Morrow.
2. NUTRITION: Mr. Gerald Smith, Mr. Ringrose, Mr. Colovos, Mr. Holter.
3. MANAGEMENT: Mr. Tirrell, Mr. Skoglund, Mr. Morrow.
4. DISEASES: Mr. Allen, Mr. Corbett, Mr. Dunlop, Mr. Strout, Mr. Samuel Smith.
5. PRODUCTS: Mr. Gerald Smith, Mr. Moore.
6. LIGHT HORSEMANSHIP: Mr. Tirrell, Mrs. Briggs.
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. Hours to be arranged. 1-3 cr. May be repeated.

The Arts (46)

George R. Thomas, Professor and Chairman; John W. Hatch, Professor; John Laurent, Associate Professor; Winifred Clark, Associate Professor; Richard D. Merritt, Assistant Professor; James A. Fasanelli, Assistant Professor; Alfred R. Potter, Assistant Professor; Daniel L. Valenza, Instructor; Dirk Bach, Instructor; Arthur Balderacchi, Instructor; David May, Instructor; Jayne Dwyer, Instructor; Ruth Trappan, Instructor

The Department of The Arts presents a series of changing exhibitions in the galleries in Paul Creative Arts Center, the Exhibition Corridor in Hewitt Hall, and the Memorial Union. 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.
An experimental art laboratory, the Student Workshop, is located in Hewitt Hall and is open to any student in the University, whether or not enrolled in art courses. This laboratory provides an excellent environment in which a student may explore materials, plan and execute projects of his own choice. Excellent facilities, including equipment ranging from small craft tools to industrial type machines, are available.

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.

Students are responsible for the care of shops, studios, and all equipment therein; damage resulting through negligence or carelessness will be the responsibility of the student. Tools and other equipment will not be used until instruction in their use is given by the member of the staff in charge. Unless specifically authorized by the Chairman of the Department, projects not a part of the instructional program must be excluded from the studios.

Courses in the Crafts

401, 402. Ceramics
Exploration of three dimensional forms in clay. A composite course dealing with the basic methods of construction of functional and non-functional forms in clay, with emphasis upon coil-built and slab-built pots, and the introduction to the potter's wheel. Studio practices in clay preparation, experimentation with glaze materials, formulation of glazes, various methods of decoration, and stacking and firing of the kilns. Mr. Potter. Elective by permission. 2 lab; 3 cr. Course fee for materials, $10.00.

403, 404. Ceramics
Exploration of three dimensional forms in clay to develop the techniques and the art of throwing clay on the potter's wheel. Objects to be functional and non-functional with the emphasis upon refinement of form, integration of texture and color to a particular problem. Studio practices in clay preparation, experimentation with glaze materials, formulation of glazes, methods of decoration, and stacking and firing of kilns. Mr. Potter. Elective by permission. 2 lab; 3 cr. Course fee for materials, $10.00.

407. Crafts
Structural and decorative design for craft projects using paper, wood, fabric, metal, leather, etc., which may be used in elementary and secondary schools. Leather work will be emphasized. Miss Clark. For Art-Education students; also elective by permission. 2 lab; 3 cr. Course fee for materials, $7.00.

408. Crafts
Structural and decorative design for craft projects using paper, wood, fabric, metal, and natural materials. These craft activities may be used in summer camps, playgrounds, settlement and scout groups. Silk screen printing will be emphasized. Miss Clark. For Recreation Education, Physical Education, and Social Service students; also elective by permission. 2 lab; 3 cr. Course fee for materials, $7.00.
413, 414. **JEWELRY AND METALSMITHING**
Structural and decorative design and construction of jewelry, flatware and hollow ware using sterling silver, copper, brass, pewter. The skills of soldering, polishing, chasing, stone setting, casting, raising, forming are included. A unit in enameling on copper is part of the first semester course. Miss Clark. Limited enrollment. 2 lab; 3 cr. Course fee for materials, $9.00.

419. **WEAVING**
An introductory course in hand weaving, using the 4-harness loom. Plain and twill weaves, hand pattern techniques, 4-harness patterns for fabric and rug samples and projects using cotton, linen, wool, rayon, etc. Miss Clark. Limited enrollment. 2 lab; 3 cr. Course fee for materials, $10.00.

425, 426. **WOODWORKING**
A basic course in wood, stressing design and techniques in hand and machine work. Projects range from small carvings and turnings to major pieces of furniture. Techniques include veneering and solid wood joinery. Mr. Valenza. Elective by permission. 1 lec; 2 lab; 3 cr. Course fee for materials: $7.00 for Arts 425; $15.00 for Arts 426.

600. **CRAFTS WORKSHOP**
Students in ceramics, jewelry and metalsmithing or woodworking may select one of these areas for advanced studio work. Miss Clark, Mr. Valenza, Mr. Potter. Prereq: Arts 413-414, or Arts 425-426, or Arts 401, 402, 403, 404 and permission. Labs. as arranged. 6 cr. maximum. Course fee for materials (varies).

Courses in Painting and Graphics, Sculpture, Architecture

431. **BASIC DESIGN**
A basic course in the structural and expressive use of elements of design as a background for crafts, ceramics, sculpture, drawing and painting, advertising design, and illustration. A series of related lectures and demonstrations will be scheduled throughout the semester. Mr. Hatch, Mr. Laurent, Miss Dwyer, Mr. Balderacchi, Mr. May, Mr. Bach. Elective by permission. 2 lab; 2 cr. No credit toward a major.

432. **DRAWING AND DESIGN**
A continuation of Arts 431 with problems in three dimensional design and drawing from the model and from nature. Mr. Hatch, Mr. Laurent, Miss Dwyer, Mr. Balderacchi, Mr. May. Prereq: Arts 431 and permission. 2 lab; 2 cr. Course fee for materials, $3.00. No credit toward a major.

451. **PHOTOGRAPHY**
The theory and practice of photography, covering camera operation, developing, printing, and enlarging. Creative solutions are sought to problems which are designed to increase the students’ perception. Mr. Merritt. Elective by permission. 1 lec; 1 lab; 3 cr. Course fee for materials, $12.50.

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 lec; 2 lab; 3 cr.
457. SCULPTURE
Experimentation with three dimensional forms in clay, wood, stone, and metal as media for sculpture. The use of carving chisels, pneumatic tools and welding torch to either cut down or to build up compositions. The development of form, of volume, and of rhythm in space. Mr. Balderacchi. Elective by permission. 2 lab; 3 cr. Course fee for materials $8.50.

536. GRAPHIC ARTS
Expression and experimentation in a variety of graphic techniques, i.e., linoleum and wood block printing, etching, lithography, etc., in black and white and color. Mr. Laurent. Elective by permission. 2 lab; 3 cr. Course fee for materials, $8.00.

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. Mr. May. Elective by permission. 2 lab; 3 cr.

541, 542. ADVANCED DRAWING AND PAINTING
Drawing is concentrated in the fall semester; extensive drawing in studio and from nature, still life and figure drawing in a variety of media, i.e., pencil, pen, ink and wash, pastel, and watercolor. An introduction to oil painting composition, means of form description, and theories of color are presented in studio exercises and outdoor sketching in the spring semester. Mr. Hatch, Mr. Laurent, and Mr. Bach. Elective by permission. 2 lab; 3 cr.

544. WATER MEDIA
A studio course dealing with various water media, transparent and opaque. Projects will stress the handling of watercolor and casein. Inks, temperas, and polyvinal will also be introduced. Mr. Hatch. Prereq: Arts 431 (or equivalent) and permission. 2 lab; 3 cr. (Alternate years; offered in 1966-67.)

554. ADVANCED PHOTOGRAPHY
The basic theory and practice of color photography. Advanced projects in black and white. Techniques of creative photography including studio and laboratory controls. A portfolio of photographs, representative of the student's progress during the course, will be required. Mr. Merritt. Elective by permission. 1 lec; 1 lab; 3 cr. The course fee for materials will approximate $25.00. (Alternate years; not offered in 1966-67.)

643, 644. ADVANCED PAINTING AND COMPOSITION
An extension of Arts 541 and 542 stressing further development in the various media. Figure study and outdoor sketching also will be included. This course may be taken a second time with emphasis on the particular need of the individual. Mr. Laurent. Elective by permission. Labs. as arranged. 3 cr.

650. STUDIO WORKSHOP
A course in painting, drawing, photography and print-making designed to subject the advanced student to an intensive experience in these four disciplines. This course is required for graduation in the painting and graphics option. Prereq.: Arts 451, 536, 541, 542, and permission. 4 lab; 6 cr. Course fee for materials, $20.50.
789. **Problems in the Visual Arts**

Advanced students may select a special problem in one of the visual arts in which they have exhibited proficiency, to be developed by means of conferences and studio work. Mr. Thomas and staff. Prereq: Permission of Department Chairman. Credits to be arranged. *This course may be repeated to a total of not more than 6 credits.*

Courses in 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. Mr. Thomas and Mr. Fasanelli. 3 cr. *Not open to freshmen. No credit toward a major.*

581. **American Art**

A chronological survey of the architecture, painting, sculpture and minor arts of the United States from earliest Colonial times to the mid-20th Century. Emphasis on architecture and the minor arts of the late 19th and 20th Centuries. Architectural field trips and museum visits in New Hampshire and Massachusetts. Mr. Thomas. 3 cr. (Alternate years; not offered in 1966-67.)

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. 3 cr. (Alternate years; offered in 1966-67.)

588. **Modern Art**

From Louis XVI to Picasso; traces the history of painting through the various revolutions, political and aesthetic, that resulted in the many schools of thought prevalent in 19th and 20th Century art, i.e., classicism, impressionism, cubism, etc. Illustrated lectures with assigned readings. Mr. Fasanelli. 3 cr.

682. **Classical Art**

A survey of the monuments in Greece and Rome covering the following periods: archaic, classical and Hellenistic in Greece, and the areas influenced by Greek culture; late Republican and Imperial Rome. Significant works from about the mid-18th Century B.C. to the 2nd and 3rd Centuries A.D. are analyzed chronologically. The aim of this course is to give the student a comprehensive picture of the classical achievement, primarily in architecture and sculpture, and to bring to the student's attention more modern debts to the past. Mr. Fasanelli. 3 cr. (Offered in 1966-67.)

684. **Medieval Art**

A chronological survey of the vast material of the Middle Ages, from the 1st and 2nd Centuries A.D. to the 14th Century. This course covers 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 accented. Mr. Fasanelli. 3 cr. (Alternate years; offered in 1966-67.)

685. 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 18th Century drawing room. Illustrated lectures with assigned readings. Mr. Fasanelli. 3 cr. (Alternate years; not offered in 1966-67.)

686. NORTHERN PAINTING
This course is devoted to the study of the development of painting in Flanders, France, and Germany from the late 14th to the early 15th Century. Beginning with a study of French manuscripts, this course will deal largely with Flemish painting in the 15th Century. Following this survey extant French monumental painting will be discussed. Analysis of German painting in the 15th Century will then be discussed and the dependence of this body of material on Flemish developments, as well as Italian, will be dealt with throughout the course. Mr. Fasanelli. 3 cr. (Alternate years; not offered in 1966-67.)

687. BAROQUE ART
This is an advanced course which is a survey of architecture, sculpture and painting, in the countries of western Europe in the 17th and 18th 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 (685), but is differently oriented. Mr. Fasanelli. (Alternate years; offered in 1966-67.)

(797). SEMINAR IN ART HISTORY
This course is a seminar which every student electing to major in the history option must take at least once. The prerequisite for taking the course 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. The students are introduced to advanced problems of a bibliographical, critical, and iconographical nature in a series of preliminary lectures. Every student is required to present the results of his research in a formal presentation of his paper at the end of the term. Mr. Fasanelli. 3 cr.

Courses in Art Education

ART-EDUCATION 791. PROBLEMS OF TEACHING ART IN SECONDARY SCHOOLS
The purpose and objectives of teaching art in the secondary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the secondary-school art program. Miss Trappan. Prereq: Educ. 758 with a grade of C or better. 2 lec; 1 lab; 3 cr.

ART-EDUCATION 792. PROBLEMS OF TEACHING ART IN ELEMENTARY SCHOOLS
The purposes and objectives of teaching art in elementary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the elementary schools. Miss Trappan. Prereq: Educ. 758 with grade of C or better. 2 lec; 1 lab; 3 cr.
**Education-Art (Ed-Art) 794. Supervised Teaching in Art**
Prereq: Art-Ed. 791, 792, and other prerequisites listed under Education.
One semester of supervised teaching. 14 cr.

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**Biochemistry (26)**

Edward J. Herbst, Professor and Chairman; Thomas G. Phillips, Professor Emeritus; Arthur E. Teeri, Professor; Stanley R. Shimer, Professor; Miyo-shi Ikawa, Professor; Douglas G. Routley, Associate Professor; Robert L. Novak, Assistant Professor; Samuel C. Smith, Assistant Professor

501. Biological Chemistry
An introduction to biological chemistry. Mr. Teeri. Prereq: Chem. 402 or 404. 3 lec; 2 lab; 5 cr.

695, 696. Investigations in Biochemistry
Introduction to biochemical investigations. Staff. Subject matter and hours to be arranged. 1-3 cr.

699. Senior Thesis
Participation in research in biochemistry. For seniors majoring in biochemistry who have completed Biochem. 751. Staff. 3 cr.

751. General Biochemistry
The fundamental principles of biochemistry with emphasis on the chemical properties, principal metabolic pathways, and functions of carbohydrates, lipids and nitrogenous compounds. Mr. Herbst and Mr. Ikawa. Prereq: Satisfactory preparation in organic chemistry and quantitative analysis. 3 lec; 2 lab; 5 cr.

756. 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. Prereq: Satisfactory preparation in organic chemistry. 3 lec; 2 lab; 5 cr.

762. Plant Metabolism
The function, occurrence, synthesis, and degradation of plant constituents. Major emphasis will be placed on respiration and photosynthesis and their relationships to the metabolism of lipids and nitrogen compounds. Mr. Routley. Prereq: Biochem. 751 or 756 or equivalent. 2 lec; 1 lab; 3 cr. (Not offered in 1966-67.)

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**Biology (41)**

401, 402. Man and the Living World
A basic course in biology, designed to give the student fundamental facts about himself and an understanding of his relation to the living world,
Biology

both plant and animal, of which he is a part. 3 cr. No credit toward a major.

405. PRINCIPLES OF BIOLOGY
A consideration of the fundamental phenomena of life, with emphasis on cellular biology, genetics, ecology, evolution, and the plant kingdom. This course is an alternate prerequisite for Zoology 412 for students in the College of Liberal Arts. Mr. Borror. 3 lec; 1 lab; 4 cr.

BIOLOGY-EDUCATION (BIOL.-ED) 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. Prereq: Two years of biological science and Ed. 758 with a grade of C or better. 2 lec; 1 lab; 3 cr.

EDUCATION-BIOLOGY (ED.-BIOL.) 794. SUPERVISED TEACHING OF HIGH-SCHOOL BIOLOGY
See description and prerequisites under Education.

Botany (27)

Albion R. Hodgdon, Professor and Chairman; M. C. Richards, Professor; Avery E. Rich, Professor; Stuart Dunn, Professor; Charlotte G. Nast, Professor; Richard Schreiber, Associate Professor; Arthur C. Mathieson, Assistant Professor; Marion E. Mills, Assistant Professor Emerita

411. GENERAL BOTANY
An introduction to plant science. The evolution of structure and function in the plant kingdom. Required as a prerequisite for Zool. 412. Mr. Schreiber. 3 lec; 1 lab; 4 cr.

503. THE PLANT WORLD
A survey of the plant kingdom from an evolutionary point of view. The structure and function of plant parts. Miss Nast. Prereq: Biol. 401 or Bot. 411. 1 lec; 2 lab; 4 cr.

506. SYSTEMATIC BOTANY
The identification and classification of our native trees, shrubs and wild flowers. Mr. Hodgdon. Prereq: Biol. 401 or Bot. 411. 1 lec; 2 lab; 3 cr.

742. PLANT ECOLOGY
Plant life and its environment, including a consideration of the principal environment factors, such as light, temperature, soil, water, and biotic relations; study of associations, successions, and plant forms; a survey of plant distribution and underlying causes. Mr. Hodgdon. Prereq: Bot. 411 or Bot. 503. 3 cr.
751. **PLANT PATHOLOGY**
The nature of disease in plants, the etiology, symptomatology, and classification of plant diseases. Mr. Rich. Prereq: Bot. 411 or Bot. 503. 1 lec; 2 lab; 3 cr.

752. **PRINCIPLES OF PLANT DISEASE CONTROL**
Exclusion, eradication, protection, and immunization, and the specific, practical methods used to control plant diseases. Mr. Rich. Prereq: Bot. 751. 1 lec; 2 lab; 3 cr. (Alternate years; not offered in 1966-67.)

753. **PLANT ANATOMY**
The anatomy of vascular plants with special emphasis upon tissue development and structure. Miss Nast. Prereq: Bot. 411 or Bot. 503. 1 lec; 2 lab; 3 cr.

754. **CYTOLOGY**
The structure, physiological behavior, and development of cells. The cellular basis of heredity. Mr. Schreiber. Prereq: a year each in the biological sciences and in chemistry. 3 cr.

755. **ADVANCED SYSTEMATIC BOTANY**
The principles and laws of plant classification and nomenclature: study of plant families, field and herbarium work. Mr. Hodgdon. Prereq: Bot. 506. Hours to be arranged. 3 cr. (Offered in 1966-67.)

756. **PLANT PHYSIOLOGY**
Structure and properties of cells, tissues, and organs; absorption and movement of water; metabolism; growth and irritability. Mr. Dunn. Prereq: Bot. 411 or Bot. 503, and one year of chemistry. 2 lec; 2 lab; 4 cr.

762. **MORPHOLOGY OF THE VASCULAR PLANTS**
The life histories and evolution of the extinct and living Pteridophytes, Gymnosperms, and Angiosperms, including comparisons of general structure and sexual organs. Miss Nast. Prereq: Bot. 411 or Bot. 503. 2 lec; 2 lab; 4 cr. (Alternate years; Offered in 1966-67.)

764. **MICROTECHNIQUE**
A methods course in embedding, sectioning, and staining plant tissues, and introduction to microscopy. Miss Nast. Prereq: Bot. 411 or Bot. 503. 3 cr.

766. **MORPHOLOGY OF THE ALGAE**
The study of form, life histories, and classification of the main divisions of the Algae. Identification and recognition of common species will be included. Prereq.: Bot. 411 or Bot. 503. 2 lec; 2 lab; 4 cr. (Alternate years; not offered in 1966-67.)

768. **MYCOLOGY**
Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Mr. Richards. 1 lec; 2 lab; 3 cr.

780. **MARINE PHYCOLOGY**
Identification, classification, ecology and life histories of the major groups of marine algae. Particular emphasis will be placed upon the New England marine algal flora. Mr. Mathieson. Prereq: Bot. 411 or Bot. 503. 2 lec; 2 lab; 4 cr. (Alternate years; offered in 1966-67.)
Botany

795, 796. INVESTIGATIONS IN: (1) SYSTEMATIC BOTANY (2) PLANT PHYSIOLOGY (3) PLANT PATHOLOGY (4) PLANT ANATOMY AND MORPHOLOGY (5) PLANT ECOLOGY (6) AQUATIC PLANTS (7) CYTOLOGY (8) PHYCOLOGY Elective only upon consultation with the Department Chairman. Mr. Hodgdon, Mr. Dunn, Mr. Rich, Miss Nast, Mr. Schreiber and Mr. Mathieson. Hours to be arranged. 2 to 6 cr.

797, 798. BOTANY SEMINAR
Library and reference work and the preparation of papers and abstracts on special phases of botany. Practice in the preparation of oral and written reports. Botany staff. Prereq: Six hours of botany or permission of the Chairman of the Department. This course may be repeated for credit. 1 cr.

Business Administration (71)

Arthur W. Johnson, Professor Emeritus; Carroll M. Degler, Professor; John A. Beckett, Professor; Dwight R. Ladd, Professor; Herman Gadon, Associate Professor; Donald C. Marschner, Associate Professor; Allan J. Braff, Associate Professor; Robin D. Willits, Associate Professor; Dwayne E. Wrightsman, Assistant Professor; Meenakshisunder Venkatesan, Assistant Professor; Surendra S. Singhvi, Instructor; Joseph E. Michael, Jr., Lecturer; Francis E. Moore, Lecturer

502. FINANCIAL ACCOUNTING
A general introduction to the objectives, theories, conventions, and processes which underlie contemporary business accounting in its role as the framework for portraying and communicating the financial status and progress of the business enterprise. (Replaces B.A. 401-402.) Mr. Ladd. 4 cr. (Not open to students who have had B.A. 401-402 or B.A. 405.)

607. MANAGERIAL CONTROL
This course is designed to acquaint the student with the principles, theory, and practice of control in business enterprise. It concentrates on controls internal to a given business but will include controls imposed upon it by its economic, political, and other environments. (Replaces B.A. 508.) (Not open to students who have had B.A. 508.) 3 cr. Mr. Beckett. Prereq: Permission of the instructor.

621-622. COMMERCIAL LAW
The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Open to juniors and seniors. Mr. Michael. 3 cr.

625, (625). MARKETING
A study of the marketing behavior of the firm as it supplies goods and services to industrial users and consumers. 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. (Replaces B.A. 525.)
Mr. Marschner. Prereq: B.A. 402 (or 502). 3 cr. (Not open to students who have had B.A. 525.)

(627). TRANSPORTATION
Economics of transportation. Competitive characteristics of the several modes of transport. National transportation policy. Limited consideration of transportation as a function of business. Mr. Ladd. Prereq: Econ. 402 or permission of instructor. 3 cr.

(643). PRODUCTION MANAGEMENT
Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. Mr. Willits. Prereq: Econ. 402; Econ. 431. 3 cr.

647. ADVERTISING AND PROMOTION
How the modern firm employs advertising and other promotional tools to help solve marketing problems. Special emphasis is also placed upon advertising as a medium of communications and as a social-cultural force in the western world. Mr. Marschner. Prereq: B.A. 625. 3 cr.

658. 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. Mr. Degler. Prereq: Econ. 402. 3 cr.

668. PERSONNEL ADMINISTRATION
Methods, techniques, and psychology employed in personnel administration from the standpoint of the manager. The case study method is used. Mr. Gadon. 3 cr.

671. CORPORATIONS
The role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combinations, and concentration. Mr. Degler. Prereq: Econ. 402. 3 cr.

672. CORPORATION FINANCE
A study of sources and uses of corporate funds; securities and securities markets; methods of financing; and financial policy. Mr. Wrightsman. Prereq: Econ. 402. 3 cr.

675 (675). MANAGERIAL ECONOMICS
Concepts and procedures for the analysis and use of cost and revenue data in making business decisions. Make or buy, product policy, pricing, and capital expenditure analysis are given special attention. Mr. Ladd. Prereq: Econ. 402. 3 cr.

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. (See page 153 for requirements.) 3-12 credits per semester.
697-698. MANAGEMENT LABORATORY
Through participation in simulations, field trips, cross course assignments, etc., the Management Laboratory will provide an opportunity for the integration of the several business courses taken concurrently. Required of all Business Administration students in both semesters of the junior year. 1 cr.

701. ORGANIZATIONAL CONCEPTS AND STRUCTURES
A theoretical examination of organizations drawing upon literature in the social sciences. Consideration is given to such aspects of organizational behavior as conflict management, patterns of leadership styles, reward structures in formal organizations, goal determination, and the management of change. Several theoretical orientations are compared. Mr. Willits. Prereq: Senior standing and permission of instructor. 4 cr. (Replaces B.A. 633.)

(725). BUSINESS HISTORY
A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to the era of the giant diversified corporations. Emphasis is placed on the role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf. 3 cr. (This course is the same as Econ. 725 and Hist. 725.)

750. MARKETING MANAGEMENT
The investigation and analysis of the ways in which the theories and principles of successful business management are applied to the solution of marketing problems, with special emphasis on policy formulation and decision-making. Mr. Marschner. Prereq: B.A. 625. 3 cr.

752. MARKETING RESEARCH
The study of marketing research as a basis for formulating marketing policies and strategy. Topics include research design, methods of collecting data, planning the investigation, sampling methods, motivation research, advertising research, and operations research. Mr. Venkatesan. Prereq: B.A. 625. 3 cr.

756. FEDERAL TAXATION
Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Permission of Instructor. 3 cr.

761. 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 software techniques and hardware characteristics related to “information technology.” Mr. Beckett. 3 cr.

762. 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 relationships, distribution costs, transfer pricing, and capital expenditure analysis. 3 cr.
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. Permission of Instructor. 3 cr.

774. 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. Mr. Beckett. Prereq: Senior standing and permission of instructor. 4 cr.

775. Operations Research
Quantitative methods for administration. Application of probability and mathematics in the solution of operational problems in business. General elements of model construction, allocation models, inventory models, queing models. 3 cr.

776. 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. Mr. Venkatesan. 3 cr.

Chemical Engineering (80)

Oswald T. Zimmerman, Professor and Chairman; Irvin Lavine, Professor Emeritus; Stephen S. T. Fan, Associate Professor; David H. Chittenden, Assistant Professor; Henry M. Gehrhardt, Assistant Professor; Charles B. Schriver, Assistant Professor; Yin-Chao Yen, Adjunct Associate Professor

511. Chemical Engineering Principles I
The presentation and interpretation of engineering data; an introduction to systems of units, dimensional analysis, and heat and material balances. 2 cr.

512. Chemical Engineering Principles II
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. 2 cr.

613. Chemical Engineering Principles III
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 lec; 1 lab; 4 cr.

614. Chemical Engineering Principles IV
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 lec; 1 lab; 4 cr.

615. CHEMICAL ENGINEERING PRINCIPLES V
Correlated with 613-614, this course presents a unified theoretical treatment of momentum, heat, and mass transfer in steady state. 3 cr.

617. CHEMICAL ENGINEERING PRINCIPLES VI
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 lec; 1 lab; 4 cr.

622. 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 processes; compression of gases; refrigeration and liquefaction of gases. 3 lec; 1 rec; 4 cr.

631. 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 lec; 1 lab; 4 cr.

641. 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 is also considered, and thermodynamics of metallurgical processes, defects and dislocations, phase relations of pure metals and alloys, microstructure, and physical and thermal treatment of metals are discussed. Study of some non-metals is also included. 3 lec; 1 lab; 4 cr.

662. CHEMICAL ENGINEERING ECONOMICS AND PLANT 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, labor requirements, 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 lec; 3 lab; 4 cr.

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. 3 lab; 3 cr.
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; and permission will be granted only to those students who have proved their ability by superior scholastic achievement. 2 to 4 cr.

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. 3 cr.

781. **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. 2 lec; 1 lab; 3 cr.

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**Chemistry (81)**

Alexander R. Amell, Professor and Chairman; Harold A. Iddles, Professor Emeritus; Albert F. Daggett, Professor; Helmut M. Haendler, Professor; Robert E. Lyle, Jr., Professor; Paul R. Jones, Professor; Charles M. Wheeler, Jr., Associate Professor; Frank L. Pilar, Associate Professor; Albert K. Sawyer, Associate Professor; Gloria G. Lyle, Associate Professor; Kenneth K. Andersen, Associate Professor; David W. Ellis, Assistant Professor; Charles W. Owens, Assistant Professor; James H. Weber, Assistant Professor; J. John Uebel, Assistant Professor; Charles V. Berney, Assistant Professor; James M. Morrison, Assistant Professor.

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 lec; 1 lab; 4 cr. (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 nonmetals 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. 2 lec; 1 rec; 1 lab; 4 cr.

405-406. **INORGANIC CHEMISTRY**
General inorganic chemistry, including qualitative analysis. The preparation of secondary school chemistry will furnish a basis for a thorough course for Chemistry majors and others who may elect the course. Mr. Sawyer and assistants. 3 lec; 2 lab; 5 cr.
517. QUANTITATIVE ANALYSIS
An elementary course in quantitative analysis designed for those students desiring a brief terminal course in analytical chemistry. Mr. Ellis and assistants. Prereq: Chem. 404. 2 lec; 2 lab; 4 cr.

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. Prereq: Chem. 404. 2 lec; 2 lab; 4 cr.

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. Prereq: Chem. 404 or 406. (Elective for Medical Technology, Nursing, and Pre-Dental students and majors in Botany.) 3 lec; 2 lab; 5 cr.

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; also 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. Prereq: Chem. 404 or 406, or permission. 3 lec; 2 lab; 5 cr.

582. INTRODUCTORY PHYSICAL CHEMISTRY
Kinetic theory of gases; quantitative laws for behavior of matter in the gas, liquid, and solid phases; valence and the chemical bond; radioactivity; atomic structure and valence; laws of solutions; homogenous and heterogenous equilibrium; colloids; electrochemistry. Designed for Pre-medical and Biology students. Prereq: Chem. 517, 521, Phys. 402. Elementary Mathematics. 3 lec; 1 lab; 4 cr.

651-652. 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. Mr. Andersen and assistants. Prereq: Chem. 404 or 406, or permission. 3 lec; 2 lab; 5 cr.

661. ANALYTICAL CHEMISTRY
A thorough treatment of the theory and techniques of gravimetric and volumetric analysis followed by special methods of analysis, such as ion exchange and EDTA titrations. Prereq: Chem. 405-406 or equivalent. 3 lec; 2 lab; 5 cr.

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES
Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radio-chemical operations. Prereq: General Inorganic Chemistry and General Physics. 3 lec; 2 lab; 5 cr.
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. Mr. Wheeler. Prereq: Math. 523 or 426 and Physics. Undergraduates must register for Chem. 685-686 concurrently. 3 lec; 3 cr.

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. Prereq: Math. 523 or 426 and Physics. Must be taken concurrently with Chem. 683-684. 2 lab; 2 cr.

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. Prereq: Chem. 548 or 652 and 684. 1 cr.

698. SEMINAR
Student reports on topics of interest. Prereq: Chem. 548 or 652 and 684. 1 cr.

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 Chem. 548, 762, 684, and have a GPA of 2.5, or permission of adviser and department chairman. 5 lab; 5 cr.

755. ADVANCED ORGANIC CHEMISTRY
The preparation of organic compounds is studied with consideration being given to structural and stereochemical control of the reactions from a knowledge of the mechanism of the reaction. Emphasis is on the solution of assigned problems. Prereq: One year of Organic Chemistry and Physical Chemistry or permission of the instructor. 3 cr.

756. CHARACTERIZATION OF ORGANIC COMPOUNDS
The spectroscopic and chemical properties of organic compounds provide a basis for the systematic characterization of organic structures. Methods for the separation of mixtures of organic compounds are considered. Mr. Lyle and assistants. Prereq: One year of Organic Chemistry. 1 lec; and 2 labs; 3 cr.

762. INSTRUMENTAL ANALYSIS
A treatment of the theory, instrumentation and application of methods such as emission spectrography, flame spectrometry, spectrophotometry, gas chromatography, coulometry, potentiometry, conductimetry, and po-
larography to chemical analysis. Prereq: Chem. 661; Chem. 684, a prereq.
or concurrent registration, or, permission of instructor. 3 lec; 2 lab; 5 cr.

775. INORGANIC CHEMISTRY
The relationship between chemical reactions and modern concepts of in
organic chemistry on a moderate level. The applicability and limitations
of the newer ideas. Mr. Haendler or Mr. Weber. Prereq: Chem. 683-684 or
permission. 3 lec; and 1 lab; 4 cr.

776. PHYSICAL CHEMISTRY III
Introduction to quantum theory; spectroscopy; chemical bonding; statis-
tical thermodynamics. Prereq: Chem. 683-684, or permission. 3 cr.

Civil Engineering (82)

J. Harold Zoller, Professor and Chairman; Russell R. Skelton, Professor
Emeritus; Charles O. Dawson, Professor; Harold E. Langley, Jr., Associate
Professor; Tung Ming Wang, Associate Professor; Robert P. Vreeland,
Associate Professor; John L. Sanborn, Assistant Professor; Louis H. Klotz,
Assistant Professor

501, (501). ELEMENTARY SURVEYING
A course for non-civil engineering students in the theory and use of tape,
level, transit, plane table, and stadia in making plane and topographic
surveys. Computations and drafting exercises necessary for making surveys
and maps for all purposes. Mr. Dawson. 2 lec; 1 lab; 3 cr.

505. SURVEYING I
Engineering measurements, using tape, transit, level, and stadia, and the
computation, adjustment, and plotting of such measurements. Prereq:
Math. 425. 1 lec; 2 lab; 3 cr.

506. SURVEYING II
Applications of engineering measurement theory; orientation by solar and
Polaris observations; theory and use of the plane table; introduction to
photogrammetry, simple curves, and earthwork computations. Prereq: C.E.
505. 1 lec; 2 lab; 3 cr.

517. ENGINEERING MATERIALS
Methods of manufacture, physical properties and the application of the
various materials used in civil engineering works, including timber, steel,
cement, mineral aggregates, concrete, and bituminous materials. Laboratory
tests and reports on the testing of cements, aggregates, concrete specimens,
cast iron, structural steel, wood, and other engineering materials. Prereq:
M.E. 523 concurrently or as a prerequisite. 3 lec; 1 lab; 4 cr.

620. TRANSPORTATION ENGINEERING
The development, organization, administration, and inter-relation of trans-
portation systems and facilities, including railroads, highways, airports,
waterways, and pipe lines. Major emphasis will be given to the economics
of location, geometric and structural design, construction materials, meth-
ods and costs, as applied to modern transportation engineering. Prereq: C.E. 506. 3 cr.

642. FLUID MECHANICS
Properties of fluids; fluid statics; flow of incompressible and compressible ideal fluids; flow of real fluids; and measurement of fluid properties. Mr. Dawson and Mr. Zoller. Prereq: M.E. 523. 3 lec; 1 lab; 4 cr.

643. WATER SUPPLY AND TREATMENT
The sources, quantity, quality, and sanitary aspects of public water supplies. Methods of purification and distribution systems. Mr. Langley. Prereq: C.E. 642. 3 lec; 1 lab; 4 cr.

644. SEWERAGE AND SEWAGE TREATMENT
The theory and problems of sewerage, the principles governing the disposal of sewage, and the various methods of sewage treatment. Mr. Langley. Prereq: C.E. 643. 3 lec; 1 lab; 4 cr.

665. SOIL MECHANICS
Soil classification, physical properties including permeability, compressibility, bearing capacity, settlement and shear resistance are related to the principles underlying the behavior of soils subjected to various loading conditions. Underground exploration and typical foundation problems are included. Prereq: C.E. 620 or permission of the instructor. 3 lec; 1 lab; 4 cr.

681. THEORY OF STRUCTURES I
The stress analysis of structures under fixed and moving loads. Roof trusses, highway and railroad bridges; use of influence lines, lateral bracing, and portals. Prereq: M.E. 523 as a prerequisite or concurrently. 3 lec; 1 design period; 4 cr.

685. THEORY OF STRUCTURES II
Beam and truss deflections. The analysis of continuous beams and rigid frames by classical and modern methods; indeterminate trusses. Prereq: C.E. 681. 3 lec; 1 design period; 4 cr.

692. STEEL DESIGN
The design of members and connections; tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Prereq: C.E. 517 and 681. 2 lec; 1 design period; 3 cr.

693. REINFORCED CONCRETE DESIGN
The principles of reinforced concrete, including rectangular beams, slabs, T-beams, columns, footings, retaining walls. Prereq: C.E. 685 as a prerequisite or concurrently. 2 lec; 1 design period; 3 cr.

696. INDEPENDENT STUDY
A limited number of qualified senior students will be permitted to pursue independent studies under faculty guidance and may write terminal theses reporting the results of their investigations. Prereq: Permission of the instructor and senior standing. 2 to 4 cr.

711. COMMUNITY PLANNING
An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable
Civil Engineering

community planning programs, including purpose and scope, the preliminary survey, elements of community land planning, the master plan, transportation systems, street patterns and traffic, motor vehicle parking, airport sites, public building sites, parks and recreational facilities, zoning, control of land subdivision, neighborhood centers, housing, legal, financial and economic problems, and redevelopment of blighted areas. Mr. Dawson. Prereq: Permission of the instructor. 3 cr.

714. CONTRACTS, SPECIFICATIONS, AND PROFESSIONAL RELATIONS
The essential elements required in engineering contracts; the purposes and content of specifications; professional conduct, relations, and ethics; and estimating by means of quantity surveys and unit cost methods. Mr. Dawson. Prereq: Permission of the instructor. 3 cr.

721. HIGHWAY ENGINEERING I
Highway organization, administration, finance, planning, programming, traffic surveys, traffic methods; highway laws, contracts, specifications; highway capacity, geometric design, access control, safety, accident studies; pavement selection, performance, and maintenance. Prereq: C.E. 620. 3 lee; 3 cr.

722. 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. Prereq: C.E. 620 and C.E. 665. 3 lee; 3 cr.

741. HYDRAULIC ENGINEERING
Application of fluid mechanics to hydraulics problems, such as reservoirs, dams, control works, open-channel flow, hydroelectric power, irrigation, drainage, and multipurpose projects. Prereq: C.E. 642. 2 lee; 1 lab; 3 cr.

742. HYDROLOGY
The occurrence and physical effects of water on the earth, including meteorology, groundwater, runoff, and streamflow routing. Prereq: C.E. 642 concurrently or as a prerequisite. 2 lee; 1 lab; 3 cr.

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. Prereq: C.E. 692 and permission of the instructor. 1 lee; 1 design period. 2 cr.

784. STRUCTURAL COMPONENTS
Selected problems in the analysis and design of structural components; such as beams on elastic foundations, curved beams, beam columns, buckling, torsion. Prereq: C.E. 685 and permission of the instructor, 3 cr.

790. STRUCTURAL ENGINEERING
The planning and design of determinate and indeterminate structures. Introduction to modern design theories; pre-stressed concrete, plastic theory of steel and reinforced concrete. Prereq: C.E. 693. 2 lee; 1 design period; 3 cr.
Economics (72)

Carroll M. Degler, Professor; John A. Hogan, Professor; Ruth J. Woodruff, Professor; Robert F. Barlow, Professor; Sam Rosen, Professor; John W. McConnell, Professor; Kenneth J. Rothwell, Associate Professor; Allan J. Braff, Associate Professor; Manley R. Irwin, Assistant Professor; Dwayne E. Wrightsman, Assistant Professor; Soon Chough, Assistant Professor; John V. Donovan, Instructor; John R. Haskell, Instructor; James H. Schulz, Instructor

401-402. PRINCIPLES OF ECONOMICS
A study of the principles underlying the organization and operation of the economy. Staff. 3 cr.

403 (403). ECONOMIC HISTORY OF THE UNITED STATES
Historical survey of the development of American business and industry with consideration of credit and trade institutions and of the role of government in the economy. Miss Woodruff. 3 cr.

431-432. BUSINESS AND 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, quality control, and time series analysis. Staff. 3 cr.

(652). PUBLIC FINANCE
Problems and policies of expenditure, revenue, and debt of federal, state, and local governments. Economic analysis and evaluation of individual types of taxes as well as entire governmental fiscal programs. Critical appraisal of recommended changes in tax systems. Tax problems in the State of New Hampshire. Prereq: Econ. 402. Mr. Schulz. 3 cr.

653. MONEY AND BANKING
The monetary and banking system with reference to monetary standards, value of money, commercial and noncommercial banking, and the structure and policy of the Federal Reserve System. Prereq; Econ. 402. Mr. Wrightsman. 3 cr.

657. GOVERNMENT REGULATION OF BUSINESS
A study of the role of government in economic affairs, with emphasis upon the regulation of competition and monopoly. Prereq: Econ. 402. Mr. Irwin. 3 cr.

663. 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. Miss Woodruff. Prereq: Econ. 402. 3 cr.
Economics

(664). 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, India, the United Kingdom, and the United States. Mr. Donovan. Prereq: Econ. 402. 3 cr.

666. ECONOMIC DEVELOPMENT
An analysis of the problems and available solutions confronting the under-developed areas of the world. Mr. Rothwell. Prereq: Econ. 402. 3 cr.

671. 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. Mr. Gadon. Prereq: Econ. 402. 3 cr.

672. 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. Mr. Hogan. Prereq: Econ. 402. 3 cr.

673. 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 equilibrium. Mr. Braff. Prereq: Econ. 402. 3 cr.

675. NATIONAL INCOME ANALYSIS
Macro-economic measurement, theory, and public policy determination. Mr. Rosen. Prereq: Econ. 402. 3 cr.

679-680. 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. Prereq: Econ. 402; 3 cr.

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. (See page 153 for requirements)

704. ECONOMIC HISTORY
An analysis of the development of the American and European economies. Miss Woodruff. Prereq: 12 semester hours of courses in economics and permission of the instructor. 3 cr.

(725). BUSINESS HISTORY
A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to the era of the giant diversified corporation. Emphasis is placed on the
role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf. 3 cr. (This course is the same as B.A. 725 and History 725.)

727. PUBLIC POLICY IN SOCIAL AND LABOR LEGISLATION
This course will cover American social and labor legislation of the recent decades and provide an opportunity to study the way in which American economic and human values have been implemented and modified by law. Attention will be given to legislation and private industry programs in social security, reemployment, unemployment insurance, health services, training and retraining and fair employment practice. The course will include lectures, discussion, assigned reading and individual student projects. Prereq: One year's work in economics or sociology. Mr. McConnell. 3 cr. (This course is the same as Sociology 727.)

754. ADVANCED MONEY AND BANKING
Emphasis on central banking, monetary policy and monetary theory. Study of current problems and developments in banking. Mr. Degler. Prereq: Econ. 653 and permission of the instructor. 3 cr.

758. GOVERNMENT REGULATION OF BUSINESS
Analysis of government policy with reference to such problems as conspiracy, monopoly, mergers, unfair practices, and discrimination. This analysis includes a legal and economic appraisal of government policy alternatives. Mr. Irwin. Prereq: Econ. 657 and permission of the instructor. 3 cr.

(761). COMPARATIVE ECONOMIC SYSTEMS
Analysis of the functioning of various types of national economic systems. Emphasis on economic planning and development. Mr. Donovan. Prereq: Econ. 664 and permission of the instructor. 3 cr.

763. INTERNATIONAL ECONOMICS
A survey of contemporary issues in international economic theory and policy. Analysis of trade theory, balance of payments problems, international liquidity, and the adjustment processes. Mr. Rothwell. Prereq: Econ. 663 and permission of the instructor. 3 cr.

773. MACROECONOMIC THEORY
Advanced analysis of such aggregates as national income, total output, employment and the general price level. Examination of the major aggregate models. Mr. Rosen. Prereq: Econ. 675 and permission of the instructor. 3 cr.

774. MATHEMATICAL ECONOMICS
An introduction to the principle mathematical techniques and their application in economics. Prereq: Permission of the instructor. 3 cr.

776. ECONOMIC FLUCTUATIONS
The study of recurrent movements of prosperity and depression, with emphasis upon causes and public policy implications. Mr. Rosen. Prereq: Econ. 675 or permission of the instructor. 3 cr.

778. ADVANCED ECONOMIC ANALYSIS
An examination of advanced topics in microeconomics with emphasis on recent developments in such areas as general equilibrium analysis, wel-
fare economics, demand theory, and capital theory. Mr. Braff. Prereq: Econ. 673 and permission of the instructor. 3 cr.

781. Advanced Statistics
The theoretical basis of statistical methods, probability, probability distributions, statistical inference, and decisions. Prereq: Permission of the instructor. 3 cr.

782. Econometrics
The application of statistics and mathematics to economic problems. The formulation of economic models, their measurement and verification. Prereq: Permission of the instructor. 3 cr.

784. Statistical Decision Making
The application of probability and statistics to decision problems. Special emphasis on the Bayesian approach to decisions under uncertainty. Prereq: Permission of the instructor. 3 cr.

797. Seminar in Economic Development
Survey of theories of economic development; detailed case studies in problems of economic development. Mr. Chough. Prereq: Econ. 666 and permission of the instructor. 3 cr.

Education (48)

Roland B. Kimball, Professor and Chairman; Thomas O. Marshall, Professor; Wayne S. Koch, Professor; Everett B. Sackett, Professor; Carleton P. Menge, Associate Professor; David D. Draves, Associate Professor; Walter N. Durost, Associate Professor; Joseph J. Petroski, Associate Professor; Angelo V. Boy, Associate Professor; Roselmina Indrisano, Assistant Professor; Deborah E. Stone, Assistant Professor; Gilbert R. Austin, Assistant Professor; Carl J. Cooper, Assistant Professor; Philip E. Northway, Assistant Professor; Philip Smith, Assistant Professor; John D. Bardwell, Lecturer.

William H. Annis, Assistant Professor (Agricultural-Education); George R. Thomas, Professor (Art-Education); Paul E. Schaefer, Associate Professor (Biology-Education); Lewis C. Goffe, Associate Professor (English-Education); William R. Jones, Associate Professor (History-Education); Marjory A. Wybourn, Professor (Home Economics-Education); Richard H. Balomenos, Assistant Professor (Mathematics-Education); John B. Whitlock, Associate Professor (Music-Education) James W. Long, Professor (Physical Education); Marion C. Beckwith, Professor (Physical Education).


Courses in Education

481, (481). AN EDUCATIONAL PSYCHOLOGY OF DEVELOPMENT
This course considers the philosophical and psychological principles underlying the process of education. Through a critical examination of human behavior, the student gains self-knowledge and an understanding of principles that affect all men. An analysis of popular novels, autobiographical reports, and technical studies constitutes the basis for group thinking and discussion. Not open to freshmen. 3 cr.

757, (757). PSYCHOLOGY OF HUMAN LEARNING
Psychology of learning as it operates within the classroom. Prereq:* Ed. 481 and permission of the Department. 3 cr.

(758), 758. PRINCIPLES OF TEACHING
Application of the theories of learning studied in Education 757, with emphasis upon the following: organization of conduct, specific planning, and a study of procedures essential to the evaluation of the learning processes. Prereq:* Ed. 757 and permission of the Department. 3 cr.

*The prerequisite for courses in education is based upon the following:
Ed. 481: Open to any student, sophomore or above.
Ed. 757, 758, 759. Prerequisite is permission of the Department. General requirement is cumulative average of 2.2 or better, and 2.5 or better in major. A speech test must be taken prior to Ed. 758.
Ed. 741-742: Senior standing, completion of all General Liberal Arts requirements, 18 semester hours in a Liberal Arts major subject, personality suitable for teaching, experience working with groups of children, Ed. 481 or Home Ec. 425 with grade of C or better, cumulative average of 2.2, and permission of the Department.
Education

759, (759). PRINCIPLES OF EDUCATION
American schools have developed, and are still developing, in unique forms quite unlike their European counterparts. Among Americans, however, there are basic disagreements concerning the direction our schools should take. This course deals with these conflicts of philosophy, the problems of American education and research pertinent to these problems. Prereq:* Ed. 758 and permission of the Department. 3 cr.

(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. Prereq: Educ. 757 or permission of instructor. 3 cr.

785. UTILIZATION OF TESTING IN PUBLIC EDUCATION
Strategies for discovering and employing predictive validities of standardized tests in public school work. 3 cr.

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. Prereq:* 16 cr. per sem.

Courses in Problems in the Teaching of School Subjects
The following courses are devoted to a study of problems, objectives, selection and organization of subject matter, teaching and testing techniques, and classroom management in the teaching of the respective subjects. For details concerning prerequisites and nature of these courses, see descriptions given under respective subject matter departments.

AGRICULTURAL EDUCATION (AG. ED) 650. PRINCIPLES OF AGRICULTURAL EDUCATION
Mr. Annis. 3 cr.

AGRICULTURAL EDUCATION (AG. ED) 651, 652. METHODS OF TEACHING AGRICULTURAL MECHANICS
Mr. Gilman. 1 lab; 1 cr.

AGRICULTURAL EDUCATION (AG. ED.) (792). PLANNING FOR TEACHING
Mr. Annis. 4 cr.

ART-EDUCATION (ART-ED.) 792. PROBLEMS OF TEACHING ART IN ELEMENTARY SCHOOLS
Mr. Thomas. 3 cr.

ART-EDUCATION (ART-ED.) 791. PROBLEMS OF TEACHING ART IN SECONDARY SCHOOLS
Mr. Thomas. 3 cr.

BIOLOGY-EDUCATION (BIOL.-ED.) 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL BIOLOGY
Mr. Schaefer. 3 cr.
Courses in Supervised Teaching

Student teaching is required in the Teacher Preparation program. It is open only to students whose applications are approved by the Department of Education and the department(s) of the subject(s) which the applicant desires to teach. Approval will be based upon the following: a cumulative university average of 2.2; a grade point average of 2.5 in the subjects of the field(s) in which supervised teaching is to be done; a 2.5 grade point average in all education courses; at least 18 semester hours of work completed in the subject(s) to be taught; personal qualities and attitudes appropriate for classroom teaching. Application should be made through the Department of Education during the week preceding November 10 or April 10 of the semester immediately preceding the semester in which supervised teaching is to be done.
Education

Students may enroll for 9 or for 14 credits* in supervised teaching. Approval to receive 9 credits for secondary supervised teaching must be granted by the Director of Secondary Student Teaching and the applicant’s subject department.

EDUCATION-AGRICULTURE (Ed-Ag) (794). SUPERVISED TEACHING IN AGRICULTURE
Prereq: Senior standing in Agricultural Education curriculum.

EDUCATION-ART (Ed-Art) 794. SUPERVISED TEACHING IN ART

EDUCATION-BIOLOGY (Ed-Biol) 794. SUPERVISED TEACHING IN HIGH SCHOOL BIOLOGY

EDUCATION-ELEMENTARY (Ed-El) 793. SUPERVISED TEACHING IN THE ELEMENTARY SCHOOL

EDUCATION-ENGLISH (Ed-Engl) 794. SUPERVISED TEACHING IN HIGH SCHOOL ENGLISH

EDUCATION-HISTORY (Ed-Hist) 794. SUPERVISED TEACHING IN HIGH SCHOOL HISTORY AND OTHER SOCIAL STUDIES

EDUCATION-HOME ECONOMICS (Ed-He) 794. SUPERVISED TEACHING IN HIGH SCHOOL HOME ECONOMICS

EDUCATION-LANGUAGE (Ed-Lang) 794. SUPERVISED TEACHING IN HIGH SCHOOL MODERN FOREIGN LANGUAGE

EDUCATION-LATIN (Ed-Lat) 794. SUPERVISED TEACHING IN HIGH SCHOOL LATIN

EDUCATION-MATHEMATICS (Ed-Math) 794. SUPERVISED TEACHING IN HIGH SCHOOL MATHEMATICS

EDUCATION-MUSIC (Ed-Mu) 793, 794. SUPERVISED TEACHING IN ELEMENTARY AND SECONDARY SCHOOL MUSIC

EDUCATION-PHYSICAL EDUCATION (Ed-PE) 790. DIRECTED TEACHING OF PHYSICAL EDUCATION
Prereq: PE-Ed. 792 or concurrently.

Electrical Engineering (83)

Alden L. Winn, Professor and Chairman; Leon W. Hitchcock, Professor Emeritus; William B. Nulsen, Professor; Robert N. Faiman, Professor; John B. Hraba, Professor; Albert D. Frost, Professor; Joseph B. Murdoch, Professor; Fletcher A. Blanchard, Associate Professor; Kerwin C. Stotz, Associate Professor; Donald W. Melvin, Associate Professor; Ronald R. Clark, Associate Professor; Robert W. Goodrich, Assistant Professor; Filson H. Glanz, Assistant Professor; Joseph D. Bronzino, Assistant Professor; Michel Michail, Instructor; W. Frank Springgate, Part-Time Instructor

*Except Ed-Agr. 794 wherein the credits are 11, Ed-HE 794 wherein they are 7, Ed-PE 790 wherein they are 6.
501-502. Electrical Engineering
The fundamental physical laws and concepts of electrical engineering and their application to electric and magnetic circuits. Prereq: Math. 426 or 423 taken concurrently and Phys. 404, E.E. 501; 2 or 3 rec; 1 lab. or conf; 3 or 4 cr. E.E. 502: 3 rec; 1 lab; 4 cr.

504. Electrical Engineering Circuits (Honors)
By combined independent study and conferences and laboratories, students cover in depth the material listed for E.E. 502 and 515. Prereq: E.E. 501 and Math. 523 or 426. Requires permission of instructor. 1 lab. and 2-3 conf; 5 cr.

510. Electronic Circuits
Theory of operation, analysis, and design of active circuits containing electron devices. Prereq: E.E. 609. Required of juniors in Electrical Engineering. 3 cr.

513-514. Applied Electromagnetics
Electric and magnetic circuits, vector diagrams, and equivalent circuits as applied to transformers, synchronous, and asynchronous machines and machine dynamics. Prereq: E.E. 502, Math. 527. Required of juniors in Electrical Engineering. 3 cr.

515. Circuit Theory

522. Electronics Laboratory
Experimental investigations in the principles of electrical engineering as applied to electronic devices, circuits, and instrumentation. Prereq: E.E. 510 taken concurrently. Required of juniors in Electrical Engineering. 1 lab; 1 cr.

555, 556, 557, 558. Student Branch IEEE
A student-conducted organization, operated under the by-laws of the Institute, designed to introduce the student to professional society activities. Approximately 10 to 12 meetings are scheduled during the year, usually in the evenings. These meetings provide lectures by industrial representatives, inspection trips and attendance at state and regional meetings. Each student is urged to become a student member of IEEE. Required of juniors and seniors in Electrical Engineering. No cr.

523, 524. Electrical Laboratory
Experimental investigations in the principles of electrical engineering as applied to electrical engineering systems, devices and components. Laboratory procedures and presentation of engineering reports. Prereq: E.E. 513, 514 taken concurrently with E.E. 523, 524 respectively. Required of juniors in Electrical Engineering. 1 lab; 2 cr.

525, 526. Electrical Laboratory
Experimental investigations in the principles of electrical engineering as applied to electrical engineering systems, devices and components. Formal reports are required. Prereq: E.E. 514, E.E. 510. Required of seniors in Electrical Engineering. 1 lab; 2 cr.
533. FUNDAMENTALS OF ELECTRICAL ENGINEERING
Direct- and alternating-current circuits, instruments and machines, and rectifiers and transformers. Prereq: Phys. 501. Required of juniors in Chemical and Civil Engineering. 3 lec; 1 lab; 4 cr.

539. ELECTRICAL ENGINEERING FUNDAMENTALS
Electric and magnetic fields and circuits. Prereq: Phys. 501. Required of juniors in Mechanical Engineering. 3 lec; 1 lab; 4 cr.

605. ELECTRICAL ENGINEERING NETWORKS AND LINES (Honors)
By combined independent study and conferences students cover in depth the material described in E.E. 645. Prereq: E.E. 504. Permission of the instructor. 2-3 conf; 5 cr.

609. PHYSICAL ELECTRONICS
Electron ballistics, conduction in gases, vacuum, metals, and semi-conductors; theory of emission; theory of operation, characteristic curves, and equivalent circuits for electron devices such as vacuum and gas tubes, solid state rectifiers, and transistors. Prereq: E.E. 504 or E.E. 515 taken concurrently. Required of juniors in Electrical Engineering. 3 cr.

640. CIRCUITS, MACHINERY, AND CONTROL
Continuation of electric circuits. Applications of electrical engineering to machines and systems. Prereq: E.E. 539. Required of juniors in Mechanical Engineering. 3 lec; 1 lab; 4 cr.

641. ELECTRONIC FUNDAMENTALS
Physical electronics, electronic circuits with emphasis on instrumentation. Prereq: E.E. 533 or 539. Required of seniors in Mechanical Engineering. 2 lec; 1 lab; 3 cr.

645. ELECTRICAL NETWORKS
Generalized network analysis, equivalent networks, filter properties, elementary synthesis, transient and steady-state analysis of transmission lines. Prereq: E.E. 515 or E.E. 504. 3 cr.

646. ELECTRIC FIELDS
Static electric and magnetic fields, electromagnetic fields, Maxwell’s equations, wave equations, plane waves. Prereq: E.E. 502, Math. 527. Required of seniors in Electrical Engineering. 3 cr.

652. INDUSTRIAL ELECTRONICS FUNDAMENTALS
Application of electronics to industrial processes. Prereq: E.E. 641. Normally limited to students not registered in the Electrical Engineering curriculum. 2 lec; 1 lab; 3 cr.

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 conf. or 1-2 lab; 1-4 cr.

706. ADVANCED CIRCUIT THEORY
Analytical techniques in electrical circuits and systems. Prereq: Permission of instructor. 3 lec; 1 conf; 4 cr; when offered without conference period. 3 cr.
741-742. FUNDAMENTALS OF ACOUSTICS
The development of the acoustical wave equation for gases, solids, and liquids; reflection and refraction, and absorption; characteristics of acoustic sources, directivity of multi-source arrays; acoustical measurements, and architectural acoustics; airborne noise control. Prereq: Physics 502 and Math. 527. 1 rec; 2 hrs. each course; 2 cr. each course.

757. ELECTRONIC SYSTEMS ANALYSIS AND DESIGN
Techniques in coding, storage, and transfer of information. Analysis and design of electronic systems. Prereq: Permission of instructor. 3 cr.

762. ILLUMINATION
Radiation, fundamental processes in gases, atomic spectra, sources of visible and near visible energy, lamp circuitry, lighting and wiring design, control of light, photometry, and color. Prereq: Permission of the instructor. 2 cr.

781. INSTRUMENTATION
Analysis and design of equipment for measurement, instrumentation, and control. 3 rec; 1 lab; 4 cr.

780, (780). ENGINEERING ANALYSIS
The basic principles and analytical methods employed in the solution of complex problems in the various branches of engineering. Prereq: Permission of the instructor. 2-3 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Prereq: Permission of the instructor. 3 lec; 3 cr; or 3 lec. and 1 lab; 4 cr.

English (49)

John C. Richardson, Associate Professor and Chairman; William G. Hennessy, Professor Emeritus; Sylvester H. Bingham, Professor; Robert G. Webster, Professor; J. Howard Schultz, Professor; Dale S. Underwood, Professor; G. Harris Daggett, Associate Professor; Max S. Maynard, Associate Professor; Lewis C. Gofe, Associate Professor; Edmund G. Miller, Associate Professor; Philip L. Nicoloff, Associate Professor; Thomas A. Williams, Jr., Associate Professor; Donald M. Murray, Associate Professor; Robert D. Hapgood, Associate Professor; Lee S. Baier, Assistant Professor; Hugh M. Potter, III, Assistant Professor; John A. Yount, Assistant Professor; S. Anthony Caldwell, Instructor; Gordon A. Lameyer, Instructor; Bruce D. Allen, Instructor; Diane S. Janeau, Instructor; James T. Sullivan, Instructor; Garrett C. Chitwood, Jr., Instructor; Richard L. Pevear, Instructor; George E. Barr, Instructor; Hidde H. Van Ameyden van Duym, Instructor; Joanne T. Radlow, Instructor; Julian H. Smith, III, Instructor; David V. Siddall, Instructor; Alfred M. Poulin, Instructor; Matthew von Baeyer, Instructor
301. IMPROVEMENT IN WRITING*
Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 3 rec; no cr. NLG.

302. IMPROVEMENT IN READING*
Intensive drill in reading skills for six weeks. 3 rec; no cr. NLG.

401-402. FRESHMAN ENGLISH
Training to write more correctly and with more force and to read with more appreciation and discernment the chief types of literature. The staff of the department under the chairmanship of Mr. Baier. 3 cr. No credit toward a major.

501 (501). EXPOSITORY WRITING
The discipline of non-fiction writing. Weekly papers and frequent conferences required. Prereq: Engl. 401-402. 3 cr. Written permission of instructor required for registration. No credit toward a literature major.

513, 514. AN INTRODUCTION TO ENGLISH LITERATURE
The development of English literature from its beginning to the 20th century by means of selected readings. Mr. Richardson, Mr. Miller, Mr. Lameyer. Prereq: Engl. 401-402. 3 cr. No credit toward a literature major.

515, 516. A SURVEY OF AMERICAN LITERATURE
Mr. Webster, Mr. Daggett, Mr. Goffee, Mr. Nicoloff, and Mr. Potter. Prereq: Engl. 401-402. 3 cr. No credit toward a literature major.

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. Mr. Schultz. Prereq: Engl. 401-402. (Alternate years; not offered in 1966-67.)

521-522. NEWS WRITING
A laboratory course in the techniques of journalism. The student is taught to report and write under strict limitations of time and space. Mr. Murray. Prereq: Engl. 401-402. 3 cr. Written permission of instructor required for registration. No credit toward a literature major.

523. WRITING OF TECHNICAL REPORTS
Required of seniors in Agriculture and in Electrical and Civil Engineering. Mr. Webster, 2 cr.

525-526. WRITING FICTION AND POETRY
A workshop in the fundamental techniques of fiction and poetry. Individual conferences. Mr. Williams and Mr. Yount. Prereq: Engl. 401-402. 3 cr. May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.

695, 696. SENIOR HONORS
Open to senior English literature majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English.

* Any student may be recalled and reassigned to an instruction group at any time in his four years at college upon report of any member of the Faculty that his work in composition or in reading is deficient.
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. Of the nine credits awarded (3 the first semester, 3 or 6 the second semester), 6 may be counted toward the 24 which constitute a major in English literature. 3 cr; 6 cr. Open to seniors by departmental invitation only.

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. Prereq: Engl. 525-526 or its equivalent. 3 cr. May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.

703-704. WRITING NON-FICTION
The techniques of advanced expository writing will be discussed and practiced in weekly papers the first semester. An article of considerable length and serious content will be written and re-written during the second semester. Workshop discussions and individual conferences. Mr. Murray. Prereq: Engl. 501, or 521-522, or 525-526, or an equivalent. 3 cr. May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.

705. ENGLISH GRAMMAR
Mr. Goffe. Required of students in the teacher preparation program and open to other students with the permission of the instructor. 3 cr. No credit toward a literature major.

709, 710, 711. CRITICAL ANALYSIS
Analysis of three forms of writing: 709, exposition; 710, fiction; 711, poetry; Mr. Bingham and Mr. Richardson. 3 cr. No credit toward a literature major.

751. HISTORY OF THE ENGLISH LANGUAGE
3 cr.

753. ANGLO-SAXON
3 cr.

754. BEOWULF
3 cr.

755, 756. CHAUCER
Mr. Underwood. 3 cr.

757, 758. SHAKESPEARE'S PLAYS
The major histories, comedies, and tragedies. Mr. Schultz and Mr. Hapgood. 3 cr.

759. MILTON
Mr. Schultz. 3 cr. (Alternate years; not offered in 1966-67.)

760. BOSWELL'S JOHNSON
Mr. Maynard. 3 cr. (Not offered in 1966-67.)
761. WORDSWORTH  
Mr. Miller. 3 cr. (Alternate years; offered in 1966-67.)

762. BROWNING  
Mr. Daggett. 3 cr. (Alternate years; not offered in 1966-67.)

763, 764. ENGLISH LITERATURE IN THE SIXTEENTH CENTURY  
Mr. Schultz. 3 cr. (Alternate years; offered in 1966-67.)

765, 766. ENGLISH LITERATURE IN THE SEVENTEENTH CENTURY  
Mr. Lameyer and Mr. Underwood. 3 cr. (Alternate years; not offered in 1966-67.)

767, 768. ENGLISH LITERATURE IN THE EIGHTEENTH CENTURY  
Mr. Maynard. 3 cr. (Alternate years; offered in 1966-67.)

769, 770. THE ENGLISH ROMANTIC PERIOD  
Wordsworth, Coleridge, Lamb, Hazlitt, Byron, Shelly, Keats, DeQuincey.  
Mr. Miller. 3 cr. (Alternate years; not offered in 1966-67.)

771, 772. VICTORIAN PROSE AND POETRY  
Major non-fiction prose from Carlyle to Stevenson and major poetry from  
Tennyson to Hardy. Mr. Miller. 3 cr. (Alternate years; offered in 1966-67.)

773, 774. BRITISH LITERATURE OF THE TWENTIETH CENTURY  
Mr. Richardson. 3 cr. (Alternate years; offered in 1966-67.)

775. NEW ENGLAND RENAISSANCE  
Emerson, Thoreau, and other transcendentalists. Mr. Daggett. 3 cr. (Alternate  
years; offered in 1966-67.)

776. AMERICAN NOVEL IN THE NINETEENTH CENTURY  
Mr. Webster. 3 cr. (Alternate years; offered in 1966-67.)

777. AMERICAN POETRY OF THE NINETEENTH CENTURY  
Mr. Daggett. 3 cr. (Alternate years; not offered in 1966-67.)

779, 780. AMERICAN LITERATURE OF THE TWENTIETH CENTURY  
Mr. Nicoloff. 3 cr. (Alternate years; not offered in 1966-67.)

781, 782. INTRODUCTION TO ENGLISH DRAMA  
The development of English drama, exclusive of Shakespeare, from the  
Middle Ages to the present. Mr. Hapgood. 3 cr. (Alternate years; not  
offered in 1966-67.)

783, 784. THE ENGLISH NOVEL OF THE EIGHTEENTH AND NINETEENTH  
CENTURIES  
Mr. Bingham and Mr. Miller. 3 cr.

ENGLISH EDUCATION (ENGL-ED) 791. PROBLEMS IN THE TEACHING OF HIGH  
SCHOOL ENGLISH  
Principles and methods of teaching literature and composition in secondary  
schools. For all students who plan to teach English in secondary  
schools and for all students majoring in Language, History, or Education.  
Mr. Goffe. Prereq: a grade of C or better in Ed. 758. Literature majors in  
English by permission of the instructor; all other students by fulfillment
of the following: Engl. 501, 513, 514, 516, 709, 710, 711; one semester of Engl. 757, 758; a demonstration of skill in the use of English grammar, either by the satisfactory completion of Engl. 705 or by examination. 3 cr. No credit toward a literature major.

Entomology (29)

James G. Conklin, Professor and Chairman; Robert L. Blickle, Professor; Walter C. O'Kane, Professor Emeritus; R. Marcel Reeves, Assistant Professor

(402), 402. INTRODUCTORY ENTOMOLOGY
An introduction to entomology in its broad aspects. The structure, biology, and classification of insects. This course should be particularly useful to students contemplating a major in entomology or in the general field of biology-education. Each student is required to make an insect collection. Open to any student. Mr. Conklin. 2 lec; 1 lab; 3 cr.

506. FOREST ENTOMOLOGY
Structure and development of insects. Orders and families of insects of importance to foresters. Principles 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. Conklin. 2 lec; 1 lab; 3 cr.

704. MEDICAL ENTOMOLOGY
Insects and arachnids in relation to public health. The more important disease carriers, their biology, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lec; 1 lab; 3 cr.

707, 708. ADVANCED ENTOMOLOGY
The anatomy and physiology of insects. Systematic entomology. Mr. Conklin, Mr. Blickle. Required of Entomology majors. Open to others than Entomology majors by permission of the Department Chairman. 2 lec; 2 lab; 4 cr.

709, 710. ADVANCED ECONOMIC ENTOMOLOGY
Problems in applied entomology; the literature of economic entomology; investigational methods; studies of the specialized phases of entomology. Mr. Conklin, Mr. Blickle. Required of Entomology majors. Open to others than Entomology majors by permission of the Department Chairman. 1 to 3 cr.

Forest Resources (30)

Paul E. Bruns, Professor and Chairman; Clark L. Stevens, Professor Emeritus; Oliver P. Wallace, Associate Professor; Harold W. Hocker, Jr., Associate Professor; John L. Hill, Associate Professor; James P. Barrett, Assistant Professor; Roger P. Sloan, Assistant Professor; Bennett B. Foster,
401. CONSERVATION OF FOREST RESOURCES
The wildland renewable resources include game, vegetation including timber, water and soil. Both the use and preservation of forest resources are important to man. Conflicts between use and preservation and among the uses may arise, which men must continually resolve. These concepts and practices are studied within the framework of man's economic and social structures. elective for all students except freshmen and Forestry majors. Mr. Wallace, staff. 3 cr.

425. DENDROLOGY
The identification, classification and silvical characteristics of trees and shrubs in autumn and winter. An introduction to plant taxonomy, ecological succession, soils and plant geography. The principal forest regions of North America: their location, extent, climatic conditions and important timber species. Required of freshmen in Forestry. Elective for other students. Mr. Olson. 2 lec; 1 lab; 3 cr.

426. WOOD TECHNOLOGY
An introduction to the fundamental properties of wood including macro- and microstructure; physical, chemical and mechanical properties. Introduction to seasoning and preservation of wood. Identification of commercially important timbers. Prereq: For. Res. 425 or permission of the instructor. Mr. Hill. 2 lec; 2 labs; 4 cr.

527. SILVICS
The ecological basis of silviculture. Classification of forest communities; environmental factors and their influence on forest vegetation; influence of vegetation on environment. Mr. Hocker. Prereq: Bot. 411; For. Res. 425 or Bot. 506. 2 lec; 1 lab; 3 cr.

528. APPLIED STATISTICS I
Statistical procedures with emphasis on biometrics. Computational procedures and interpretation of results will be covered in lecture and laboratory. Mr. Durgin. Prereq: 3 cr. of Math. 2 lec; 1 lab; 3 cr.

542. FOREST ENGINEERING
The use of common forest engineering and surveying equipment and techniques. Course to include use and preparation of maps with various types of equipment and methods, logging road location, public land survey, and courthouse search for deeds and surveys. Mr. Foster. Prereq: Sophomore standing and C.E. 501 or permission of instructor. Two week field session in June. 3 cr.

543. FOREST MENSURATION
Theory and practice in the basics of forest mensuration. Forest inventory, growth and yield, volume table construction, and elements of photogrammetry. The application of statistical procedures in forest mensuration. Mr. Barrett. Prereq: Math. 407-408 or equivalent, Math. 401, For. Res. 528. 2 lec; 1 4-hr. lab; 4 cr.
544. **FOREST ECONOMICS**  
Application of economics and finance to the forest business. Nature of forest investments, forests taxation, and forest resources. Mr. Wallace. Prereq: 3 cr. of Econ. 4 lec; 4 cr.

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. Prereq: For. Res. 425; For. Res. 527 or Bot. 742. 2 lec; 1 lab; 3 cr.

650. **LOGGING ECONOMICS**  
Application of economic principles to the study of timber harvesting. The use of quantitative methods in developing logging cost and production functions. Field problems. Mr. Foster. Prereq: For. Res. 528, For. Res. 544, or equivalents. 2 lec; 1 lab; 3 cr.

651. **WOOD PRODUCTS MANUFACTURE AND MARKETING**  
A study of wood products manufacturing processes with emphasis on plant management and marketing problems of the wood using industries. Plant visits are employed as a basis for study. Mr. Hill. Prereq: For. Res. 426. 2 lec; 1 lab; 3 cr.

660. **FOREST PROTECTION**  
Principles of protection from fire, insects, fungi, climatic extremes, and other injurious agencies. Principles are illustrated by protection problems of northeastern forests. Emphasis is placed upon the development of resistant forest stands. Mr. Weyrick. Prereq: Ent. 506, Bot. 751, or equivalent. 2 lec; 1 lab; 3 cr.

661. **FOREST MANAGEMENT**  
The management of forest areas on an economic and ecological basis. The integration and application of business methods and the technical phases of forestry. Mr. Foster. Prereq: For. Res. 543, 629, 650, 660. 3 lec; 1 lab; 4 cr.

671, 672. **INVESTIGATIONS IN FORESTRY**  

711. **STATISTICAL METHODS II**  
An intermediate course in statistics. All students elect applied phase with basic phase optional for additional credit. Applied phase presents concepts of statistical models, tests of significance, analysis of variance in one-way and multiway classifications, and factorial experiments. Introduction to co-variance, multiple regression, and analysis with unequal subclass numbers; introduction to chi-square tests, discrete distributions; non-parametric statistics, and sampling. Basic phase parallels and supplements applied phase; algebraic derivation of computing formulae, study of models and derivation of expected values; matrix representation of experimental design and multiple regression models; introduction to least squares. Mr. Barrett. Prereq: An elementary statistics course. 3-4 cr.
730. **FOREST TREE IMPROVEMENT**  
A consideration of the genetics of forest tree improvement with emphasis on variation in natural populations, the basis of selection of desired characters and the fundamentals of controlled breeding. The application of principles will be directed toward silviculture, management and utilization. Mr. Hocker. Prereq: Permission of the instructor. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

734. **FOREST FISH AND GAME**  
Fish and wildlife population dynamics and the theory of game management. The characteristics of important game species and management techniques useful in the northeastern forest habitat. Elective with permission of instructor. Mr. Olson. 3 lec; 1 lab; 4 cr.

746. **FOREST MANAGEMENT RESOURCE SURVEY**  
A study of forest land use coordination. Multiple uses treated separately and as integrated concurrent uses of forested lands. Forest management for water, recreation, wildlife and range benefits. Mr. Weyrick. Prereq: For. 544 and For. 661, or permission of the instructor. 2 lec; 1 lab; 4 cr.

755. **FOREST WILDLIFE MANAGEMENT**  
Readings and discussions on the properties of wildlife species and the various phases of management including public relations, law enforcement, and control of undesirable species. Students should be prepared to participate in week-end field trips to game management areas in New England. Mr. Olson. Prereq: For. Res. 734 or permission of the instructor. 2 lec; 1 lab; 3 cr.

758. **PHOTOGRAFMETRY IN FORESTRY**  
Elementary principles of photogrammetry with emphasis on their application to all phases of forestry. The value and use of aerial photos in forest typing, planimetric, and topographic mapping; measurement of area and volume estimation. Mr. Barrett. Prereq: Permission of the instructor. 2 lec; 1 lab; 3 cr.

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. Prereq: Senior standing and permission of the instructor. 2 lec; 1 lab; 3 cr.

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**French and Italian**

Louis J. Hudon, Professor and Chairman; Clifford S. Parker, Professor Emeritus; Samuel E. Stokes, Jr., Associate Professor; Edna S. Hudon, Visiting Associate Professor; Grover E. Marshall, Assistant Professor; Vlasta J. Polish, Instructor
French (56)

New students will be assigned to the proper course on the basis of their scores on the French placement examinations.

401-402. ELEMENTARY FRENCH*
For students without previous knowledge of French. 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. 4 rec; 1 practical drill; 2 lab; 4 cr. (Students who offer two or more entrance units of high school work in French will not be permitted to register for credit for French 401.)

503-504. INTERMEDIATE FRENCH*
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 French. 3 rec; 1 lab; 3 cr. (No credit toward a major. Open by placement examination, and to students who have passed French 402 with a grade of C. Students making a grade of A in French 504 may take courses numbered 741 and above with the permission of the Department Chairman.)

505-506. INTRODUCTION TO FRENCH LITERATURE AND THOUGHT*
Reading and analysis of significant works in French literature and thought, beginning in the seventeenth century. Outside readings on the historical and cultural background of the works read. Papers and discussion in French. Term paper in English. 3 cr. This course or its equivalent is prerequisite to all higher courses in French. Open to students who have achieved a grade of C or better in French 504 and by placement examination.

(514). FRENCH GRAMMAR AND SPEECH HABITS*
Thorough study of the structure of the French language and practice of basic speech patterns. 3 cr. Primarily for students who have not taken French 503-504. No credit toward a major. Prereq: French 506, but may be taken concurrently with French 506.

685-686. JUNIOR YEAR AT DIJON UNIVERSITY
A program of studies at the University of Dijon (France) for students who have completed their sophomore year and have passed with a grade of B or better French 505-506 and French 514. The students chosen for the program will be required to take a non-credit orientation course during the second semester of their sophomore year to prepare them for French university life. Interested students should consult with the Director of the Program, Professor Louis J. Hudon. 32 cr. Students must be approved for this program. Not offered for graduate credit.

* No student educated in a foreign country will be permitted to register for any French course numbered 650 or below if French is the student's native language.
695, 696. **HONORS WORK IN FRENCH**
For seniors writing a research paper in the Honors program in French. Prereq: Permission of Department Chairman. Variable credit.

741. **FRENCH LITERATURE OF THE MIDDLE AGES**
Readings in the epic, lyric poetry and the romance. Required of Senior French Majors. Conducted in French. Prereq: Fr. 506, 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

742. **FRENCH LITERATURE OF THE RENAISSANCE**
Rabelais, Marguerite de Navarre, Ronsard, Du Bellay, Montaigne and others. Conducted in French. Prereq: Fr. 506. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

759-760. **FRENCH LITERATURE OF THE SEVENTEENTH CENTURY**
759: Historical and literary background of French Classicism; poetry, Corneille, Pascal, and Molière's early plays. 760: Molière, Racine, La Fontaine, Mme. de La Fayette, Boileau, and La Bruyère. Conducted in French. Prereq: French 506. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

761-762. **EIGHTEENTH CENTURY FRENCH LITERATURE AND THOUGHT**
761: Precursors of Age of Enlightenment — Bayle, Fontenelle, Montesquieu; Voltaire's early works; Marivaux and others. 762: Diderot, Encyclopedists, later Voltaire, Laclos, Rousseau and others. Conducted in French. Prereq: Fr. 506. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

767-768. **NINETEENTH CENTURY FRENCH LITERATURE**
767: Romanticism; Mme. de Stael, Chateaubriand, Lamartine, Hugo, Vigny, Musset. 768: Late Romanticism; Realism; Stendahl, Balzac, Flaubert; Hugo, the Parnassian school. Conducted in French. Prereq: French 506. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

770. **INTRODUCTION TO MODERN FRENCH POETRY**
Baudelaire, Rimbaud, Mallarmé, Valéry and others. Prereq: French 506. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

781-782. **CONTEMPORARY FRENCH NOVEL AND THEATER**
781: Maeterlinck, Vilarac, Apollinaire, Gide, Proust, Mauriac, and others. 782: Malraux, Berlangos, Sartre, Camus, Anouilh, Giraudoux and others. Conducted in French. Prereq: French 506. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

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 six hours of French courses numbered 650 and above. 3 cr; 4 cr. for Honors.

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, such as literary criticism in the Seventeenth Century. Staff. Prereq: Permission of the Department Chairman. Variable credit.
Italian (59)

New students will be assigned to the proper course on the basis of their scores on the Italian placement examination.

401-402. **Elementary Italian***
For students without previous knowledge of Italian. 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. 4 cr. (Students who offer two or more entrance units of high school work in Italian will not be permitted to register for credit for Italian 401.)

503-504. **Intermediate Italian***
Intensive and extensive reading of texts of intrinsic literary and intellectual worth: Dante, Petrarca, Leopardi, and others. (Open by placement examination, and to students who have passed Italian 402 with a grade of C.) 3 cr.

Geology and Geography

Herbert Tischler, **Professor and Chairman**; T. Ralph Meyers, **Professor**; Donald H. Chapman, **Professor**; Cecil J. Schneer, **Professor**; William H. Wallace, **Professor**; Glenn W. Stewart, **Associate Professor**; Henri E. Gaudette, **Assistant Professor**; Robert G. LeBlanc, **Instructor**

Geology (51)

401-402. **Principles of Geology**
The earth and its history. A consideration of land forms and a discussion of the materials and structures of the earth's crust. The interpretation of past geologic events, and their effect on the development of life forms. Staff. 3 lec; 1 lab; 4 cr. **No credit toward a major.**

407. **General Geology**
An introductory course in physical geology. The structures and materials of the earth's crust and the forces which have produced and altered them. Mr. Stewart. For students in Technology. **Open to other students by permission only.** 2 cr. (Not available for credit after completing Geol. 401.) **No credit toward a major.**

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. Prereq: Geol. 402 or 407, or Chem. 402 or 404. 2 lec; 2 lab; 4 cr.

* No student educated in a foreign country will be permitted to register for any course numbered 650 or below if Italian is the student's native language.
531. **Structural Geology**
The structural units of the earth's crust and the mechanics of their formation. Mr. Stewart. Prereq: Geol. 402 and Math. 407-408, or permission of the instructor. 3 lec; 1 lab. or field work; 4 cr.

552. **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. Prereq: Geol. 402 or permission of instructor. 3 lec; 1 lab; 4 cr.

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. Prereq: Geol. 402 or permission of the instructor. 3 lec; 1 lab; 4 cr.

613. **Physical and Chemical Mineralogy**
An introduction to the theory of natural solids; the structure of the atom; the crystal, its geometry, its physics and chemistry, its natural history; methods of physical-chemical mineralogy. Mr. Schneer. Prereq: Chem. 404. 2 lec; 1 lab; 3 cr.

622. **Elements of Petrology**
The origin, modes of occurrence, and classification of rocks. Mr. Stewart. Prereq: Geol. 402. 2 lec; 1 lab. or field exercise; 3 cr.

632. **Field Geology**
Training in basic field methods of geologic mapping. Mr. Stewart. Prereq: Geol. 531. 1 lec; 1 lab. or field work; 2 cr. (Alternate years; offered in 1966-67.)

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. New Hampshire examples of both Alpine and Continental glaciation will be studied in the field. Mr. Chapman. Prereq: Geol. 402. 2 lec; 1 lab; 3 cr.

699. **Senior Thesis**
Open to students during their last semester in residence while completing their senior thesis. May not be taken by students who elect a senior comprehensive examination in place of the senior thesis. Satisfactory completion of the senior thesis represents satisfactory completion of the course. No letter grade will be given. 2 cr.

716. **Mineralogy of Clays**
The composition of various types of clays; the structure and properties of clay minerals; the origin and mode of occurrence of the clay minerals and clay materials; the utilization of clays in the arts and industry. Mr. Gaudette. Prereq: Geol. 613, 512; Geol. 407; or permission of the instructor.

741. **Principles of Geochemistry**
The chemical approach to the interpretation of geological processes with emphasis on the principles which control the distribution and migration
of elements in geological environments. Mr. Gaudette. Prereq: Geol. 613 or permission of the instructor.

754. SEDIMENTOLOGY
The properties of sediments and sedimentary rocks, the sedimentary processes and environments, correlation procedures and stratigraphic principles. Mr. Tischler. Prereq: Geol. 401 and 512 or permission of instructor. 2 lec; 1 lab; 3 cr.

771-772. ECONOMIC GEOLOGY
First semester: the types of coal and their occurrence in the United States; petroleum, the structures in which it is found and the distribution and geology of oil fields, especially in the United States; industrial minerals and their utilization. Second semester: the metals, their ores, and the geology of important ore deposits. Mr. Meyers. Prereq: Geol. 512. 3 cr.

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 high school science teacher who needs an introduction to the Earth Sciences. (Not available for credit after completing Geol. 401 or equivalent.) It will only be offered during Summer Sessions. To register one must be a certified science teacher with at least 3 years of teaching experience. 4 cr.

782. HISTORICAL GEOLOGY
The hypotheses concerning the origin of the earth are discussed, the history and evolution of life are described, and the sequence of past geologic events are interpreted. Selected invertebrate fossils are observed in the laboratory and the geologic history of southern New Hampshire is interpreted on the field trips. Prereq: Geol. 781 or equivalent. This course is for high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Geol. 402 or equivalent.) It will only be offered during Summer Session. To register one must be a certified science teacher with at least three years of teaching experience. 4 cr.

795. GEOLOGICAL PROBLEMS
Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed below. Staff. Prereq: Permission of the instructor. 1-2 cr. This course may be repeated to a total of not more than 5 credits.

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
797. GEOLOGY SEMINAR
Study of selected topics in both classical and modern geological thought. Prereq: Senior standing and permission of the instructor. 2 cr. (Course not offered regularly.)

Geography (50)

401, 402. REGIONAL GEOGRAPHY OF THE WORLD
A survey of the geography of the world, organized in terms of the major cultural areas of the earth. The Polar, European, and Dry World cultural areas are considered during the first semester; the Oriental, African, Pacific, and New World cultural areas are analysed during the second semester. In each area the unique integration of physical and human features that produces the distinctive character of the region is studied. Mr. Wallace and Mr. LeBlanc. 3 cr.

471, 472. PHYSICAL GEOGRAPHY
A systematic study of the earth in terms of climates, landforms, vegetation, and soils. Cartography, weather, and climate are studied in Geog. 471. Landforms, vegetation, soils, and the integration of physical features in selected areas are studied in Geog. 472. Mr. Wallace and Mr. LeBlanc. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

473, (473). THE WEATHER
The interpretation of atmospheric phenomena; the heating and circulation of the atmosphere and the nature and movement of the air masses which influence the weather of North America and particularly of New England. Mr. Chapman. 2 cr.

481. CULTURAL GEOGRAPHY
The geographic pattern of mankind. The differentiation of the world in terms of population, race, language, religion, and the basic economic activities. Emphasis is placed on the historical origin and diffusion of these phenomena as well as their significance in understanding the contemporary culture map of the world. Mr. LeBlanc. 3 cr.

511. GEOGRAPHY OF ANGLO-AMERICA
A regional and topical analysis of the United States and Canada. Physical features and human phenomena are studied in terms of their contributions to the character of the area. Mr. Wallace. Prereq: Geog. 401 or 402, or permission of instructor. 3 cr. (Alternate years; offered in 1966-67.)

531. GEOGRAPHY OF WESTERN EUROPEAN 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 landforms, climates and vegetation; the distribution of races, languages and religions, and the significance of these factors in Western Europe. Most of the course is devoted to the analysis of the following areas: the British Isles, Northern Europe, the Low Countries, Germany, Alpine Europe, France, and Mediterranean Europe. Mr. Wallace. Prereq: Geog. 401 or 402, or permission of instructor. 3 cr. (Alternate years; not offered in 1966-67.)
532. Geography of the U.S.S.R. and Eastern Europe
A systematic analysis of the Soviet Union and the Communist Bloc countries 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. Prereq: Geog. 401 or 402 or permission of the instructor. (Alternate years; not offered in 1966-67.)

570. Climatology
The description, analysis, and interpretation of the climates of the world. A knowledge of the basic meteorological processes is assumed. Major topics covered include: world patterns of temperature, precipitation, pressure and winds, and the causes of these patterns; local weather and storm types; new concepts in meteorology and their application to climatology; problems of climatic classification and the major systems of climatic classification. Mr. Wallace. Prereq: Geog. 471 or 473, or permission of the instructor. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

795. Meteorological or Geographical Problems
Special problems by means of conferences, assigned readings, and laboratory work, fitted to individual needs. Mr. Wallace, Mr. LeBlanc and Mr. Chapman. Prereq: Permission of the instructor. 1-5 cr. This course may be repeated to a total of not more than 5 credits.

797. Seminar in Geography
The purpose of this course is to provide an integration of the various fields of geography, to give an introduction to the history and methodology of geography, and to provide an introduction to the research techniques of the discipline. Major topics to be covered include the history of geographic thought, source materials and methods of geographic archival research, problems of cartographic representation, statistical techniques in geography, geographic field techniques, and the definition of research problems in geography. Students will prepare short research papers and select topics for independent study the following semester. Course intended primarily for seniors majoring in geography. Mr. Wallace and Mr. LeBlanc. Prereq: Permission of instructor. 3 cr.

German and Russian

Hermann W. Reske, Professor and Chairman; Alexander P. Danoff, Assistant Professor; Laurence V. Harding, Assistant Professor; Ursula D. Lawson, Instructor; Judith M. Oloskey, Instructor; Hildegard S. Reske, Lecturer

German (57)
New students will be assigned to the proper course on the basis of their scores on the German placement examination.
German and Russian

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 credits toward a major. 5 rec; 2 lab; 4 cr. (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.)

501-502. GERMAN COMPOSITION AND GRAMMAR REVIEW*
A systematic review of German grammar and syntax. Concentration on the writing of compositions of gradually increasing difficulty, proceeding from concrete observations to theoretical and abstract discussion. 3 rec; 1 lab; 3 cr. Open by placement examination, and to students who have passed German 402 with a grade of C. Students making a grade of A in German 502 may take courses numbered 750 and above with the permission of the Department Chairman.

507-508. ORAL PRACTICE IN GERMAN*
A systematic course in oral self-expression, stressing enunciation and intonation. Prepared and extemporaneous talks, dialogues and group discussions. 2 rec; 1 lab; 2 cr. Open by placement examination, and to students who have passed German 402 with a grade of C. Students making a grade of A in German 508 may take courses numbered 750 and above with the permission of the Department Chairman.

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. 3 cr. This course or its equivalent is prerequisite to all higher courses in German. Open to students who have achieved a grade of C or better in German 507-508, and by placement examination. Open also to students who have received a grade of C or better in German 501-502 and who have permission of the Department Chairman.

685-686. JUNIOR YEAR AT MARBURG UNIVERSITY
A program of studies at the University of Marburg (West Germany) for students at the University who have completed their sophomore year and have passed with a grade of B or better German 502 or the equivalent. Those applying will be expected to attend regularly during the semester preceding their year abroad a non-credit orientation seminar. Interested students should consult with the Director of the Program, Professor Hermann W. Reske. 32 cr. Students must be approved for this program.

695, 696. HONORS WORK IN GERMAN
For seniors writing a research paper in the Honors program in German. Prereq: Permission of Department Chairman. Variable credit.

755. GERMAN LITERATURE OF THE AGE OF THE BAROQUE
German literature between Reformation and the Age of Enlightenment. Reading, interpretation, and critical analysis of prescribed prose, drama

* No student educated in a foreign country will be permitted to register for any German course numbered 650 or below if German is the student's native language.
and poetry with emphasis on the philosophical and social ideas of the time. Prereq: German 605, 606. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

**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. Prereq: German 605, 606. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

**757-758. THE AGE OF GOETHE**
German literature of Storm and Stress and the Classical Period. Interpretation and critical analysis with emphasis upon selected works of Wagner, Klinger, Lenz, Schiller, and Goethe. Prereq: German 606. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

**759-760. GERMAN ROMANTICISM**
German literature from the end of the Eighteenth century to 1830. Interpretation and critical analysis of prescribed prose, drama, and poetry of prominent writers and poets of the period, from Wackenroder to Eichendorff. Prereq: Ger. 606. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

**761-762. THE AGE OF REALISM**
Representative German writers, dramatists, poets and novelists from the end of Romanticism to the beginning of Naturalism (1830-1880) will be read and discussed with a background of social and philosophical development. Prereq: German 606. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

**763-764. GERMAN LITERATURE SINCE 1880**
From Naturalism to the present. Reading, interpretation, and critical analysis of prescribed prose, drama and poetry of Hauptmann, Hofmannsthal, Rilke, Mann, Kafka. Prereq: German 606. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

**781-782. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE AND ADVANCED STYLISTICS**
A systematic study of style, shades of meaning, adequacy of expression. A thorough knowledge of German grammar is prerequisite. Practice in writing seminar papers and obtaining stylistic flexibility in the use of written German. Prereq: German 605-606. 3 cr; 4 cr. for Honors.

**795, 796. SPECIAL STUDIES IN GERMAN LITERATURE**
Individual guided study in special topics, with training in bibliography, note taking, organization of material. Examples of topics which may be selected by instructor and student in conference are: (1) Wolfram von Eschenbach: Parzival, (2) Walther von der Vogelweide: Lyrics, (3) Middle High German Popular Epics, (4) German Literature of the 17th Century, (5) Goethe's Poetry, (6) Goethe's Faust, (7) Heinrich v. Kleist, (8) German Romanticism, (9) 20th Century German Literature. Prereq: Permission of Department Chairman. Variable credit.
German and Russian

Russian (61)

New students will be assigned to the proper course, on the basis of their scores on the Russian placement examination.

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. 5 rec; 2 labs; 4 cr. (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.

501-502. INTERMEDIATE RUSSIAN*
Intensive grammar review. Oral practice stressing pronunciation and intonation. Reading of prose and practice in written expression. 3 rec; 1 lab; 3 cr. Open by placement examination and to students who have passed Russian 402 with a grade of C.

605-606. INTRODUCTION TO RUSSIAN LITERATURE*
Readings of selections from Russian literature with emphasis on comprehension. Conversation and composition based on the texts used. Classroom work in Russian. Background reading and term paper in English. 3 rec; 3 cr. Open to students who have passed Russian 502 with a grade of B or permission of instructor.

795, 796. SPECIAL STUDIES IN RUSSIAN LITERATURE
Individual guided study in special topics. Topics may be chosen from pre-nineteenth century literature, the Silver Age of Poetry, Poetry and Prose of the Soviet Era. Prereq: Permission of the instructor. Variable credit.

Government (See Political Science)

Greek (See Spanish and Classics)

History (53)

William R. Jones, Associate Professor and Chairman; William Yale, Professor Emeritus; Philip M. Marston, Professor; David F. Long, Professor; Hans Heilbroner, Professor; William Greenleaf, Professor; Gibson R. Johnson, Associate Professor Emeritus; Allan B. Partridge, Associate Professor; Robert C. Gilmore, Associate Professor; Charles A. Jellison, Jr., Associate Professor; Marion E. James, Associate Professor; Robert M. Isherwood, Assistant Professor; Douglas L. Wheeler, Assistant Professor; Allen B. Linden, Instructor; John O. Voll, Instructor; John M. Donaldson, Instructor

*No student educated in a foreign country will be permitted to register for any Russian course numbered 650 or below if Russian is the student's native language.
Students are not permitted to enroll concurrently in survey courses and advanced courses of the same area, i.e., History 503 and 707, 708, 711, 719; 504 and 712, 715, 716, 720; 535 and 743, 747; 536 and 747, 749, 756; 580 and 781. Students are not 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 required of all students.

401, 402. INTRODUCTION TO CONTEMPORARY CIVILIZATION
A historical analysis of the fundamental forms and forces of human societies, Western and non-Western, from the Paleolithic Age to the present. Special attention will be given to the history of science and technology, of education and learning and of artistic expression. Staff. 3 cr. No credit toward a major.

Group I

503, 504. HISTORY OF THE UNITED STATES
American history from Washington’s first administration to the present. Political, social, economic, and diplomatic aspects. Mr. Jellison and Mr. Long. Not open to freshmen. 3 cr.

707, 708. COLONIAL AND REVOLUTIONARY AMERICAN HISTORY
Colonial beginnings in America, national rivalries, the English colonies, the Revolution, and our national life to 1789. Early forms of Americanism in the making. Mr. Marston. 3 cr.

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. 3 cr.

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 a world power in the nuclear age. Political, economic, and diplomatic developments. Mr. Greenleaf. 3 cr.

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. 3 cr.

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. Prereq: Permission of the instructor. 3 cr.

725. BUSINESS HISTORY
A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to
the era of the giant diversified corporation. Emphasis is placed on the role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf, 3 cr.

Group II

535, 536. MODERN EUROPEAN HISTORY
Europe from the end of the Middle Ages to our own times. The evolution of the national state; international relations; the expansion of Europe overseas; and the background of our 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. Not open to freshmen. 3 cr.

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. Not open to freshmen. 3 cr.

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. 3 cr.

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. 3 cr.

747. THE AGE OF ABSOLUTISM
The theory and practice of absolutism from its origin in the seventeenth century to its apogee in Enlightened Despotism. Mr. Isherwood. 3 cr.

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. 3 cr.

756. TWENTIETH-CENTURY EUROPE
European history in the Twentieth Century will be treated from the point of view of a civilization in a constant state of crisis. World War I, the inter-war period, World War II, and the attempts to solve the conflicts of modern society after that war in terms of new economic, political, and cultural patterns will represent the core of the study. The effects of extra-European influences, the loss of European primacy and continued strife within the structure of the European state and cultural system. Mr. Heilbronner. 3 cr.

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 understand-
ing of the present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. Mr. Heilbronner. 3 cr.

774. European Historiography
An examination of selected works of historical literature since the Reformation. Emphasis will be placed on the comparison of different schools of historical interpretation, the development of historical methods, and the impact of Romanticism, Idealism, Nationalism, and Positivism on the composition of historical literature. Mr. Isherwood. 3 cr.

Group III

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. Not open to freshmen. 3 cr.

575. The Ancient Near East
A history of the Near East from the neolithic revolution 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. Not open to freshmen. 3 cr.

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. Not open to freshmen. 3 cr.

577. The Hellenistic-Roman World
History of the Ancient World from the death of Alexander in 323 B.C. to the end of Constantine's reign in 337 A.D. The course will cover major political, economic, and social developments but will give most consideration to artistic, scientific, philosophical, and religious trends—with particular emphasis on the rise of Christianity and the transformation of the classical world. Miss James. Not open to freshmen. 3 cr.

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. Not open to freshmen. 3 cr.

585, 586. The History of the Middle East
The history of the Middle East from antiquity to the present time. Some of the topics covered will be the genesis and expansion of Islam; the establishment of Ottoman rule; relations with European powers; and the emergence of modern nations in this area. Mr. Voll. Not open to freshmen. 3 cr.

587, 588. The History of Sub-Saharan Africa
The history of the African continent, its peoples and cultures from the neolithic period to the present time. Some of the topics covered will be
History

the peopling of Africa; Africa's contact with the ancient world; the
growth of African states and kingdoms; the impact of Islamic and Eu-
ropean civilizations; and the establishment and destruction of European
imperialism. Mr. Wheeler. Not open to freshmen. 3 cr.

(781). HISTORY OF MODERN CHINA, 1850-1950
A study of the modernization of China. The course will be concerned
with 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. 3 cr.

784. HISTORY OF SOUTHERN AFRICA SINCE 1820
Mr. Wheeler. 3 cr.

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 moderniza-
tion and reform of the traditional society, the conservative reaction to
reform, the impact of nationalism and the appearance of new ideologies.
Mr. Voll. 3 cr.

Group IV

695, 696. HONORS PROGRAM
An honors program involving two types of work: (1) The student carries
on independent study in some specialized areas (according to the re-
quirements of the existing independent study program). (2) The student
attends a seminar in which he discusses the nature of history, historical
method, and a survey of historical writing, various historical philosophies,
and interpretations. Prereq: A student must have a cumulative average
of 3.0, or must show an exceptional aptitude for history. Each case will be
judged individually. 3 or 6 cr.

(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 Phys. Sci. (789). Mr. Schneer. Cannot be used for credit in
History without permission of the History Department. Prereq: Permis-
sion of adviser and instructor. 3 cr.

HISTORY-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL
HISTORY AND OTHER SOCIAL STUDIES
Bibliography and new interpretations of history; the social studies cur-
riculum, past and present; aims and objectives in the social studies;
selection and organization of teaching material; teaching and testing tech-
niques. Special emphasis on teaching American history and the problems
of American democracy. Open to students who have satisfactorily com-
pleted History 503, 504; six credits in other history courses, exclusive of
History 401, 402; six credits from American Government, Principles of
Economics or Principles of Sociology; and Education 758. 3 cr. This
course may not be used to satisfy major requirements.

792. ADVANCED STUDY IN THE TEACHING OF WORLD HISTORY
6 cr. (Offered in Summer Session only. Admission limited to in-service
high school teachers with permission of the Department of History.)
Home Economics (31)

Marjory A. Wybourn, Professor and Chairman; Elizabeth M. Rand, Associate Professor; Earl O. Goodman, Associate Professor; Ruth E. Pearce, Associate Professor; Dawn A. McClowry, Instructor; Sylvia E. Hoffman, Instructor

407. HOME ECONOMICS PROFESSIONAL SEMINAR
Designed to help the student define and clarify professional and educational objectives and to become acquainted with the philosophy of home economics and with professional opportunities in the field. Trips will be planned to meet home economists in various positions. Miss Wybourn and staff. 2 cr. NLG.

(548), 548. FIELD WORK
A supervised experience which provides an opportunity for students to explore various professional fields. Prereq: Permission of adviser. Staff. 2-6 cr.

Child Development and Family Relations

415, (415). PERSONALITY AND COURTSHIP
The effects of family interaction on the personality development of the individual from birth through courtship with an emphasis on the student gaining insight into his own involvement in courtship and mate selection. Mr. Goodman. 3 cr.

425-426, (425). CHILD DEVELOPMENT
The development and guidance of the child from the prenatal to the adolescent period with emphasis on the preschool child. Observation and work at the University Nursery School. Study of children in other situations may be included during the second semester. Not open to freshmen. Miss Rand. 3 cr.

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. Enrollment by application to the Department of Home Economics. 15-17 cr.

783, (783). FAMILY RELATIONSHIPS
A study of husband-wife, parent-child, and sibling interactions throughout the family life cycle. Mr. Goodman. 3 cr.

(792). METHODS IN FAMILY RELATIONS EDUCATION
A study of the methods and materials used in family relations education in high schools, colleges, churches, and social agencies. Mr. Goodman. 2-4 cr.

795, (795). PROJECTS IN CHILD DEVELOPMENT
Discussion, conferences, and supplementary projects based upon special interests of the student. Work with children in the University Nursery School or in other situations. Prereq: H.E. 426 and permission of the instructor. 1-3 cr. each semester. Miss Rand. Maximum of 6 cr.
Clothing and Textiles

(404), 404. TEXTILES
The textile fibers and their characteristics, natural and man-made, as related to their selection, care, and ultimate use. 3 cr.

405, (405). CLOTHING SELECTION AND CONSTRUCTION
Selection of clothing to meet individual needs with consideration given to design appropriateness and social, psychological, and economic forces. Principles involved in clothing construction with application to garments. 3 cr.

560. FLAT PATTERN
Application of the principles of flat pattern designing to the development of design ideas for apparel. Prereq: H.E. 405. Miss Pearce. 3 cr

561. DRAPING
Basic principles of fabric manipulation in the draping processes and the development of patterns and garments through this method. Prereq: H.E. 405 or equivalent. 3 cr.

563 TAILORING
The appreciation and application of tailoring principles to making and buying tailored garments. Prereq: H.E. 560. Miss Pearce. 3 cr.

765. HISTORY OF COSTUME
A broad historical survey of western world costume from primitive times to the present. The influence of social, religious, and political conditions of the eras studied to costume evolution. 3 cr. Miss Pearce. (Alternate years; not offered in 1966-67.)

768. SOCIO-PSYCHOLOGICAL ASPECTS OF CLOTHING
The analysis of research and theory in the social psychological aspects of clothing. An exploration and study of clothing behavior of individuals and groups. Miss Pearce. 3 cr.

(769). ADVANCED TEXTILES
Investigation and evaluation of fabrics in everyday use. Consumer problems with emphasis on economic and social implications. Prereq: H.E. 404. 3 cr.

Foods and Nutrition

(418), 418. PRINCIPLES OF FOOD SELECTION AND PREPARATION
Fundamental principles of selection, preparation, meal planning and service of food. Miss McClowry. 3 cr.

521. (521). QUANTITY FOODS AND PURCHASING
Principles and methods of quantity food production and purchasing. Laboratory experiences in the University Dining Halls. Prereq: H.E. 418. Miss Hoffman. 3 cr.

573, (573). NUTRITION
A study of the nutrients essential to human life and well-being, their functions in metabolism, sources in food, and relationship between food habits and health. An application of this information to all stages of the family life cycle. Second semester freshmen may enroll. Miss Hoffman. 3 cr.
674. **Nutrition in Health and Disease**  

771, (771). **Experimental Foods**  
Application of the experimental method of study to the principles underlying food preparation. Includes laboratory and individual projects. Prereq: H.E. 418. Miss Hoffman. 3 cr.

778. **Food and Nutrition Trends and Developments**  
Investigation and evaluation of current problems in food production, preparation and preservation and of current nutritional developments. Independent study of current literature. Miss Hoffman. 3 cr.

797. **Nutrition Seminar**  
Theoretical approach to nutrient metabolism. Critical review of literature in the field of nutrition relative to the principles on which human nutrition is based. Prereq: H.E. 573. Miss Hoffman. 3 cr.

**Home Economics Education**

791. **Methods in Home Economics Education**  
Home economics education in the school program, curriculum materials, methods, and resources in teaching home economics. Miss Wybourn. 3 cr.

(794), 794. **Supervised Teaching in Home Economics**  
Eight weeks of supervised teaching in a school. Prereq: Educ. 757 and H.E. 791. 7 cr.

(798), 798. **Seminar in Home Economics Education**  
Recent developments and problems in teaching home economics at all levels. Individuals or small groups may work on specific problems in the field. Prereq: H.E. 791 or equivalent. 2-4 cr.

**Management and Housing**

(531). **Interior Design**  
An application of the principles of design to the decorating of the home. Economic and social factors relating to housing for the family. 3 cr.

(654), 654. **Family Financial Management**  
Basic principles of management, family financial decision-making at various stages of the family life cycle in relationship to values and goals. Family expenditures, methods of keeping records, use of credit, investments, and various forms of insurance. 3 cr.

(658), 658. **Home Management Experiences**  
Management principles in the operation of the home. Permission of instructor. 2-4 cr.

757, (757). **Home Management**  
The management of individual and family resources as related to human needs, values, and goals throughout the life cycle of the family. Prereq: H.E. 654 or permission of instructor. 3 cr.
Projects in Home Management

The student, under the guidance of the instructor, will undertake selected areas of study in the field of home management. Such investigations may include: (1) home management for the disabled, (2) consumer education, (3) management processes, (4) current research. 1-3 cr. each semester. Maximum of 6 cr.

Hotel Administration (74)

Richard H. Pew, Associate Professor; John R. Cox, Instructor

401. Introduction to Hotel Management
The scope of the hotel-motel business, both resort and transient. History of hospitality including current trends in the lodging and feeding industries. Mr. Cox. 2 cr.

410, 412, 514, 516. Lectures on Hotel Management
Delivered by notable representatives in the hotel-motel, club, food service, institutional, student union, and allied fields. Mr. Pew. ½ cr. for each course. NLG.

509. Hotel and Restaurant Accounting
A study of hotel and restaurant accounting systems with emphasis on internal control. Includes study and interpretation of operating statistics and financial reports. Food and beverage cost accounting is also presented. Open to Hotel Administration majors only. Mr. Cox. Prereq: B.A. 502. 3 cr.

555. Hotel Operation
The organization, personnel, and work of the departments; front office procedure; housekeeping. Mr. Pew. Prereq: H.A. 509 or permission of instructor. 3 cr.

556. Hotel Engineering Problems
Basic principles of electricity and heat, laundry practices and equipment, kitchen planning and layouts, pumps and vacuum systems, water supply and use, fire protection and other mechanical problems of hotel-motel and food service operations. Mr. Pew. Prereq: H.A. 555 or permission of the instructor. 3 cr.

666. Hotel Promotion and Sales
The principles and practices used internally and externally for stimulating hotel and restaurant sales. Mr. Cox. Prereq: H.A. 555. 2 cr.

667. Stewarding and Catering
Purchasing, receiving, and control of foods and beverages. Organized as staff-type meeting for laboratory research, planning, preparation, and service of exceptional functions, including the critique. Mr. Pew. Prereq: H.E. 521 or 771. 3 cr.

669. Hotel Administration Project
A problems course concerned with advancing knowledge in the lodging and feeding fields. Mr. Pew. Prereq: Senior standing and permission of the instructor. 3 cr.
670. **SENIOR SEMINAR**  
Assigned readings, followed by discussion of techniques, procedures and policies in hotels, clubs, motels, restaurants, hospitals, institutions, and student unions; contract feeding; university lodging and feeding. Mr. Pew. Prereq: Senior standing and permission of the instructor. 2 cr. Open to Hotel students only.

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**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 an historical framework but is not intended to be an 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. Casas, Mr. Daggett, Mr. Maynard, and guest lecturers. Not open to freshmen. 3 cr.

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**Italian (See French and Italian)**

**Languages (See Language, General; French and Italian; German and Russian; Spanish and Classics)**

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**Language, General (55)**

501, 502. **SURVEY OF GREEK AND ROMAN LITERATURE**  
The masterpieces of Greek and Roman literature in translation. Through the study of literature, the students 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 languages 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. 3 cr. **No credit toward a major.**

**LANGUAGE-EDUCATION (LANG-ED.) 791. PROBLEMS IN THE TEACHING OF MODERN LANGUAGES IN THE HIGH SCHOOL**  
The special objectives, methods, and devices of modern language teaching in high school. For prospective teachers of French, German and Spanish. Prereq: Education 758 with grade of C or better (or one year of teaching experience) and one of the following courses: French 506, German 606, Spanish 506. 3 cr.

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**Latin (See Spanish and Classics)**
The following courses are non-departmental.

651, (651). Senior Synthesis: American Civilization in Transition
An interdisciplinary course designed to promote an awareness of some major issues facing the contemporary world. Assigned readings and weekly evening lectures by guest speakers constitute the basis for reflection and discussion in two one-hour seminar sections. Mr. Menge. Prereq: Senior standing. 3 cr. Open to all Colleges.

695, 696. Independent Study
Independent study for the College of Liberal Arts junior or senior honor student whose major department has no independent study course. Prereq: 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 6 credits and a senior for a total of 12 credits. See description of the College of Liberal Arts Honors Program.

Mathematics (84)

M. Evans Munroe, Professor and Chairman; Marvin R. Solt, Professor Emeritus; William L. Kichline, Professor; Robert J. Silverman, Professor; Robb Jacoby, Professor; Shan S. Kuo, Professor of Applied Mathematics; James Radlow, Professor of Applied Mathematics; Edward H. Batho, Professor; Shepley L. Ross, Associate Professor; David M. Burton, Associate Professor; Richard H. Balomenos, Associate Professor; William E. Bonnice, Associate Professor; Robert O. Kimball, Assistant Professor; Frederick J. Robinson, Assistant Professor; William G. Witthoft, Assistant Professor; Merle D. Guay, Assistant Professor; Samuel D. Shore, Assistant Professor; Roger H. Hou, Assistant Professor; Daniel J. Heisey, Assistant Professor; Calvin J. Williams, Instructor

401-402. Digital Computation Principles I and II
An introduction to the electronic digital computer. No previous knowledge of computers or college mathematics is assumed. 402 includes the FORTRAN language, use of the IBM 1620 system, and an introduction to the IBM 360 system. Open to any student. 1 cr.

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. Prereq: At least 3 entrance units in mathematics taken exclusively from the fields of algebra, geometry, and trigonometry, and including work in all three of these subjects. 3 cr. Does not count for major credit in Mathematics.

407-408. Fundamental Mathematics
Introduction to logic, selected topics in mathematical structures; limits, continuity, introduction to calculus; finite mathematics; probability and
statistical inference; theory of games. Recommended for non-technical students desiring a year's work in mathematics at the University level. Prereq: At least 3 entrance units in mathematics taken exclusively from the fields of algebra, geometry, and trigonometry, and including work in all three of these subjects. 3 cr. Does not count for major credit in Mathematics.

411. DIGITAL COMPUTER SYSTEMS
Similar to 401-402 except this course is recommended for non-technical students. Includes concepts of the logical flow chart, essentials of computer languages, and use of available equipment. 2 cr.

421. CALCULUS B 1
Review of topics from algebra and trigonometry; introduction to differential and integral calculus. Students electing calculus will be placed in the 421-422-523 sequence or in the 425-426 sequence on the basis of an achievement test in algebra and trigonometry. Prereq: 2 years of algebra, 1 year of geometry, ½ year of trigonometry. 3 cr. Does not count for major credit in Mathematics.

422. CALCULUS B 2
Continuation of differential and integral calculus with analytic geometry. Prereq: Math. 421. 3 cr. Does not count for major credit in Mathematics.

425. CALCULUS A 1
First course in analytic geometry and calculus. Students electing calculus will be placed in the 421-422-523 sequence or in the 425-426 sequence on the basis of an achievement test in algebra and trigonometry. Prereq: 2 years of algebra, 1 year of geometry, 4 cr. Does not count for major credit in Mathematics.

426. CALCULUS A 2
Conclusion of introductory course in calculus of functions of one argument. Prereq: Math. 425. 4 cr.

523. CALCULUS B 3
Conclusion of introductory course in calculus of functions of one argument. Prereq: Math. 422. 3 cr.

527. DIFFERENTIAL EQUATIONS
Basic concepts, methods, and applications of ordinary differential equations; exact and approximate methods for solving first order equations; higher order linear equations; series solutions; systems of equations; boundary value problems. Prereq: Math. 523 or 426. 4 cr.

528. MULTI-DIMENSIONAL CALCULUS
Vectors, matrices and linear transformations, partial derivatives, maximum-minimum problems, implicit function theorem and applications, vector differential calculus, exterior products and multiple integrals, the generalized Stokes theorem and its classical specializations. Prereq: Math. 523 or 426. 4 cr.

531. INTRODUCTION TO SET THEORY AND NUMBER SYSTEMS
Fundamental concepts of logic and set theory; formal development of the rational, real; and complex number systems. Prereq: Math. 422 or 426. 3 cr.
542. **PROBABILITY**
Discrete and continuous distributions; random variables; moments; normal and Poisson distributions; the central limit theorem; laws of large numbers. Prereq: Math. 531. 3 cr.

601-602. **FOUNDATIONS OF THE NUMBER SYSTEM**
Postulates and mathematical structures. A study of various mathematical systems designed to show the nature and significance of the fundamental principles of arithmetic. Intended primarily for elementary school teachers. Prereq: Consent of instructor. 3 cr.

603. **BASIC CONCEPTS OF ALGEBRA**
An introduction to generalization and abstraction in algebra designed primarily for prospective elementary school teachers. Prereq: Math. 602. 3 cr.

604. **INFORMAL GEOMETRY**
An introduction to the objects and methods of study in a modern treatment of Euclidean geometry designed primarily for prospective elementary school teachers. Prereq: Math. 602. 3 cr.

609. **METHODS OF APPLIED MATHEMATICS I**
Solutions of ordinary differential equations by D-operators, Laplace Transforms, and by series; representation of functions by definite integrals (Gamma, Beta, and error functions); Bessel functions; Fourier Series. Prereq: Math. 527. 4 cr.

610. **METHODS OF APPLIED MATHEMATICS II**
Vector analysis (line, surface, and volume integrals); elementary variational techniques; development of some partial differential equations of mathematical physics; solutions of partial differential equations by Laplace transforms and by Green's functions. Prereq: Math. 629. 4 cr.

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 to 6 cr.

698. **SENIOR SEMINAR**
Individual study on special topics. Preparation and presentation of reports on topics assigned. Prereq: Senior standing in mathematics. 3 cr.

741. **MATHEMATICAL STATISTICS I**
Sampling theory; estimation of parameters; the multivariate normal distribution. Prereq: Math. 542. 3 cr.

742. **MATHEMATICAL STATISTICS II**
Testing statistical hypotheses, confidence intervals, regression and correlation, non-parametric methods, and other topics. Prereq: Math. 741. 3 cr.

753-754. **METHODS AND TECHNIQUES OF MODERN COMPUTATION**
Methods of numerical analysis which are believed to be particularly suitable for high speed computation, including some newly developed methods. Methods for making analytical approximations will also be emphasized. An introduction to programming techniques, assembly and compiler
Mathematics

programs, interpretive systems and symbolic operations. In the laboratory portion of the course, the practical aspects of modern computation, such as loss of precision, round-off error, overflow and underflow, etc., will be illustrated by means of short problems on both the desk calculator and the digital computer in the UNH Computation Center. A long range project for investigation on the computer will be assigned. Prereq: Math. 527 and 301. 3 lec; 1 lab; 4 cr.

755. FUNDAMENTAL CONCEPTS OF GEOMETRY
Systems of postulates of various geometries; geometric invariants; synthetic and analytic projective geometry; introduction to non-Euclidean geometry, topology, and the elementary differential geometry of curves and surfaces. Prereq: Math. 523 or 426. 3 cr.

756. TOPICS IN NUMBER THEORY
Elementary properties of integers; the Euclidean algorithm; divisibility; diophantine equations of the first degree; congruences; residue classes and the Euler function; distribution of primes; quadratic residues; diophantine equations of the second degree; selected topics in diophantine approximation and number-theoretic functions. Prereq: Math. 426 or 523. 3 cr.

761. HIGHER ALGEBRA I
The integers; the rational and complex number systems; congruences; polynomials; groups; rings; integral domains; fields. Prereq: Math. 551. 3 cr.

762. HIGHER ALGEBRA II
Vector spaces and transformations matrices and determinants. Prereq: Math. 761. 3 cr.

767. REAL ANALYSIS I
The real number system; elements of set theory; theory of limits; continuous functions and their properties; differentiability and the mean value theorem. Prereq: Math. 531. 3 cr.

768. REAL ANALYSIS II
The Riemann integral; uniform convergence; double and iterated limits; applications of double limit theorem to series, limits under the integral sign and existence theorems for differential equations. Prereq: Math. 767. 3 cr.

771. GROUP THEORY AND PRINCIPAL IDEAL DOMAINS
Finite groups and their applications; Galois theory; Sylow theorems; structure of principal ideal domains with applications to elementary divisor theory; unique factorization domains. Prereq: Math. 762. 3 cr.

781. THEORY OF APPROXIMATION
The theorems of Weierstrass on approximation of continuous functions; the Tschebycheff approximation problems; Tschebycheff polynomials; trigonometric polynomials of best approximation; interpolation; the formulas of Lagrange and Newton; trigonometric interpolation. Prereq: Math. 527. 3 cr.

782. NON-LINEAR DIFFERENTIAL EQUATIONS
Phase plane analysis of lineal systems and non-linear conservation systems; stability theorems; limit cycles and periodic solutions; the Van der
Mathematics

Pol equation; the method of Kryloff and Bogoliouboff. Prereq: Math. 527. 3 cr.

783. INTRODUCTION TO DIFFERENTIAL GEOMETRY
A first course in the metric differential Geometry of curves and surfaces in Euclidean space. Prereq: Math. 527. 3 cr.

784. INTRODUCTION TO TOPOLOGY
Elementary point-set topology in metric and topological spaces, in particular the real line and plane. Prereq: Math. 761. 3 cr.

788. COMPLEX ANALYSIS
The complex number system; analyticity; elementary functions; Cauchy integral theorem and formulas; Taylor and Laurent series; singularities and residues; conformal mapping. Prereq: Math. 527. 3 cr.

791. MATHEMATICS-EDUCATION (MATH-ED)
The aims and values of secondary-school mathematics; the recommendations of the national committee on mathematics requirements, and the State Board requirements; the subject matter and the sequence in which it should be presented in both junior and senior high schools; techniques and instructional aids used in teaching secondary-school mathematics; errors, testing program, remedial teaching. Students preparing to teach mathematics in high school should register for this course — it is a prerequisite for Supervised Teaching in Mathematics. Lectures, assigned readings and discussion. Prereq: Education 758 and Math. 523 or 426. 3 cr. May be counted as major credit only by students preparing to teach mathematics in secondary schools.

796. INTRODUCTION TO THEORY OF DIFFERENTIAL EQUATIONS
Existence and uniqueness theorems for ordinary differential equations; theory of linear ordinary differential equations of order n; oscillation and comparison theorems for second order linear ordinary differential equations; first order partial differential equations; linear partial differential equations of the second order. Prereq: Math. 767. 3 cr.

Mechanical Engineering (85)

Robert W. Corell, Associate Professor and Chairman; Edward T. Donovan, Professor; E. Howard Stolworthy, Professor; Tenho S. Kauppinen, Associate Professor; Russell L. Valentine, Associate Professor; E. Eugene Allmendinger, Associate Professor; Douglas M. Norris, Jr., Associate Professor; William Mosberg, Associate Professor; Victor D. Azzi, Associate Professor of Mechanics; Godfrey H. Savage, Associate Professor; Wayne M. Beasley, Adjunct Associate Professor of Materials Science; Frederich G. Hochgraf, Associate Professor of Materials Science; William E. Clark, Assistant Professor; Wei Tseng Yang, Assistant Professor; John A. Wilson, Assistant Professor; Harvard B. Emery, Assistant Professor of Graphics; Elias M. O'Connell, Instructor Emeritus
405, (405). ENGINEERING GRAPHICS
Communication of engineering information and concepts by multiview
drawings, pictorial views, sketches, and graphs; the fundamentals of
descriptive geometry. 2 lab; 3 cr.

413. ENGINEERING GRAPHICS
Communication of engineering information and concepts by multiview
drawings, pictorial views, sketches, and graphs. 1 lab; 1½ cr.

414. ENGINEERING GRAPHICS
The analysis of various engineering problems employing the fundamen­
tals of descriptive geometry. Prereq: M.E. 413. 1 lab; 1½ cr.

510, (510). MANUFACTURING PROCESSES AND DESIGN
A study of the machines and processes that are used in manufacturing
and an analysis of the effect of these processes on the design of manufac­
tured parts. Prereq: M.E. 405. 3 lab; 3 cr.

511, (511). MACHINE SHOP PRACTICE
Advanced work in machine tools and their use; production methods,
inspection, and quality control. Prereq: M.E. 510. 2 lab; 2 cr.

522. MATERIALS I
An introduction to the structure and properties of metals, plastics, and
ceramics; the influence of atomic structure on physical properties;
equilibrium multiphase relations; deformation models. Prereq: Chem.
401, 403, or 405. 3 cr.

523, (523). MECHANICS OF SOLIDS
Statics of rigid and deformable bodies; stress, strain, and constitutive
laws; stress and deformation in structural elements and simple struc­
tures; elastic and plastic stability. Prereq: Physics 404, Math. 426 or Math.
422. 4 cr.

524, (524). DYNAMICS
Review of particle dynamics; kinematics and dynamics of rigid bodies;
moving reference frames; vibration of linear systems. Prereq: Physics
404, Math. 426 or Math. 422. 4 cr.

533. THERMODYNAMICS
The fundamental laws of thermodynamics and their relation to working
substances. Prereq: Math. 422 or 426. 3 cr.

534. THERMODYNAMICS
A comprehensive study of the laws of thermodynamics and their affect
on the behavior of media; microscopic thermodynamics; thermodynamics
of combustion reactions; heat transmission. Prereq: M.E. 533. 3 cr.

536. 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. Prereq:
M.E. 524 and M.E. 533. 3 cr.

537. MECHANICAL LABORATORY
Introduction to instrumentation and measurement of mechanical systems;
design and management of experimental studies; preparation of engineer­
ing reports. Prereq: or concurrent: M.E. 533, 523, 524. 1 lec; 1 lab; 2 cr.
538. MECHANICAL LABORATORY
Experimental methods in the solution of engineering problems; experimental design, data analysis, and management of experiments. Prereq: M.E. 537. 1 lec; 1 lab; 2 cr.

539. MECHANICAL LABORATORY
Experimental methods in solution of engineering problems. (For Electrical Engineering students.) Prereq: M.E. 523, 524, 533. 1 lab; 1 cr.

643. MACHINE DESIGN AND ANALYSIS
The concepts of strength of materials and dynamics are developed further and applied in the analysis and design of mechanical elements and systems. Prereq: M.E. 523, 524, Math. 527. 3 cr.

644. MECHANICAL VIBRATIONS
Theory of vibratory motion applied to the analysis of discrete mechanical systems. Prereq: M.E. 524, Math. 527. 3 cr.

653. HEAT TRANSFER
Analysis of heat transfer phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Prereq: M.E. 534, 536, Math. 527. 3 cr.

657-658. HEAT AND POWER SYSTEMS
The utilization of thermodynamics, fluid mechanics, combustion, heat transfer, and other engineering sciences in the analysis and engineering evaluation of heat and energy conversion systems. Prereq. or concurrent: M.E. 653. 2 lec; 1 lab; 3 cr.

663. MATERIALS II
Theoretical and experimental application of the theory of elasticity, dislocation theory, and fracture mechanics to the determination of physical design parameters of crystalline and amorphous solids. Prereq: M.E. 522. 2 lec; 1 lab; 3 cr.

671. NAVAL ARCHITECTURE I
Introduction to naval architecture; geometry and hull form delineation; hydrostatic characteristics of floating and submerged bodies; introduction to ship strength; computer applications to problems. Prereq. or concurrent: M.E. 523. 3 cr.

691, (691). ENGINEERING ECONOMY
The principles that form the basis for making engineering decisions to obtain the most favorable economic results. Prereq: Senior standing. 3 cr.

695, 696. MECHANICAL ENGINEERING PROJECT
A special study involving investigation of problems germane to mechanical engineering. Prereq: Permission of department. 1-3 cr.

697-698. MECHANICAL ENGINEERING SEMINAR
Study and discussion of topics related to engineering with student-faculty participation. 1 cr.

699. UNDERGRADUATE THESIS
Individual experience in organizing an investigation of an engineering problem and its solution. Elective for seniors in Mechanical Engineering. Prereq: Permission of the Department. 2 cr.
701. MACROSCOPIC THERMODYNAMICS
Behavior of thermodynamic systems consistent with the approach of
Gibbs and Caratheodory. 3 cr.

727. ADVANCED STRENGTH OF MATERIALS
Energy methods; beams on elastic foundation; bending and buckling of
thin plates; membrane stresses in shells; numerical methods. Prereq:
M.E. 523, Math. 629. 3 cr.

729. KINEMATICS
The vector equations of relative motions are used to analyze mechanisms
of varying complexity; graphical and analytical methods for space link-
ages. Prereq: M.E. 524. 2 lec; 1 lab; 3 cr.

751. GAS DYNAMICS
Basic equations of motion applied to compressible, ideal fluid flow;
normal and oblique shock waves; vorticity and circulation; irrotational
flow; linear approach to two-dimensional flow problems; method of char-
acteristics. Prereq: M.E. 534, 536. 3 cr.

755. INTERNAL COMBUSTION ENGINES
Basic science and basic engineering courses are related to engineering
problems through a study of spark ignition engines. Associated laboratory
gives practice in organization of personnel and equipment to conduct and
report engineering investigations. Prereq: M.E. 533. 2 lec; 1 lab; 3 cr.

756. TURBOMACHINERY
Application of basic and engineering sciences to the engineering problems
of turbomachinery; design, management, and reporting of experimental
studies. Prereq: M.E. 533, 536. 2 lec; 1 lab; 3 cr.

764. X-RAY METALLOGRAPHY
Theoretical and experimental studies of x-ray diffraction and microradiogra-
phy. Prereq: Consent of instructor. 3 cr.

772. NAVAL ARCHITECTURE II
Hydrodynamic resistances of surface ships and submerged bodies; model
testing theory; powering and propellers; use of “Standard Series” tests;
introduction to ship motion, control steering, and rudders; concepts of
ship design, computer application to problems. Prereq: Consent of in-
structor. 3 cr.

Microbiology (47)

Lawrence W. Slanetz, Professor and Chairman; Theodore G. Metcalf, Pro-
fessor; William Chesbro, Associate Professor; George J. Hageage, Jr., Assis-
tant Professor

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 ad-
ministration. Mr. Slanetz. Prereq: Biol. 401, 402 or consent of instructor.
3 lec; 3 cr.
Microbiology

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. Slanetz, Mr. Hageage, and Mr. Chesbro. Prereq: Chem. 401-402 or equivalent. 2 lec; 2 lab; 4 cr.

600. Food and Sanitary 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. Slanetz and Mr. Chesbro. Prereq: Microb. 503. 2 lec; 2 lab; 4 cr.

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. Prereq: Microb. 503. 2 lec; 1 lab; 4 cr.

702. Pathogenic Microbiology
The morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Mr. Metcalf. Prereq: 503. 2 lec; 2 lab; 4 cr.

705. Immunology and Serology
The defensive elements possessed by man 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. Prereq: Microb. 702. 2 lec; 2 lab; 4 cr.

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. Prereq: Microb. 702. 1 lec; 3 lab; 4 cr.

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 Technologist's Certificate administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists. 32 cr. This course cannot be taken for graduate credit.
795, 796. PROBLEMS IN MICROBIOLOGY
Special problems, depending upon the training and desire of the student. Elective only upon consultation. Mr. Slanetz and staff. Credits to be arranged.

797, 798. MICROBIOLOGY SEMINAR
Reports and discussions on current literature and recent developments in microbiology. Mr. Slanetz and staff. Prereq: Microh. 600 or 702 and consent of the instructor. 1 2-hr. period; 1 cr.

Music

Donald E. Steele, Professor and Chairman; Robert W. Manton, Professor Emeritus; Karl H. Bratton, Professor; John B. Whitlock, Associate Professor; Andrew J. Galos, Associate Professor; Irving D. Bartley, Associate Professor; John D. Wicks, Associate Professor; Raymond A. Hoffman, Assistant Professor; Wendell E. Orr, Assistant Professor; Paul F. Verrette, Instructor; Keith Polk, Instructor; Stanley D. Hettinger, Instructor; Howard Williams, Instructor

Students majoring in Music or enrolled in the Music-Education Curriculum are required to attend all student and faculty recitals as a part of the assigned work of their program.

Music Laboratory (63)
Registration for musical organization courses should be completed during the registration period. These courses cannot be used to satisfy major requirements except in the Music-Education and Bachelor of Music Curricula. Each participant must be registered for either credit or audit by permission of the instructor. All Music laboratory courses may be repeated.

A maximum of 8 credits earned in music laboratories may be used toward graduation.

440, (440). BAND — TECHNIQUES AND LITERATURE
The Concert Band 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 appearances on tour throughout New England. 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. Mr. Hettinger. Prereq: Permission of instructor. 2 lab; 1 cr. NLG.

441, (441). UNIVERSITY-COMMUNITY SYMPHONY ORCHESTRA — TECHNIQUES AND LITERATURE
Open to all students and others on basis of individual tryouts. The orchestra gives several concerts of the finest symphonic literature during the year and also accompanies the vocal groups and solo instrumentalists on various occasions. Membership includes students, faculty, and mem-
bers of the surrounding communities. Mr. Galos. Prereq: Permission of instructor. 2 lab; 1 cr. NLG.

442, (442). Women's Glee Club — Techniques and Literature
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. Mr. Bartley. Prereq: Permission of the instructor. 2 lab; 1 cr. NLG.

443, (443). The New Hampshiremen — Techniques and Literature
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. Orr. Prereq: Permission of the instructor. 2 lab; 1 cr. NLG.

444, (444). 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. Bratton. Prereq: Permission of instructor. 2 lab; 1 cr. NLG.

446, (446). Ensemble — Techniques and Literature
1) Brass; 2) Strings; 3) Tudor Singers; 4) Woodwind; 5) Opera Workshop. Small groups of instrumentalists and vocalists organized to provide advanced students experience in such groups, plus an acquaintance with the more advanced literature in the areas. Prereq: Permission of instructor. 2 lab; 1 cr. NLG.

447, (447). String Orchestra — Techniques and Literature
Open to all students on basis of individual tryouts. This group appears at all the University-Community Symphony Orchestra concerts. The most select of string compositions are studied and played. 1 rec; 1 cr. NLG.

Applied Music (63)
Lessons in Applied Music are based on half-hour private instruction per week. One semester hour credit may be earned with one lesson per week; two to four semester hours of credit may be earned with two lessons per week, but only students in the Bachelor of Music Curriculum are allowed to register for three and four credits. Five one-hour practice periods per credit will be sought out by the music students themselves. The special semester fee for Applied Music is $25 per half-hour lesson. These fees include the use of a practice room for the required preparations.

Majors in Applied Music within the B.A. Curriculum are required to present 16 semester hours in Applied Music taken over a period of four years. Two lessons per week are required each semester. Four semester credits taken in the freshman year are regarded as prerequisite to the Applied Music option.

Registration in Applied Music courses is open to all students in the University, subject to approval by the instructor who will determine the course level. A student may register for credit in the same course in successive semesters.
461, 462. 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. Permission of the instructor. Mr. Bratton. 2 cr.

463, 464. Functional Piano Class
Piano instruction primarily for beginning students in a class. Training in the following subjects will constitute the course: pianoforte techniques and reading of music; keyboard harmony geared to the practical harmonization of grade school melodies; transposition; sight reading; improvisation. Especially for students interested in Occupational Therapy and Elementary Teacher's curriculum. Beginning students in Music Education curriculum may take this course for 1 semester. Enrollment limited to 8. Permission of instructor. 2 cr.

570. Piano
The methods of presentation and the material used vary with each pupil and his degree of advancement. With beginners, training is given in the fundamentals of pianoforte technique and in the reading of keyboard music. As early as is practicable, 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, Mr. Bartley, Mr. Wicks, and Mr. Verrette. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

571. Organ
A thorough foundation in pedal and manual technique, including hymn playing, followed in subsequent semesters by literature chiefly from the Baroque, Romantic, and Contemporary periods. Permission of instructor. Mr. Bartley and Mr. Wicks. 1 or 2 lessons; 1 or 2 cr.

572. Violin, Viola
The choice of literature and method in violin teaching depends entirely on the individual pupil's background and ability, therefore no single course of study is set up as a requirement for all pupils. Emphasis is placed primarily on musicianship and musical values, and the development of a sound, reliable technique as a means to that end. Technique is developed in these lessons not so much through exercise and drill as it is through the best in literature. Mr. Galos. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

573. Voice
Instruction in voice will seek to develop those qualities which are essential for intelligent interrelations, such as correct posture, breathing, pure tone, resonance, clear enunciation, and technical facility. Each voice is given the treatment best suited to its individual needs. A higher ideal than the perfection of mere mechanical skill is sought, namely a musicianly style of singing and a thorough appreciation of the best works of the masters, both classic and modern. Mr. Bratton and Mr. Orr. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.
574. 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. Mr. Hoffman. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

575. 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. Hettinger. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

576. 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. Whitlock, Mr. Polk, and Mr. Williams. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

577. PERCUSSION
Snare drum rudiments. The technique, tuning and sticking of the pedal and band 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. Permission of instructor. 1 or 2 lessons; 1 or 2 cr.

Theory and Composition (63)

421-422. 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 basses (figured and unfigured) and soprano melodies using triads and their inversions, and secondary dominants. Attention will also be given to harmonic rhythm and modulation. Staff. 5 labs. and a general lecture. 3 cr.

521-522. SIGHTSINGING, EAR TRAINING, DICTATION II
Further training in basic elements of music. The rhythmical and melodic phenomena of the art, development of acuity and accuracy in perception and response. Mr. Hoffman. Prereq: Mus. 421-422. 3 lab; 1 cr.

523-524. HARMONY II
Continuation of harmonization techniques developed in THEORY I. The use of irregular resolutions; the diminished 7th; the incomplete major 9th; the complete dominant 9th; the sequence; the nondominant 7th, 9th, 11th, and 13th; the raised supertonic and submediant; the Neapolitan sixth; the four augmented 6th chords; and other chromatically al-
tered chords. Formal and harmonic analysis of preludes in the Well-Tempered Clavier and works of the Classical and Romantic periods. Continued emphasis on keyboard harmony. Mr. Wicks. Prereq: Mus. 421-422. 2 cr.

525-526. CONDUCTING METHODS — BAND AND ORCHESTRA
The development of conducting — physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and condensed scores. Essential instrumental conducting techniques, band and orchestra literature, psychology of rehearsal. Mr. Galos. 1 cr.

719-720. COUNTERPOINT
First semester: Sixteenth century polyphony based on the style of Palestrina. Second semester: free instrumental counterpoint based on the styles of Bach and Handel. Twentieth century counterpoint will be discussed in the closing classes of the course. Mr. Wicks. Prereq: Mus. 523-524 or permission of instructor. 2 cr.

721-722. CANON AND FUGUE
Free counterpoint in three and four parts, double counterpoint, the writing of simple two-part inventions, choral preludes, etc. The canon- and fugal studies will be based largely upon the works of Bach and will have as their objective the composition of a two-, a three-, and a four-voiced fugue. Prereq: Mus. 719-720 or permission of instructor. Mr. Williams. 2 cr.

723-724. COMPOSITION
The various smaller harmonic forms, the variation, the rondo, and the sonata forms will serve as models for composition. Prereq: Permission of the instructor. Mr. Williams. 2 cr.

725-726. ORCHESTRATION AND CHORESTRATION
Instruments and methods of combining them into coherent arrangements arriving at successful balances for the band and orchestral arranger. The characteristics, range and tone quality of the instruments are fully covered and transcriptions are made. Orchestral effects are studied. Chorestration is offered during the latter part of the second semester. The techniques of writing for solo voices, for mixed voices, men’s and women’s voices, are taken up through the medium of arrangements, and original work. Mr. Williams. Prereq: Permission of the instructor. 2 cr.

History, Literature, and Appreciation (63)

401. MUSIC APPRECIATION
Masterpieces drawn from the works of Palestrina, Bach, Handel, Haydn, and Mozart. Selections will be analyzed by the students and the instructor and played several times in the classroom. Supplementary assigned recordings at the University Library. 2 cr. (Special Summer Session course.)

402. MUSIC APPRECIATION
Intelligent listening through formal analysis of the irreducible minimum of great musical masterpieces. A selection of the most important works of Beethoven, Shubert, Mendelssohn, Chopin, Liszt, Brahms, Tschaikowsky, d’Indy, and many others analyzed by the students and the instructor and
Music

played several times in the classroom. 2 cr. (Special Summer Session course.)

403-404. INTRODUCTION TO MUSIC
A beginning listener's approach to the great music of the ages. Emphasis will be placed not only on the means of acquiring a discerning ear, but also on presenting a broad perspective of music in relation to the history of Western civilization. For non-music majors only. Mr. Polk and Mr. Hoffman. 3 cr.

405-406. HISTORY AND LITERATURE OF MUSIC
Through analysis, performance, and reading, the course aims at a practical knowledge of the techniques of composition, styles, and forms of the principal periods in the history of music. Mr. Polk. Required of all music majors. 3 cr.

501. 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. May be taken for credit or as recreation. Mr. Bratton. 1 cr. (Special Summer Session course which may be repeated.)

502. SURVEY OF MUSIC IN AMERICA
The development of music in the United States from Colonial times to the present. The various influences, such as the English tradition, the German era, the French impressionistic influence, and finally the quest for an American style with the music of the most representative composers. 2 cr. (Not offered in 1966-67.)

701. MASTERS OF THE RENAISSANCE
Important composers of the fifteenth and sixteenth centuries and their works: Vittoria, Palestrina, Byrd, and others. Mr. Wicks. 2 cr. (Not offered in 1966-67.)

703. ROMANTIC MUSIC OF THE NINETEENTH CENTURY
The sonata form as a basis for 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. 2 cr. (Not offered in 1966-67.)

704. TWENTIETH CENTURY MUSIC
Music of the twentieth century, including its literature, its trends, and an analysis of techniques, styles, forms, and expression. Mr. Steele. 2 cr. (Not offered in 1966-67.)

705. THE LIFE AND WORKS OF BEETHOVEN
The piano sonatas, symphonic works, and the string quartets. Lectures, analysis, reports, required readings, and listening. Mr. Galos. 2 cr.

707-708. SURVEY OF OPERA AND ORATORIO
A historical and musical survey of the opera and oratorio, from their common birth, through the development of each specific form to the present
day. Particular stress is given to political and religious influences. Mr. Orr. 2 cr. (Not offered in 1966-67.)

709, 710. 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 concertos of Haydn, Mozart, Beethoven, Schubert, the Romantic composers, and of contemporary writers. Mr. Steele. 2 cr.

731. MUSIC IN THE MEDIEVAL PERIOD
A study in depth of the music in medieval times. Periods considered include plainsong, music of the Mass, secular monophony, beginnings of polyphony, French and Italian ars nova. 2 cr. (Not offered in 1966-67.)

733. MUSIC OF THE BAROQUE
A study of early, middle, and late baroque music and its various schools. The cantatas, lute and keyboard music, the early concerto and sonata are studied in detail. The literature of Bach and Handel is investigated. Mr. Wicks. 2 cr.

734. MUSIC IN THE CLASSICAL PERIOD
A study of the music of the rococo and classical periods. The following subjects will be investigated: "style galant," opera seria and opera buffa, the keyboard sonata, and the music of Haydn and Mozart. Mr. Wicks. 2 cr.

Music Education (64)
The Department of Music offers a four-year curriculum for teachers of elementary and secondary school music. (See Music-Education curriculum.)

551. TECHNIQUES AND METHODS IN STRINGED INSTRUMENTS
Class-teaching of stringed instruments simulating classroom situations and methods. Mr. Galos. 2 cr.

552. TECHNIQUE AND METHODS IN WOODWIND INSTRUMENTS
Basic fundamentals of performance in woodwind instruments, techniques of class instruction, and an introductory study of woodwind literature. Mr. Hettinger. 3 cr.

553. TECHNIQUES AND METHODS IN BRASS AND PERCUSSION INSTRUMENTS
Correct tone production and technique of brass instruments and of rudimentary percussion technique. Materials and procedures for class instruction. Mr. Whitlock. 3 cr.

751, 752. TECHNIQUES AND METHODS IN CHORAL MUSIC
A lecture workshop course touching upon some of the problems and solutions in the organization and performance of high school and college glee clubs and community choirs. Emphasis is placed on techniques of choral conducting and rehearsal, repertory, and materials. Offered to Mus. Ed. students who wish to place a greater emphasis on a vocal option in the Mus. Ed. curriculum rather than instrumental. A student taking 751, 752 may substitute them for two of the instrumental techniques and methods courses. Mr. Bratton. 3 cr.

753. ESSENTIALS OF MUSIC FOR THE CLASSROOM TEACHER
A course designed to provide training in the elements and appreciation of music for application to the grade-school classroom situation. Em-
phasis will be placed on melodic and rhythmical accuracy, basic keyboard
harmony, elementary conducting, music literature. Recommended for the
grade-school teacher. No performing ability required. Mr. Steele. Prereq:
Permission of the instructor. 2 cr. (Special Summer Session course; not
offered in 1966.)

754. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER
For the non-music specialist interested in utilizing music as a means of
enriching children's lives. The correlation and integration of music in the
school curriculum and the basic skills and techniques necessary. Also open
to music specialists and school administrators. Mr. Whitlock. 3 cr. (Sum-
mer Session course; not offered in 1966.)

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 and the classification of
voices; the selection of vocal and instrumental materials to fit the needs
of the individual group, in order to insure the maximum growth and
musical development of the students; and the building of unified concert
programs. Problems of administration and management, and the relation-
ship of the teacher to school and community. Observation of music pro-
grams in secondary schools. Mr. Whitlock. Prereq: Educ. 758. 3 lec; 1
lab; 3 cr.

792. PROBLEMS IN THE TEACHING OF ELEMENTARY SCHOOL MUSIC
Aims, scope, and organization of materials and activities in the elementary
schools in keeping with modern trends in educational philosophy. The
child voice, its care and development. A demonstration of materials and
methods for the various grades. Observations of elementary school music.
Mr. Whitlock. Prereq: Educ. 758. 3 lec; 1 lab; 3 cr.

793, 794. EDUCATION-MUSIC (Ed-MU). SUPERVISED TEACHING IN
ELEMENTARY AND SECONDARY SCHOOL MUSIC
Prereq: Mu-Ed. 792, 791. 7 cr.

796. ORGANIZATION AND ADMINISTRATION OF SCHOOL MUSIC GROUPS
Problems of organizing and administering school orchestras, bands, glee
clubs, choruses and small ensembles, such as objectives, motivation, sched-
ule, discipline, equipment, programs, finances, rehearsal techniques, con-
tests and festivals, materials, personnel selection and grades. Mr. Whit-
lock. 3 cr. (Special Summer Session course; not offered in 1966.)

797. MUSIC EDUCATION SEMINAR — INSTRUMENTAL AND CHORAL
A study and discussion of instrumental and choral music methods in the
elementary and secondary schools with emphasis given to voice and in-
strumental classes, as well as the development of music organization. This
seminar is especially designed for classroom music teachers and supervi-
sors of considerable experience. Opportunity will be given the class mem-
ers to observe the University of New Hampshire Summer Youth Music
School organizations during the sixth week. Prereq: Teaching experience
in instrumental and/or choral music. Mr. Bratton and Mr. Whitlock. 3 cr.
(Special Summer Session course; not offered in 1966.)
Nursing (54)

Mary Louise Fernald, Assistant Professor and Chairman; Ann Manchester, Instructor

The following courses are required for students majoring in nursing. Nursing 401-402 and 503-504 will be offered in 1966-67.

401-402. INTRODUCTION TO NURSING
An introductory course discussing the influences of the past and present and the issues of the future as they affect nursing. The role of the nurse as a professional person will be discussed. Miss Fernald. 1 cr.

503-504. FUNDAMENTALS OF NURSING
This course will assist the student in developing beginning skills, understanding, and knowledge of nursing. The laboratories will be experiences in hospitals designed to guide the student in planning and carrying out nursing care of people. This will be taught and supervised by University faculty. Miss Manchester. 2 lec; 1 lab; 3 cr.

551. MEDICAL AND SURGICAL NURSING
Medical and surgical nursing will be introductory in this course. Lectures in medical and surgical conditions and the nursing care involved will be planned. Prereq: Nurs. 503-504. 2 lec; 2 lab; 4 cr.

602-610-621. COMPREHENSIVE NURSING
Psychiatric nursing, maternal and child nursing, public health nursing, and medical and surgical nursing will be taught during the calendar year. Lectures, discussions, and nursing laboratory experience in all areas will be planned. Nursing laboratory experience will be provided using the local hospitals, a medical center, public health agencies, and other health facilities. Comprehensive nursing will be stressed. Prereq: Nurs. 551. 602, 14 cr; 610, 6 cr; 621, 14 cr. Total 34 cr.

701. REHABILITATION NURSING
Geriatric nursing, nursing of long-term illness, including rehabilitation nursing, will be included. Experience and field trips to nursing homes and rehabilitation centers will be planned. Prereq: Nurs. 621. 3 lec; 1 lab; 4 cr.

702. SENIOR SEMINAR IN NURSING
Responsibility of the professional nurse will be discussed, including team leadership, head nursing, responsibility as a beginning practitioner, as an individual, and as a citizen. Prereq: Nurs. 621. 4 cr.
Occupational Therapy (65)

Marguerite Abbott, Associate Professor and Chairman; R. Virginia Bell, Assistant Professor

MEDICAL LECTURERS: William Amman, M.D., Ear, Nose Throat Conditions; Arthur DiMambro, M.D., Orthopedics; Charles H. Howarth, M.D., General Medicine, Surgery, and Chest Conditions; Lawrence Doyle, M.D., Medical Psychiatry; Gerald Shattuck, M.D., Pediatrics

The following courses are for Occupational Therapy students; elective for others by permission of the Department Chairman. Grade of 2.0 or above required.

411. INTRODUCTION TO OCCUPATIONAL THERAPY
Survey course of the scope and area of occupational therapy and its functions as a profession. History and philosophy of medicine reviewed, with an emerging O.T. philosophy as a basic frame of reference for the treatment of patients. Films, guest lecturers, and instruction trips to hospitals and clinics. Miss Abbott. 2 cr.

412. THERAPEUTIC CRAFTS
Therapeutic crafts and skills in selected handicrafts, such as stenciling, copper tooling, bookbinding, fly tying, basketry, cord knotting, paper-mache, and chip carving. Crafts are analyzed relative to their therapeutic suitability for patients. Individual (craft) study projects are introduced, together with the basic methods of presenting activities to patients, by demonstration and return demonstration method. Minimum laboratory fee $6.00. Miss Bell. Prereq: O.T. 411 with grade of C or better. 2 lab; 3 cr.

515. THERAPEUTIC CRAFTS, ADVANCED
Projects and methods in leather work; ½ semester. Graphic arts with emphasis on printing and silk screen techniques, ½ semester. Therapeutic analysis of activities will be introduced. Minimum laboratory fee $12.00. Miss Bell. Prereq: O.T. 412. 2 lab; 3 cr.

522. APPLICATION OF OCCUPATIONAL THERAPY TREATMENT TO GENERAL MEDICINE AND SURGERY
Also includes cardiac and chest conditions. Special problems of sensory disturbances are presented. Conditions of special significance with pediatrics and geriatrics discussed. Miss Abbott and Miss Bell. Prereq: O.T. 681, Psych. 537 or Home Ec. 425. 2 cr.

524. APPLICATION OF OCCUPATIONAL THERAPY TO PSYCHIATRIC CONDITIONS
Principles of dynamic psychiatry as applied by occupational therapy to assist in establishing an atmosphere conducive to recovery (containing minimum anxiety and maximum support) by utilizing individual and group activity programs. Miss Bell. Prereq: O.T. 683, Psych. 654. 2 cr.

526. APPLICATION OF OCCUPATIONAL THERAPY TO PHYSICAL AND NEUROLOGICAL DISABILITIES
Techniques used in treating patients with orthopedic and neurological conditions. Cerebral palsy, poliomyelitis, and degenerative neurological conditions are presented and discussed, upon the basic principle of the application of therapeutic exercise to these conditions; to improve joint
motion or muscle power; to develop coordination and improve the neuromuscular pattern of movement; and to assist the patient in adjustment, by building up a wholesome psychological climate conducive to recovery. Films, guest lecturers, demonstrations. Miss Abbott. Prereq: O.T. 522, 681, 682, P.E.M. 652, Zool. 507, 510, 610. 3 cr.

681. GENERAL MEDICAL LECTURES
Etiology, pathology, symptoms, and treatment of general medicine, surgery, and chest diseases; sensory disturbances, ophthalmology, otology; overview of pediatric disabilities and common childhood diseases. Films. Dr. Charles H. Howarth, Dr. William Amman, Dr. Gerald Shattuck. Prereq: Zool. 507. 3 cr.

682. ORTHOPEDIC MEDICAL LECTURES

683. PSYCHIATRIC MEDICAL LECTURES
A basic course in medical psychiatry, including both child and adult psychiatric conditions. Etiology, symptomology, prognosis, and medical treatment of the psychoneurosis, functional psychoses, the organic reaction types, plus the various types of drug therapy, currently in use. Films. Dr. Lawrence Doyle. Prereq: Psych. 654. 2 cr.

698. ADVANCED READING SEMINAR
A conference-seminar to assist the senior O.T. student to integrate the knowledge and skills he has acquired. The student is put into contact with a variety of ideas and modalities of social psychological-medicine, forming a frame of reference for a philosophy of professional O.T. Ideas, methods, and techniques, by way of the seminar conference method. This will be followed by a plan of integrated independent study in a specific field of the student's major O.T. interest. Miss Abbott. Prereq: Senior standing. 3 cr.

702. ADMINISTRATION AND ORGANIZATION FOR HOSPITAL AND AGENCY COMMUNITY WORK
The general principles of organization and administration, which include a body of knowledge of group dynamics, supervisory practices, including employer-employee relationships, personal policies, layout of O.T. physical plants, floor plans, purchasing, and various methods of inventory. Miss Abbott. Prereq: Senior standing. 2 cr.

711. CLINICAL AFFILIATION IN GENERAL MEDICINE, SURGERY, AND PEDIATRICS
Full time — three months. No credit.

712. CLINICAL AFFILIATION IN PSYCHIATRY
Full time — three months. No credit.

713. CLINICAL AFFILIATION IN PHYSICAL DISABILITIES
Full time — three months. No credit.

All occupational therapy affiliation fees must be paid prior to entering any affiliation.
Philosophy

Philosophy (66)

Robert P. Sylvester, Associate Professor and Chairman; Donald C. Babcock, Professor Emeritus; Asher Moore, Professor; Paul Brockelman, Assistant Professor; Howard Press, Instructor

400. 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 all students. 3 cr.

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. Open to all students. 3 cr.

500-501. HISTORY OF PHILOSOPHY
The history of Western philosophy through the study of the major figures and movements from the early Greek philosophers to the nineteenth century. 4 cr. Students who are interested in advanced work in Philosophy should take Philosophy 500-501 as early as possible. This course is not ordinarily open to freshmen, but freshmen who expect to major in philosophy or who intend to take advanced work in philosophy may elect the course by securing the permission of the instructor. Students who wish to register for Philosophy 501 without having taken Philosophy 500 must secure the permission of the instructor.

502. MEDIAEVAL 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. Prereq: Phil. 500 or permission of the instructor. (Not open to freshmen.) 4 cr. (Alternate years).

503. 19TH CENTURY PHILOSOPHY
An historical survey of philosophic thought in the 19th century, its emergence from 18th century thought, and its bearing upon contemporary philosophy, with particular emphasis upon major figures and movements in Germany, France, and England. Readings from such figures as Fichte, Schelling, Hegel, and Schopenhauer in German classical philosophy, Auguste Comte and Henri Bergson in French philosophy, and Herbert Spencer, Jeremy Bentham, and John Stuart Mill in English philosophy. Prereq: Phil. 500-501. 4 cr.

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. Mr. Brockelman. (Not open to freshmen.) 4 cr.
521. PHILOSOPHY AND THE ARTS
A consideration of contemporary works of literature, music, theatre, film, and the plastic arts, in an attempt to elicit those philosophic concerns and perspectives which dominate the present. Attention will be given to social discontent, to the impact of science and technology, and to the search for authentic personal existence. Intensive use will be made of the cultural resources of the University and the region, so there will be some expense involved. Open to all students. Mr. Moore. 4 cr.

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. Prereq: Phil. 521 or other evidence of adequate experience of at least two of the arts. 4 cr.

530. ETHICAL THEORIES
A study of the problems of moral philosophy through the critical examination of important traditional and contemporary theories of ethics. Mr. Sylvester. (Not open to freshmen.) 4 cr.

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. Mr. Sylvester. (Not open to freshmen.) 4 cr.

550. SYMBOLIC LOGIC
The principles and techniques of modern logic, with special attention to their philosophic 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. Prereq.: Philosophy 400 or permission of the instructor. 4 cr.

595. 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. Offered for second semester freshmen and sophomores. 3 cr. One hour conference with the instructor per week.

600. PHILOSOPHY THROUGH LITERATURE
A study of the philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. 3 lec; 4 cr. (Alternate years.)

610. ANALYTIC PHILOSOPHY
A study of 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. Prereq: Phil. 500-501. 4 cr. (Alternate years.)
Philosophy

615. CONTEMPORARY MOVEMENTS IN PHILOSOPHY
A study of contemporary pragmatism, neo-realism and naturalism, with
their roots in 19th Century American Philosophy. Readings from such
recent and contemporary figures as Peirce, James, Dewey, Santayana,
Whitehead, and C. I. Lewis. Prereq: Phil. 500-501. 4 cr.

620. EXISTENTIALISM
A study of existentialism, its roots in the nineteenth century, its relation
of phenomenology, and its development to the present day. Readings
from such recent and contemporary figures as Sartre, Marcel, Heidegger,
and Jaspers. Prereq: Phil. 500-501. 4 cr. (Alternate years.)

630. PHILOSOPHY OF SCIENCE
A discussion of various philosophical problems raised by science. For
example: induction and probability, the nature of law, the significance
of statistical techniques, the purpose and general principles of experi­
mental design, theory construction, operationism, the nature of mathe•
matics and its application in science, the place of speculation in science,
the unity of science, special problems of the biological and social sci­
ences. The relation of science to ethics, the humanities, and everyday life.
4 cr. (Alternate years.)

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. Prereq: Phil 500-501. Lectures, lectures-discussion,
or seminar. 4 cr. Barring duplication of subject this course may be re­
peated for credit.

701. TOPICS IN SYSTEMATIC PHILOSOPHY
Intensive study of selected problems of philosophy in such areas as
epistemology, metaphysics, and theory of value. Topics and instructors
to be announced each year. Prereq: Phil. 500-501. Lectures, lectures-discussion,
or seminar. 4 cr. Barring duplication of subject this course
may be repeated for credit.

795, 796. INDIVIDUAL STUDY
Students who are adequately prepared to do independent work in­
volving extensive reading and writing may do advanced work on an in­
dividual basis. Before registering for this course the student must formu­
late a project and secure the consent of a member of the department
who will supervise his work. Conferences and/or written work as re­
quired by the supervisor. Seniors may write the senior paper for credit
under this course offering. Credits to be arranged.
Physical Education for Men (90)

James W. Long, Director, Division of Physical Education and Athletics, and Professor; Gavin H. Carter, Chairman, Department of Physical Education for Men, and Associate Professor; Andrew T. Mooradian, Chairman, Department of Intercollegiate Athletics, and Associate Professor; Carl J. Lundholm, Professor; Paul C. Sweet, Professor; E. William Olson, Associate Professor; Robert E. Wear, Associate Professor; E. J. Blood, Assistant Professor; Walter E. Weiland, Assistant Professor; Robert Kertzer, Assistant Professor; Theodore W. Conner, Instructor; E. William Haubrich, Instructor; Ruben Bjorkman, Instructor; Thomas Barstow, Instructor; Lionel J. Carbonneau, Instructor; W. Kevin Condon, Instructor; Robin K. Tellor, Instructor; Joseph M. Yukica, Instructor

The Department of Physical Education for Men strives to meet the needs of college students for physical fitness, mental alertness, emotional stability, and social acceptability by providing opportunities for exercise, for self-expression, for emotional expression, for skill development in a wide variety of physical and recreational activities, and for professional preparation of men wishing to enter the fields of health and physical education or recreation education.

In the physical education courses, basic and elective activity, instruction is aimed at developing skills above the mediocre level, including health knowledge and habits, stressing applied physiological principles of living, administering general motor ability, fitness proficiency tests, and posture examinations with follow-up.

Requirements

A minimum of two semesters of physical education is required for men students. Freshmen men should register for P.E. 431-432 unless they are interested in selecting health and physical education or recreation education as a field of concentration in which case they will take 441-442. Transfer students will register for the appropriate courses after consulting Department advisers. See description below.

Each student must, before entering the University, have had 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, as recommended by the University Physician, will be taught. The physical therapist of the Division of Physical Education and Athletics will serve as the liaison with the University Health Service.

The standard uniform required of all students consists of white trunks, white sleeveless jersey, white sox, and rubber-soled or basketball shoes. Limited sports equipment is furnished, but, as a general rule, students are
required to furnish their own equipment in the individual sports. In elective courses, students should check the requirements for equipment and special fees before enrollment.

Basic Instructional Program

**431-432. PHYSICAL EDUCATION ACTIVITY COURSES**

Required of all freshman men. These courses are organized as instruction in skills and in the principles of physical conditioning and health. Elective activities will include archery, badminton, bowling, fencing, golf, gymnastics, handball, lacrosse, riding, riflery, skating, skiing, social dance, soccer, squash rackets, swimming, tennis, track and field, volleyball, weight training and conditioning, and wrestling. 2 hrs; ½ cr. NLG

**433, 434. ELECTIVE ACTIVITY COURSES**

Additional elective activity courses may be elected by sophomores, juniors, and seniors. Activities may be chosen from those listed under P.E. 431-432. No activity may be repeated for credit. Prereq: P.E. 431. 2 hrs; ½ cr.

**PHYSICAL EDUCATION ACTIVITY COURSES (SPECIALIZED)**

Opportunity for students to become acquainted with basic skills in a variety of physical activities taught in the secondary school. 441-442 are for freshmen; 443-444 are for sophomores. Required of students in the Physical Education Curricula in lieu of P.E. 431-432. Staff. 3 periods; 1 cr.

Theory Courses

**453. PRINCIPLES OF PHYSICAL EDUCATION**

The historical factors, biological, psychological and sociological principles influencing the methods and practices in health, physical education, and recreation today. The relationship of physical education to education and educational aims and objectives will be discussed. Miss Browne. 3 cr.

**520. PHYSIOLOGY EXERCISE**

Course provides the essential background necessary for an understanding of the response of the body to exercise. Available research data in physiological phenomena associated with exercise will be discussed and analyzed, supplemented by individual study. Mr. Kertzer. Prereq: Zool. 507. 2 cr.

**521. PROBLEMS 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. Olson. 1 lec; 2 lab; 2 cr.

*Students in the Physical Education Curriculum must complete no less than six of these courses and not including more than two of the Problems of Coaching courses.*

*Students in the Academic Teaching Option must complete no less than four of these courses and not including more than two of the Problems of Coaching Courses.*

254
522. PROBLEMS OF COACHING FOOTBALL*
Analysis of various systems of play. Instruction in team and individual offensive and defensive fundamentals. The rules, theory, strategy, general-ship of team play, coaching methods, physical conditioning, and rules. Football Staff. 1 lec; 2 lab; 2 cr.

524. PROBLEMS 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. 1 lec; 2 lab; 2 cr.

525. THEORY OF TEACHING TEAM SPORTS FOR MEN*
Theory and practical teaching methods in the team sports which form the foundation for a broad program of physical education. Staff. 2 lec; 1 lab; 2 cr.

526. THEORY OF TEACHING INDIVIDUAL SPORTS FOR MEN*
Theory, practical teaching methods and the development of advanced skills in the individual sports which form the foundation for a broad program of physical education. Staff. 2 lec; 1 lab; 2 cr.

527. THEORY OF TEACHING AQUATICS*
Theory, teaching methods, and skills in swimming, diving and water safety. Staff. 2 lec; 1 lab; 2 cr.

528. PROBLEMS 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. 1 lec; 2 lab; 2 cr.

529. THEORY OF TEACHING GYMNASTICS AND TUMBLING*
Theory, practical teaching methods, and advanced skills are taught including tumbling, gymnastic routines and the use of gymnasium apparatus. Mr. Weiland. 1 lec; 2 lab; 2 cr.

553. THEORY OF TEACHING DANCE*
A survey of methods, materials and techniques in teaching dance. Instruction in performance and teaching rhythms, social, folk, and square dance. Miss Morrison. 2 lec; 1 lab; 2 cr.

622. FIRST AID-SAFETY; ATHLETIC TRAINING
Nature and causes of injuries incident to physical activities. The common hazards of play, and preventive measures for children and athletes are discussed. First aid principles are presented. Mr. Condon. Prereq: Zool. 507. 2 cr.

652. KINESIOLOGY; ADAPTIVE PHYSICAL EDUCATION
A course in body mechanics and kinesiology which deals with a program for the handicapped and individual problems in health and physical education. Mr. Kertzer. Prereq: Zool. 507. 3 cr.
656. **PROBLEMS OF HEALTH EDUCATION**
A course designed to acquaint the student with methods, materials and principles of developing a broad school health program. Mrs. Wooster. Prereq: P.E. 592. 3 cr.

665. **ADMINISTRATION OF PHYSICAL EDUCATION IN SECONDARY SCHOOLS**
Administrative methods in the conduct of physical, health, and recreation education. 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 relations. Mr. Lundholm. 3 cr.

668. **MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION**
Procedures used in the evaluation, construction, administration, and interpretation 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 Knowlton and Mr. Weiland. 2 cr.

P.E.-Ed. 692. **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. Miss Newman. 3 cr.

Ed.-P.E. 790. **DIRECTED TEACHING OF PHYSICAL EDUCATION**
Opportunity for teaching physical education activities under direction in the elementary or secondary school. Mr. Lundholm. Prereq: P.E. 791 or concurrently. 1 lec; 2-5 hr. lab; 6 cr.

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**Physical Education for Women (91)**

Marion C. Beckwith, *Chairman and Professor of Physical Education for Women*; Evelyn Browne, *Professor*; Caroline S. Wooster, *Associate Professor*; Barbara K. Newman, *Associate Professor*; Joan T. Stone, *Assistant Professor*; Janet Atwood, *Assistant Professor*; Patricia Farrell, *Assistant Professor*; Jean Morrison, *Assistant Professor*; Elizabeth E. Knowlton, *Instructor*; Patricia Lalone, *Instructor*; Marilyn La Plante, *Instructor*

The Department of Physical Education for Women aims to develop in each individual the physical, social, and mental qualities which will enable her to meet successfully the demands of modern society. The course includes recreational and leisure-time activities, vigorous team sports and gymnastics, rhythmic and dance activity, and the opportunity to participate in club activities which are provided primarily for the more highly skilled. This program is supplemented by the extra-curricula competitions sponsored jointly by the Women's Recreation Association and the Department.

**Requirements and Regulations**

All women students are required to complete at least one credit of a basic instructional course for each of the first four semesters they attend the University. Freshmen women (except majors) should register for P.E. 401,
Physical Education for Women

402; sophomores for P.E. 403, 404. Freshmen interested in majoring in Physical Education or Recreation Education should elect P.E. 411 and 412 in place of 401 and 402. In addition they should also elect P.E. 421 and 422 for a second credit of laboratory work. A second activity may be elected each semester by any student for additional credit P.E. 405, P.E. 406. Unless there is an elementary and an intermediate section, the same activity shall not be credited more than twice.

Each student must, before entering, have had a physical examination by a physician. A posture test will be given by the Physical Education staff. Individual gymnastics is required of each freshmen whose physical condition indicates this need. Students with physical disabilities must follow the same procedure as other students including registration for physical education. In most cases, modified activities are recommended by the University Physician. All students are expected to take the Humiston Motor Ability Test and must take the swimming proficiency test the fall that they enter the University.

Special gymnasium uniforms consist of black leotards, blue cotton tennis-type dress and shorts, white socks, and regulation gymnasium sneakers. Students are required to furnish their own individual equipment for such activities as tennis, skiing, and skating. Equipment is furnished for golf, fencing, badminton, hockey, archery, lacrosse, riflery, and softball. The special riding fee is $35 a quarter for two periods a week.

Advanced Instruction

To provide for the more highly skilled student and to encourage the interest of others, regardless of ability, the Department offers in its program numerous clubs and activities in which instruction is given by a member of the teaching staff. The clubs and their instructors follow:

BADMINTON CLUB, Miss Stone; DANCE CLUB, Miss Morrison; DURHAM REELERS, Miss Farrell; FENCING CLUB, Miss Knowlton; GYMNASTICS CLUB, Miss LaLone and Mr. Weiland; RIFLE CLUB, Miss Browne; SKATING CLUB, Mrs. Jones; SKI CLUB, Miss LaLone; W.R.A., Miss Farrell and staff. A RIDING CLUB is also available, Mrs. Janet Briggs, Instructor, Animal Science Department.

Women students following any teacher training curriculum are urged to elect for required physical education the following activities: folk and square dancing, recreation workshop, volleyball, hockey and basketball.

Basic Instructional Program

401. MOVEMENT FUNDAMENTALS

Designed to develop basic concepts of movement through experiences in body mechanics, dance, and gymnastics. A preparation course for further work in specific movement areas. Motor ability testing, posture analyses, fitness orientation included. Required of all Freshmen women first semester. Prospective majors elect 411 and 421. 3 hrs; 1 cr. NLG.
Physical Education for Women

402, 403, 404. Physical Education Activity Courses
Required of all second semester freshmen and of sophomore women.
Select from list below. 3 hrs; 1 cr. NLG.

405, 406. Physical Education Activity Courses
Elective for juniors and seniors plus freshmen and sophomores desiring
to take an elective. 3 hr; 1 cr. See list below.

407, 408. Physical Education Activity Courses
Elective for juniors and seniors desiring to register for a second activity
beyond 405 or 406. 3 hr; 1 cr. See list below.

Physical Education Activity Courses (Specialized)
Specialized courses for students majoring in physical education. Others
by permission of instructor. 411, 412, 421, 422 are for freshmen; 413,
414, 423, 424 are for sophomores; 415, 416 are for juniors; 417 is for
seniors. 3 hr; 1 cr.

Activities (Elect one each quarter)

First Quarter
Apparatus, archery (elem. + inter.), badminton, fitness lab golf (elem.
+ inter.), movement fundamentals, modern dance (elem. + inter.),
hockey, individual gym, riding (elem. + inter. + adv.), soccer, swim-
mimg, tennis (elem. + inter.).

Second Quarter
Basketball, badminton (elem. + inter.), elementary games (majors),
fencing, folk and square dance, movement fundamentals, gymnastics,
modern dance (elem. + inter.), individual gym, riding (elem. + inter.
+ adv.), riflery, figure skating (elem. + inter.), skiing (beg.), recrea-
tion workshop, stunts and tumbling, swimming.

Third Quarter
Badminton (elem. + inter.), dance composition, elementary games,
fencing, folk and square dance, gymnastics, individual gym, modern
dance (elem. + inter.), riding (elem. + inter. + adv.), riflery (elem.
+ inter.), figure skating (elem. + inter.), skiing (beg. + elem. + inter.
+ adv.), recreation workshop, stunts and tumbling, volleyball, swimming.

Fourth Quarter
Archery (elem. + inter.), outdoor education, dance composition (elem.
+ inter.), individual gym, lacrosse, modern dance (elem. + inter.),
riding (elem. + inter. + adv.), softball, swimming, tennis (elem. + inter.
+ adv.)

Theory Courses

453. Principles of Physical Education
The historical factors, biological, psychological, and sociological prin-
ciples influencing the methods and practices in health, physical education,
and recreation today. The relationship of physical education to education
and educational aims and objectives will be discussed. Miss Browne.
3 cr.
454. ORGANIZED CAMPING
The methods, objectives, and purposes of organized camping; standards, facilities, equipment, food, sanitation, health, and safety requirements; program planning and leadership qualifications; integration of camping in the public schools; basic outdoor living skills. Miss Atwood and Mrs. Wooster. Permission of instructor. 3 cr.

455. INTRODUCTION TO COMMUNITY RECREATION
History, trends, community organization, financial aspects of administration, program planning, and leadership of community recreation, including playgrounds. Principles and philosophy of recreation. Miss Farrell. Elective for sophomores, juniors, and seniors. 3 cr.

520. PHYSIOLOGY OF EXERCISE
Course provides the essential background necessary for an understanding of the response of the body to exercise. Available research data in physiological phenomena associated with exercise will be discussed and analyzed, supplemented by individual study. Mr. Kertzer. Prereq: Zool. 507. 2 cr.

553, 554. THE THEORY OF TEACHING DANCE
A survey of methods, materials and techniques in teaching dance. Includes instruction in performance and teaching of rhythms, social, international folk and square dance, first semester; modern dance, second semester. Prereq: concurrent with second quarter international folk and American square dance; concurrent with third quarter: modern dance (elem. and inter.). Miss Morrison. Open to Physical Education majors or by permission of instructor. 2 lec; 1 lab; 2 cr.

563, 564. THE THEORY OF TEACHING TEAM SPORTS FOR WOMEN
The methods and principles involved in the teaching of team sports and lead-up games with emphasis on coaching methods strategy and techniques of officiating. Discussion of equipment, history, tactics, and rules of each sport. Miss Stone. Prereq: Elementary courses in team sports. 2 lec; 1 lab; 2 cr.

573, 574. THE THEORY OF TEACHING INDIVIDUAL SPORTS FOR WOMEN
The methods and principles involved in the teaching of tennis, badminton, bowling, skiing, skating, golf, and archery. The history, equipment, courtesies, rules, techniques, and strategy of each sport will be discussed. Miss Atwood and Miss Beckwith. Prereq: Elementary work in the courses listed above. Open to junior and senior majors or others by permission of instructor. 2 lec; 1 lab; 2 cr.

582. PERSONAL AND COMMUNITY HEALTH
Course deals with the individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Long. Prereq: Biol. 401-402. 3 cr.

P.E. 652. KINESIOLOGY; ADAPTIVE PHYSICAL EDUCATION
A course in body mechanics and kinesiology which deals with a program for the handicapped and individual problems in health and physical education. Mr. Kertzer. Prereq: Zool. 507. 3 cr.

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. Prereq: Zool. 601 or concurrently. 2 lec; 2 lab; 3 cr.

656. PROBLEMS OF HEALTH EDUCATION
Methods, materials, and principles of teaching school health. First aid, safety education, health examination, and recognition and prevention of disease. Mrs. Wooster. Open to Physical Education majors and others by permission of instructor. Prereq: P.E. 582. 3 cr.

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 relations. Miss Beckwith. 3 cr.

668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION
Procedures used in the evaluation, construction, administration, and interpretation 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 Knowlton and Mr. Weiland. 2 cr.

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. Prereq: P.E.-Ed. 792 or concurrently. Miss Farrell. 1 lec. 2-5 hr. lab; 6 cr.

Ed.-P.E. (790), 790. DIRECTED TEACHING OF PHYSICAL EDUCATION
Opportunity for teaching physical education activities under supervision primarily in the elementary and secondary schools. Miss Newman. Prereq: P.E.-Ed. 792 or concurrently. 1 lec; 2-5 hr. lab; 6 cr.

P.E.-Ed. 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. Prereq: Elementary games or its equivalent. 3 cr.

Physical Science (44)

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 achievements and problems of science as part of culture. Mr. Schneer. 3 lec; 1 lab; 4 cr. 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 Hist. 789. Mr. Schneer. Prereq: Permission of the instructor. 3 cr. (Course usually offered in the second semester.)

**Physics (86)**

Robert E. Houston, Jr., *Professor and Chairman*; David G. Clark, *Associate Professor and Associate Chairman*; Harry H. Hall, *Professor*; John A. Lockwood, *Professor*; Lyman Mower, *Professor*; Laurence J. Cahill, Jr., *Professor*; John E. Mulhern, Jr., *Professor*; Horace L. Howes, *Professor Emeritus*; Edward L. Chupp, *Associate Professor*; Robert H. Lambert, *Associate Professor*; John W. Dewdney, *Associate Professor*; Richard L. Kaufmann, *Associate Professor*; George H. Mullen, *Assistant Professor*; Robert E. Simpson, *Assistant Professor*; John Dowling, Jr., *Assistant Professor*; Mark P. Klein, *Assistant Professor*; Robert W. Jenkins, *Instructor* (part-time); Antal A. Sarkady, *Instructor* (part-time)

401-402. INTRODUCTORY PHYSICS

A broad survey of both classical and modern physics, designed to enable the student to appreciate the role of physics in our society. The main emphasis is on the fundamental laws of nature upon which all science is based. This includes such topics as the conservation laws, structure of matter, relativity, atomic and nuclear phenomena, and elementary particles. (A student who decides to major in Physics in the College of Liberal Arts may substitute this course for Phys. 404 with the permission of the department.) 2 lec; 1 rec; 1 lab; 4 cr.

403. ELEMENTARY PHYSICS

An elementary course with emphasis on selected topics from the various fields of physics. A knowledge of high school algebra and plane geometry is a prerequisite. Open only to students in the College of Agriculture. 1 lec; 2 rec; 1 lab; 4 cr.

404. GENERAL PHYSICS I

An elementary course emphasizing the role of mechanics as a foundation underlying all of physics. This is the first semester of the three semester sequence: Phys. 404, 501-502. Prereq: Math. 421 or 425 passed or taken concurrently. Should be taken as the introductory course for Physics majors in the College of Liberal Arts*; cannot be counted for major credit. 2 lec; 2 rec. (in alternate weeks one of the recitations is a laboratory exercise); 4 cr.

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 the 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. 3 cr.

* See description of Liberal Arts Physics major program, page 102.
406. INTRODUCTORY ASTRONOMY
A brief descriptive course covering celestial coordinate systems and 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. 3 cr.

501-502. GENERAL PHYSICS II, III
Selected topics from electrostatics, electromagnetism, wave motion, kinetic theory, relativity, and quantum theory. Prereq: Phys. 404 or Phys. 401-402, Math. 422 or 426. Must be taken as the introductory course for Physics majors in the College of Liberal Arts; cannot be counted for major credit. 2 lec; 1 rec; 1 lab; 4 cr.

503. MODERN PHYSICS
An introduction to twentieth century physics, including the structure of atoms and nuclei, including the basic ideas of quantum mechanics and solid state theory. Prereq: Phys. 501, 502, Math. 523, 527. 3 cr.

601-602. PHYSICAL MECHANICS
An analytical treatment of classical mechanics covering the methods of statics and dynamics of particles and rigid bodies, both in a plane and in space, and the application of these methods to physical problems; oscillations; constrained motion; generalized co-ordinates and Lagrange's Equations. Prereq: Phys. 501, 502, Math. 629-630 passed or taken concurrently. 3 lec; 3 cr.

605-606. EXPERIMENTAL PHYSICS I AND II

607. PHYSICAL OPTICS

608. THERMODYNAMICS
An introduction to thermodynamics and kinetic theory. 3 cr.

609-610. EXPERIMENTAL PHYSICS III-IV
Work of research type. Special problems are assigned to the individual student. Prereq: Senior standing in Physics. 2 lab; 3 cr.

611-612. PHYSICAL COLLOQUIUM
Participation in departmental colloquium reading, and study. Prereq: Senior standing in Physics. 1 cr. May be taken more than once. NLG

613-614. SPECIAL TOPICS
Any selected topics not sufficiently well covered in a general course. Prereq: Math. 629-630 passed or taken concurrently, and senior standing in Physics. 1, 2, or 3 cr.

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 inter-
action of radiation and matter. The operation of semiconducting and superconducting devices and lasers will be considered. Prereq: Math. 527, Phys. 502. 3 cr.

696. INDEPENDENT STUDY
Individual study projects in physics under the direction of a faculty adviser. Open only to physics honors students. 1-15 cr.

701. INTRODUCTORY QUANTUM MECHANICS
An introduction to quantum mechanics, with applications to atomic and molecular spectra. Prereq: Phys. 703 and Math. 629-630 passed or taken concurrently. 3 cr.

702. ATOMIC AND NUCLEAR PHYSICS
Natural radioactivity, nuclear reactions, nuclear scattering, models of the nucleus, high energy nuclear physics, cosmic rays. Prereq: Phys. 701. 3 cr.

703-704. ELECTRICITY AND MAGNETISM
Foundation of electromagnetic theory, including electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction to electrodynamics. Prereq: Phys. 501-502; Math. 629-630 passed or taken concurrently. 3 cr.

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**Plant Science (32)**

Lincoln C. Peirce, Professor and Chairman; Gerald M. Dunn, Professor; Russell Eggert, Professor; Ford S. Prince, Professor Emeritus; Paul T. Blood, Associate Professor; Leroy J. Higgins, Associate Professor; Clarence A. Langer, Associate Professor; Lorne A. McFadden, Associate Professor; Douglas G. Routley, Associate Professor; Owen M. Rogers, Associate Professor; James R. Mitchell, Assistant Professor; Radcliffe B. Pike, Extension Specialist

401. PLANTS AND MAN
A brief but important review in basic plant sciences having in mind the creation of positive thinking in relation to significant food and ornamental plants and their response to environment and culture. Staff. 3 cr.

402. CROPS FOR FEED AND FIBER
The distribution, growth, and management of crops for livestock and industry. Mr. Higgins. 2 lec; 1 lab; 3 cr.

403. THE WORLD OF PLANTS
The distribution of economically important plants, and man's efforts to control the growth of these plants for production of food and utilization of beauty. Mr. Peirce. 2 cr. Not open to Plant Science majors.

406. PLANT PROPAGATION
Controlled reproduction of plants with a discussion of microclimate and subsequent plant development. Mr. Rogers. Prereq: Bot. 411. 2 lec; 2 lab; 4 cr.
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 lec; 1 lab; 3 cr.

603. SEED TESTING
The identification of seeds and the techniques used in official methods of sampling and analyzing agricultural seeds for purity and germination. Mrs. Sanborn, Seed Analyst. Prereq: Bot. 411 and permission of instructor. 1 lab; 1 cr.

667. TURFGRASS MANAGEMENT
Characteristics of growth of fine turfgrasses, their adaptation to use, and their response to competition and environment. Mr. Higgins. 2 lec; 1 lab; (optional); 2-3 cr. (Alternate years; offered in 1966-67.)

678. HERBACEOUS AND WOODY ORNAMENTALS
A survey of the more important ornamental plants, their growth characteristics, culture, maintenance, and use. Mr. Rogers. Prereq: Bot. 411, 506. 3 lec; 1 lab; 4 cr. (Alternate years; offered in 1966-67.)

697-698. SENIOR SEMINAR
Required of all Plant Science seniors and open to seniors of related departments. Discussions in production and technological aspects of plant science. Staff. 1 cr. each semester.

704. ANNUAL CROPS
A study of annual grains, silage crops, and potatoes and their characteristics of growth as affected by culture and management. Mr. Higgins. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

706. PASTURE-HAY CROPS
A survey of the important forage and pasture crops, their characteristics of growth, culture, and management. Mr. Higgins. Prereq: Bot. 411, Pl. Sci. 402. 3 lec; 1 lab; 4 cr. (Alternate years; offered in 1966-67.)

708. NUTRITION AND WATER RELATIONS
Mineral requirements of plants and response to deficiencies. Effect of soil and atmospheric environments on plant growth and differentiation of plant parts. Mr. Eggert. Prereq: 3 cr. in plant physiology. 2 lec; 1 lab; 3 cr. (Offered in 1966-67.)

753. FRUIT CROPS
The growth and management of tree and small fruit crops. Pest control, storage, marketing, and response to pruning and grafting. Mr. Eggert. Prereq: 7 cr. Bot., Pl. Sci. 406, 7 cr. Soils. 3 lec; 1 lab; 4 cr. (Alternate years; offered in 1966-67.)

764. VEGETABLE CROPS
Systematic classification of vegetable crops, their use, management, and response to environment and competition in food and seed production. Mr. Peirce. Prereq: Bot. 411, Pl. Sci. 406 or equivalent. 3 lec; field trip; 3 cr. (Alternate years; offered in 1966-67.)
765. SYSTEMATIC POMOLOGY
Taxanomic relationships and group characteristics among varieties of trees and small fruits. Mr. Eggert. Prereq: 6-8 cr. in Botany. 1 lee; 1 lab; 2 cr. (Alternate years; not offered in 1966-67.)

768. PLANT GROWTH AND DEVELOPMENT
Biochemical and physiological aspects of crop production. Bases for changes in growth or development of plants effected by environment or treatments. Mr. Eggert. Prereq: Chem. 545, Bot. 756 or equivalent. 3 cr. (Alternate years; not offered in 1966-67.)

774. METHODS AND THEORY OF PLANT BREEDING
History and use of plant breeding systems, including bulk and pedigree methods, recurrent selection, gamete selection, and testing. Mr. Peirce. Prereq: 3 cr. in genetics. 3 cr. (Alternate years; not offered in 1966-67.)

795-796. INVESTIGATIONS IN PLANT SCIENCE
Selected topics for crop or library research. Prereq: Permission of instructor. 1-4 cr.
2. Breeding and Genetics: Messrs. Dunn, Peirce, Rogers.

Political Science (52)

Frederic Wurzburg, Associate Professor and Chairman; John T. Holden, Professor; Robert B. Dishman, Professor; Erwin A. Jaffe, Associate Professor; David L. Larson, Associate Professor; Joseph P. Ford, Instructor; Raymond E. Matheson, Instructor; Paul Dunham, Research Associate, Public Administration Service

All students majoring in Political Science must complete Political Science 405 and 406 with a grade of C or better. These two courses qualify the student for his major but may not be counted for major credit.

405, (405). ELEMENTS OF POLITICAL SCIENCE
An introduction to politics and government in modern society. The scope and method of political science, the behavior of the individual and group in political society, the nature and structure of political power, and competing political ideologies, e.g., communism, elitism, democracy. Staff. Open to all students. 3 cr.

(406), 406. PRINCIPLES OF AMERICAN GOVERNMENT
The origins and development of the national government in the United States. The role which legislators, administrators, judges, and the people themselves play in the governmental process and the constitutional and political framework within which they operate. Staff. Open to all students. 3 cr.
Political Science

408, (408). AMERICA IN WORLD AFFAIRS
The problems of American foreign relations. The formulation and execution of policy, the emergence of the United States as a world power, contemporary issues confronting the country, and policies adopted to meet the issues. Mr. Holden and Mr. Ford. Open to all students, 3 cr.

513. INTRODUCTION TO STATE AND LOCAL GOVERNMENT
An examination of the institutions, services, historical background, and social, economic, and political environment of state and local governments. Emphasis will be placed upon the political process and the relation between structure and politics, including an analysis of the impact of this relationship upon executive, legislative, and judicial powers. State-local relations will be examined in some detail. Mr. Dunham. 3 cr.

514. PROBLEMS IN STATE AND LOCAL GOVERNMENT
An examination of selected problems in state and local government and their proposed solutions. Topics to be covered include the role of states in a federal system, metropolitanism, urban planning, reapportionment of state legislatures, taxation and educational politics. Field trips to town meetings and to the state legislature, when in session, will be included. Prereq: Pol. Sci. 513, 3 cr.

515. WESTERN EUROPEAN DEMOCRACY
A comparative study of the leading democratic systems in Western Europe, including Great Britain, France, and Bonn Germany, with more emphasis on the Common Market and other relevant regional organizations. Mr. Wurzburg. Prereq: Pol. Sci. 405 or permission of instructor. 3 cr.

516. TOTALITARIAN DICTATORSHIP
A comparative study of totalitarian dictatorship emphasizing the Communist regimes of Russia and China but with some attention given to Fascist regimes. Mr. Wurzburg. Prereq: Pol. Sci. 405 or permission of instructor. 3 cr.

525. POLITICAL PARTIES AND THE ELECTORAL PROCESS
Political parties as an instrument for the popular control of government in the United States. The way in which parties are organized, the methods by which they nominate candidates and campaign for their election, and the groups from which they draw most of their electoral support. Mr. Ford. Prereq: Pol. Sci. 406. 3 cr.

535. THE THEORY OF INTERNATIONAL RELATIONS
The integrated and interdisciplinary study of the behavior of nation-states in relation to one another. The growth and development of the nation-state system with its correlative aspects of sovereignty, international law, nationalism, internationalism, and international organization. Prereq: Pol. Sci. 405, 408 or permission of the instructor. Mr. Larson. 3 cr.

536. THE PRACTICE OF INTERNATIONAL RELATIONS
The struggle for power, prestige and prosperity between and among nation-states. An analysis of the national interest-ideological axis will be made with some attention paid to the causal factors of the phenomena of international affairs. Prereq: Pol. Sci. 535 or permission of the instructor. Mr. Lawson. 3 cr.
561. AMERICAN POLITICAL THOUGHT
A survey and analysis of the major theories which have contributed to American political thinking from the colonial period to the present. Prereq: Pol. Sci. 405, 406 or introductory American history course. Mr. Jaffe. 3 cr.

715. COMPARATIVE POLITICS
Concepts of government and politics dealing with political dynamics, institutions, and change in developed and under-developed areas by use of the comparative method. Mr. Wurzburg. 3 cr.

717. CONTINENTAL EUROPEAN POLITICAL PARTIES
The relationship of theories of representation and political parties to historical circumstance. Following an appraisal of today's party systems, chronological treatment serves to show how changes within and among political parties are connected with the changing role parties play in the political process. Prereq: Permission of Department. Mr. Wurzburg. 3 cr.

726. PRESSURE GROUPS AND THE GOVERNMENTAL PROCESS
Political interests groups as an unofficial "third house" of American national and state legislatures. The efforts by pressure groups to influence public officials by lobbying, propaganda, and direct political action. Mr. Ford. Prereq: Pol. Sci. 406. 3 cr.

731. THE ADMINISTRATIVE PROCESS
The principal concepts of governmental administration, including theories of organization, administrative leadership, internal management, and administrative responsibility and control. The relationship of group behavior and policy development to the administrative process. Prereq: Pol. Sci. 406 or Soc. 400. 3 cr.

741. ADMINISTRATION OF JUSTICE
A comparative study from primitive times to the present of the administration of criminal and civil justice under various legal institutions and systems. The modern role of the police, public prosecutor, judge, jury, counsel, and interest groups in the judicial process in the United States and in other nations, including England and Wales, France, Germany, and the Soviet Union. Mr. Dishman. 3 cr.

742. THE SUPREME COURT AND THE AMERICAN CONSTITUTION
The Supreme Court considered as both a court of law and a political institution. The origins and development of judicial review and changing conceptions of the judicial process. The Supreme Court as supreme arbitrator in disputes between the nation and the states, the President and Congress, and majority rule and minority rights. Mr. Dishman. Prereq: Pol. Sci. 406 or permission of the instructor. 3 cr.

745. WORLD POLITICS
The basic driving forces in international relations, including the nature of political power and its extension or limitation. Geopolitics, nationalism, ideology, imperialism, international economic relations, balance of power, warfare, regulation of arms, international law, and collective security. Mr. Holden. 3 cr.
Political Science

746. **FOREIGN POLICIES OF THE GREAT POWERS**
Fundamental factors influencing contemporary foreign policy formulation of the United States, the Soviet Union, the British Commonwealth, and other significant powers. Problems and choices confronting policy makers of these powers in dealing with issues involving the United Nations, regional organizations, Western Europe, Middle East, and Asia. Mr. Holden. 3 cr.

747. **CONDUCT OF FOREIGN POLICY**
The constitutional, institutional, and procedural aspects of decision-making within the framework of U. S. national security and national policy. Some emphasis will be given to the ideological framework within which the decision-making process occurs. Mr. Larson. 3 cr.

751. **CONTEMPORARY SOUTHEAST ASIA**
A comparative study of the political and social development of Southeast Asia. The significance of the role of independence and dependence; the competing influence of communism and Western democracy; the special significance of the role of China, India, Great Britain, and the United States. The states to be studied include the Philippines, Laos, Cambodia, Viet Nam, Viet Minh, Thailand, Burma, Malaya, and Indonesia. Mr. Holden. 3 cr.

752. **GOVERNMENT OF EMERGING COUNTRIES**
A comparative study of recent developments in the politics and governing systems of Asia and Africa, and regional arrangements indigenous to these areas. Prereq: Pol. Sci. 405 or permission of instructor. 3 cr.

754. **GOVERNMENTS OF LATIN AMERICA**
A comparative study of the politics and governing systems of Latin America with some consideration given to regional arrangements. Prereq: Pol. Sci. 405 or permission of instructor. 3 cr. Mr. Larson.

756. **CONTEMPORARY SOUTH ASIA**
A comparative and analytical study of the historic, political, social, and economic influences in modern South Asia. Special attention will be paid to the rivalries between Pakistan and India, to the pressures of the Soviet, the United States and China; to the influences of both the Commonwealth and the Afro-Asian bloc ideals and goals. The states to be included are Pakistan, India, Ceylon, Nepal, and Afghanistan. Mr. Holden. 3 cr.

763. **POLITICAL THOUGHT IN THE WEST**
The principal political theories from Plato and Aristotle to the beginning of the modern liberal tradition. The growth and development of political thinking and institutions in terms of the development of modern government. The development of the modern national state and its fundamental institutions. Mr. Jaffe. 3 cr.

764. **MODERN POLITICAL THOUGHT**
Modern western political thought from the emergence of the nation state to the present. The meaning and growth of the basic patterns of thought on the Continent and in England, including liberalism, democracy, nationalism, socialism, communism, and fascism. The contributions of American political thought as it grew from its English origins to the development of the American constitutional system. Mr. Jaffe. 3 cr.
765. Contemporary Political Theory
A survey and analysis of contemporary political theories. The crisis in
democratic thought, totalitarian ideology, the search for scientific politi-
cal theory. Prereq: Pol. Sci. 763, 764, or permission of instructor. Mr.
Jaffe. 3 cr.

771, (771). Research in Government Problems
Independent study of the methods and techniques of research in various
fields of government. Students analyze the economic, social, and politi-
cal structure of their own community, the composition and organization
of their state legislature, the record of their Representative in Congress
or one of their Senators, the legislative history of an act of Congress,
and the judicial process as exemplified by a decision of the U. S. Supreme
Court. Students not writing a profile of their home community will be
expected to write an extended thesis on some topic of their choice in
any field of political science. Open to junior majors in political science
and others with permission of the instructor. Mr. Dishman. 3 cr.

775. International Law
The theory and practice of international law and its relation to the inter-
national community of nation-states and international organizations. Also,
the function of law in international relations as analyzed from decisions
of national and international tribunals and as manifested in constitutions,
 charters, and other international documents. Prereq: Permission of the
instructor. Mr. Larson, 3 cr.

776. International Organization
The theory of collective security and cooperation and the practice of
international organizations as a response to meeting the needs of the
international community. Emphasis will be placed upon the League-
United Nations System and specialized regional organizations. Prereq:
Pol. Sci. 765 or permission of the instructor. Mr. Larson. 3 cr.

779. Public Policy and Regionalism
3 cr. (Not offered in 1966-67.)

797, 798. Seminar in Political Science
A selected current topic from government, political philosophy and his-
tory, political behavior, public law, public administration, or inter-
national relations will be the vehicle for this seminar. Each student is
held responsible for a specific phase of the selected problem. He will
also, through the techniques of the seminar, acquaint himself with the
whole project. The course is restricted to undergraduates with honor
grades and graduate students in Social Science. Advance copies of the
syllabus may be secured from the Chairman of the Department. Per-
mission of the instructor is required. Mr. Holden, Mr. Dishman, Mr. Ford,
Mr. Jaffe, Mr. Wurzburg. 3 cr.

Poultry Science
(See Animal Sciences)
Psychology (67)

Raymond L. Erickson, Associate Professor and Chairman; Herbert A. Carroll, Professor Emeritus; George M. Haslerud, Professor; Eugene S. Mills, Professor; Brian R. Kay, Professor; Frederick M. Jervis, Associate Professor; Earl C. Hagstrom, Associate Professor; Walter R. Duryea, Assistant Professor; Robert G. Congdon, Assistant Professor; Edward F. Rutledge, Assistant Professor; Gordon A. Haaland, Instructor; J. Alden McConnell, Instructor

401-402. General Psychology
Psychology as a behavioral science, with emphasis on both its theoretical and applied aspects; the basic determinants of behavior and the nature of psychological inquiry. Included in the first semester are such topics as the history of psychology, scientific method, perception, conditioning, verbal behavior and thinking, and the biological bases of behavior. In the second semester, motivation, frustration and conflict, psychopathology, psychological testing, personality, and social behavior. Completion of both semesters is a prerequisite for all other courses in the department, except with permission of the instructor. Cannot be counted for major credit. Not open to students who have taken Psych. 1. Staff. 3 cr.

537. Developmental Psychology
Man's behavioral and psychological development and their relation to physical growth. Phylogenetic and ontogenetic development are examined and pertinent animal studies are introduced. The prenatal period is considered along with childhood, adolescence, and early maturity. The developmental methods of study are also an integral part of the course. Prereq: Psych. 402. 3 cr. (Formerly 437.)

544. Psychology of Personality
The major theories of personality, with an examination of clinical and research literature as it is related to the nature and development of personality. Mr. Jervis, Mr. McConnell. Prereq: Psych. 402. 3 cr.

567. Statistics in Psychology
Investigation of the methods utilized in the statistical analysis of psychological data. The basic concepts of descriptive statistics, such as the normal distribution, measures of central tendency, measures of dispersion, and correlation. The principles of statistical inference are introduced, and the student gains experience in the appropriate use of several tests of significance. Prereq: Psych. 402. 3 cr. (Formerly 667.)

605. Mental Hygiene in Teaching
The fundamental needs of human beings, with emphasis on the mental and emotional conflicts of secondary school students arising from frustration of these needs. Ways of recognizing these conflicts and of helping students to resolve them are considered in detail. Attention also is given to sources of stress in the teaching profession. Mr. Carroll. Prereq: Psych. 402. 3 cr. (Offered only in the summer.)

654. Psychopathology
A systematic examination of the more severe behavioral disorders as found in the major forms of the neuroses and psychoses. The ego defense
mechanisms and the construct of anxiety are seen as central to the understanding of these disorders. The search for causes, the interpretations of symptoms, and the methods of treatment. Mr. McConnell. Prereq: Psych. 402. 3 cr.

663. THE EXCEPTIONAL CHILD
A comparison of gifted, retarded, physically handicapped, and emotionally disturbed children along such basic psychological dimensions as intellectual functioning, personality dynamics, and adjustment problems. Prereq: Psych. 402. 3 cr.

695. HONORS IN PSYCHOLOGY
Open to seniors with a 3.0 average in psychology courses and the recommendation of a member of the psychology faculty, or in unusual cases to those who receive special departmental permission. As individuals, or as members of a seminar group, students make library and/or laboratory investigations of problems of mutual interest to professor and student. Oral or written reports made by members of the seminar are a basis for discussion. Staff. Prereq: 15 semester credits in Psychology. 3 cr.

697. THE INTEGRATING OF PSYCHOLOGY
Through lectures, discussions, and papers, senior majors recall and reassess their knowledge of psychology, fill gaps in their background, and work on the growing edge of the science. The examination in this course satisfies the departmental requirement of a comprehensive examination. Mr. Haslerud. Prereq: 12 semester credits in Psychology. 3 cr. Required of all undergraduate majors in Psychology.

757. EXPERIMENTAL PSYCHOLOGY
The application of experimental methods to a variety of psychological phenomena. In addition to participating in a sequence of basic laboratory experiments, each student will be responsible for conceiving, conducting, and reporting an original experiment. Mr. Haslerud, Mr. Hagstrom. Prereq: Psych. 567. 2 lec; 2 lab; 4 cr.

758. PSYCHOLOGY OF LEARNING
An evaluation of contemporary theories of learning. Attention is given to the historical antecedents of current theories, their experimental support, and practical implications. Mr. Haslerud, Mr. Erickson. Prereq: Psych. 402. 3 cr.

760. PSYCHOLOGY OF MOTIVATION
Motivational constructs are studied in relation to contemporary theories of behavior. The role of motivational variables is considered in relation to such other areas of psychology as learning, perception, and personality. Mr. Rutledge. Prereq: Psych 402. 3 cr.

776. COMPARATIVE PSYCHOLOGY
Appraisal of the similarities and differences in the behavior of infrahuman organisms as an aid to understanding the evolution of complex behavior. The comparative method is applied to the study of such topics as instinct, consciousness, reasoning, judgment, social influence, and abnormal behavior. Mr. Hagstrom. Prereq: Psych. 402. 3 cr.
Psychology

778. PHYSIOLOGICAL PSYCHOLOGY
A study of behavior as it is related to the physiological structure and function of the organism. Special attention is given to sensory, neural, and glandular functions as organic bases for factors such as motivation, emotion, and learning. Mr. Hagstrom. Prereq: Psych. 402. 3 cr.

780. SOCIAL PSYCHOLOGY
A consideration of the social factors affecting perceptual-cognitive processes, learning, motivation, and the behavior of man in the social system. Mr. Haaland. Prereq: Psych. 402. 3 cr.

783. SYSTEMATIC PSYCHOLOGY
An evaluation of the numerous approaches to the study of behavior that exist within contemporary psychology. Historical perspective is given by attention to the major antecedents in philosophy, theology, and the physical sciences, and their relationship to the subsequent development of schools and systems of psychology. Prereq: Psychol. 402. 3 cr.

789. (789). SPECIAL TOPICS IN PSYCHOLOGY
Taught by a different staff member each year. The instructor will present advanced material in an area in which he has developed specialized knowledge through research and special study. Students may repeat the course, but may not duplicate areas of specialization. Staff. Prereq: 15 credits in Psychology and/or permission of instructor. 3 cr.

Reserve Officers Training Corps

Department of Military Science (98)

Colonel Pierre D. Boy, Professor of Military Science; Major Wayne C. Smith, Jr., Infantry, Assistant Professor; Major Robert H. Nourse, Infantry, Assistant Professor; Captain Anthony D. Potter, Artillery, Assistant Professor; Captain Martin P. Sorensen, Artillery, Assistant Professor; Sergeant Major Emery A. Myshrall, Assistant; Master Sergeant Joseph E. R. Guertin, Assistant; Sergeant Alton F. Lindsay, Assistant; Master Sergeant Clarence P. Andersen, U. S. Army (Retired), Army ROTC Property Officer

The Army Reserve Officer Training Corps offers a course of instruction leading to a commission as a 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 Military Science courses follow the student’s normal academic progression, i.e., a student takes Military Science 413-414 during his freshman year and Military Science 523-524 during his sophomore year. If he elects and is accepted for Advanced ROTC, he will take Military Science 633-634 and Military Science 743-744 during his junior and senior years respectively.
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 details, contact the Professor of Military Science.

413. FUNDAMENTALS OF MILITARY SCIENCE

The organization of the Army and ROTC and the Army and national security. Practical training in leadership, marksmanship, military drill, and command provides a balanced picture of the mission of the Army and an introduction to the military program. Two hours of classroom instruction plus leadership laboratory. 2 cr.

414. CONCURRENT DEVELOPMENT

An integrated course consisting of leadership laboratory conducted by the Army ROTC Department and an elective University subject which, in the opinion of the student’s faculty adviser and the Professor of Military Science, will develop the cadet’s potential. The elective course must be selected from the areas of effective communication, science comprehension, general psychology, or political development and political institutions. A course falling within one of these areas, which is also required in the student’s college curriculum, is acceptable. Credit is awarded after satisfactory completion of the elective course and leadership laboratory. Cr. NLG.

523. AMERICAN MILITARY HISTORY

A survey of American military history from the origins of the American Army to the present with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army and society. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 cr.

524. LAND NAVIGATION AND THE PRINCIPLES OF MILITARY OPERATIONS

The science of military maps and land navigation. An introduction to military operations with emphasis on the principles of firepower and maneuver. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 cr.

633. PROFESSIONAL DEVELOPMENT

Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student’s faculty adviser and the Professor of Military Science, will contribute to the cadet’s potential as a prospective Army officer. The academic subject must be selected from the areas of effective communication, science comprehension, general psychology, or political developments and political institutions. Military instruction, a prerequisite for cadet subsistence pay and commissioning, will include leadership laboratory and branches of the Army. The integrated course of instruction outlined above must provide for a
minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and leadership laboratory. Cr. NLG.

634. MILITARY LEADERSHIP AND COMMAND
The principles of leadership. The theory and practice of military teaching methods, small unit tactics, military communication facilities. Leadership laboratory to include exercise of command of small units. Five hours of instruction per week. 3 cr.

743. PRINCIPLES OF COMMAND AND STAFF
An introduction to the military staff and military staff work to include the relationship between command and staff, relationship of staff to subordinate units, command channels, liaison, military intelligence, and training management. Military logistics to include troop movements, motor transportation, and supply and evacuation. Army administration and military law. Leadership laboratory to include practical application of leadership principles and exercise of command. Minimum of five hours of instruction per week. 3 cr.

744. PROFESSIONAL DEVELOPMENT
Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will contribute to the cadet's potential as a prospective Army officer. The academic subject must be selected from the areas of effective communication, science comprehension, general psychology, or political developments and political institutions. Military instruction, a prerequisite for cadet subsistence allowance and commissioning, will include leadership laboratory, service orientation, and a study of the role of the United States in world affairs. The integrated course of instruction outlined above must provide for a minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and leadership laboratory. Cr. NLG.

406. ARMY ROTC BAND
Open only to freshmen and sophomore men enrolled in the Army ROTC program on basis of individual tryouts. This band furnishes music for all Army ROTC military functions. ½ cr. semester. NLG.

ARMY FLIGHT TRAINING
A program conducted by licensed flight instructors which 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. Open to Army ROTC senior advanced-course students who can meet physical and aptitude requirements. No credit.

Department of Aerospace Studies (99)

Lieutenant Colonel Bud Barbee, USAF, Professor; Major Don L. Thompson, USAF, Assistant Professor; Major Denis J. Driscoll, USAF, Assistant Professor; Captain Donald P. Uhl, USAF, Assistant Professor; Technical Sergeant Charles E. Mooers, USAF, Assistant; Staff Sergeant John B. MacDonald, USAF, Assistant; Staff Sergeant Alfred Seppy, USAF, Assistant
The Air Force ROTC offers two separate, but related programs leading to a commission in the United States Air Force upon graduation.

The traditional four-year program is available to entering freshmen, in which they will pursue courses in aerospace studies in all four of their undergraduate years. In addition, a new two-year Air Force program is offered to those students with advanced standing who have not previously completed freshman and sophomore ROTC courses. This program applies specifically to transfer students, graduate students, and those at the junior level who have not completed two years of the basic ROTC program. Students entering the new two-year program must have two years of college remaining at the University, either undergraduate or graduate, in order to complete the course of study leading to a commission in the Air Force.

The four-year program (18 credit hours) is recommended for those with normal academic loads who have a particular interest in the basic course material and who wish to have the opportunity to compete for Air Force scholarships.

The two-year program (12 credit hours) is recommended for technology students and others who wish to minimize the number of AFROTC credits. The two-year program summer training session is two weeks longer than the summer session of the four-year program. No Air Force scholarships are available for members of the two-year program. In both the four and the two-year programs, the courses emphasize quality educational development in those skills considered necessary for a career in the Air Force.

The four-year Air Force ROTC curriculum is divided into two phases. The lower division (Basic) program is established as the General Military Course and consists of aerospace studies for one semester in each of the freshman and sophomore years. Completion of the General Military Course entitles the student to six hours of academic credit. He acquires training in leadership skills, a broader understanding of the vital issues at play in national and international affairs, and the role of the military services in national security.

The upper division (Advanced) program is established as the Professional Officer Course, open to both the four-year student as he enters his junior year and to those who enter into the special two-year Air Force ROTC program. The course of study leading to a commission includes specialized instruction in the growth and development of aerospace power, astronautics and space operations, and management principles and practices. Completion of the Professional Officer Course entitles the student to twelve hours of academic credit. Students intending to apply for enrollment in Professional Officer Course should consult their adviser or the Professor of Aerospace Studies in regard to application of AFROTC academic credits toward specific degree requirements in the various schools and colleges of the University.
Attractive financial aid is available to students entering both the four-year and the two-year program. Some highly qualified students in the four-year program will be eligible for scholarships of as much as $1,300 per year. This will be a selective and highly competitive program. All students accepted for entry into the Professional Officer Course will receive a retainer pay at the rate of $40 per month while pursuing courses of study leading to an Air Force commission. Special pay is authorized cadets when they attend summer training at an Air Force Base.

Selection for the Professional Officer Course in both flying and non-flying categories 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. About one-third of those admitted into the Professional Officer Course are physically qualified for, and desire, flight training as pilot or observer. Pilot cadets will receive, during their senior year, 36½ hours of flight instruction under the supervision of the Federal Aviation Agency, leading toward a private pilot’s license.

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.

413. AIR LEADERSHIP
Leadership training through eight 2-hour training periods. An introduction to military customs and courtesies and practice of basic drill procedures. Cr. NLG.

416. WORLD MILITARY SYSTEMS
An introductory course exploring the causes of the present world conflict, the role and relationship of military power to that conflict, and the responsibility of an Air Force officer. A discussion of the factors from which differing political philosophies have evolved. A tri-dimensional analysis of the three prime political philosophies which have guided segments of society in the 20th century. A discussion of the means that nations develop to pursue their objectives and how they confront each other in the use of these means. The U. S. organization for national security with emphasis upon the role and structure of the U. S. Air Force.

525. WORLD MILITARY SYSTEMS
World military forces and the political-military issues surrounding the existence of these forces. This includes the U. S. Army and Navy and their doctrines, missions, and employment concepts; the military forces of NATO, CENTO, SEATO, and their role in free world security; and the military force of the USSR, the Soviet Bloc; and the Chinese Communist forces. An analysis of the trends and implications of world military power. 3 cr.

528. AIR LEADERSHIP
Leadership training through seven 2-hour training periods. A consolidation of basic military skills with emphasis on building confidence through the exercise of command. Cr. NLG.
635. THE UNITED STATES AIR FORCE
The nature of military conflict and the development of aerospace power into a prime security element. The modes of employment of aerospace forces in general war, limited war, and actions short of war. Includes training in the development of leadership skills. 3 lec; 1 lab; 3 cr.

636. UNITED STATES SPACE OPERATIONS
The development and the importance of the national space effort, the characteristics of the solar system that affect space exploration and operation, and current and planned capabilities for space operations. Includes training in the development of leadership skills. 3 lec; 1 lab; 3 cr.

745. USAF PROFESSIONAL OFFICER DEVELOPMENT
The meaning of military professionalism, responsibilities of the professional man, and his relationship to the military services and national security. The military justice system and specific aspects of military life. Includes training and development of leadership skills. Flight instruction, training in weather and air navigation, and an opportunity to qualify for a private pilot's license is offered to selected cadets. 3 lec; 1 lab; 3 cr.

746. USAF PROFESSIONAL OFFICER DEVELOPMENT
Leadership theory, functions, and practices; management principles and functions; problem solving; and management tools, practices, and controls. Specific personal matters to help the cadet make a rapid, effective adjustment to active duty as an Air Force officer. For those selected, flight instruction continues in weather, air navigation, and preparation for a private pilot's license. 3 cr.

Resource Economics (21)

Robert L. Christensen, Assistant Professor and Acting Chairman; James R. Bowring, Professor; William H. Drew, Professor; Harold C. Grinnell, Professor Emeritus; William F. Henry, Professor; Richard A. Andrews, Associate Professor; Owen B. Durgin, Associate Professor; Silas B. Weeks, Associate Professor; Robert H. Forste, Assistant Professor; George E. Frick, Adjunct Professor

402. ECONOMICS OF AGRICULTURE 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. 3 cr.

501. AGRICULTURAL BUSINESS
The organizational, legal, and financial aspects of businesses engaged in buying farm products and selling farm supplies. Farm cooperatives are covered as a special case. Agricultural marketing problems are integrated with the course content. Mr. Christensen. 3 cr. (Alternate years; offered in 1966-67.)
504. MANAGEMENT OF FARM AND RELATED RESOURCE-BASED BUSINESS
Planning, operation, and management control in the economic and institutional environment. An understanding of decision-making principles, analyzing records, planning adjustments, and organizing the firm. Laboratory experience in organizing the business firm, budgeting changes, decision-making, estimating credit needs, and measuring growth. Emphasis is placed upon the proprietorship and the partnership forms of business organization. Prereq: Econ. 402 or Res. Econ. 402 or permission of instructor. Mr. Andrews. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

505. AGRICULTURAL MARKETING
The marketing structure for the major food industries and the kinds of market decisions and agreements made for profit and general welfare by firms, processors, and government policy makers. Market development, plant location, prices, grades and specification buying as related to the demand for food by institutional buyers, processors, and retailers. International trade in food products and the place of the surplus productive capacity of the United States in relation to world trade. Mr. Bowring. 3 cr. (Alternate years; not offered in 1966-67.)

507. ECONOMICS OF CONSUMPTION
The significance to the economy of consumer decisions about spending and saving. The economic theories of consumer decision making. Factors influencing consumer choice, such as product prices and grades, retail merchandising, and consumer incomes. Process of maximizing consumer satisfaction. Mr. Henry. 3 cr.

611. PUBLIC POLICY FOR AGRICULTURAL AND NATURAL RESOURCES
The development and implementation of policies for the use of agricultural and other natural resources. Production and marketing controls, land use and conservation measures, and the contribution that economic principles can make in determining desirable policies. Mr. Drew. 3 cr.

697-698. SEMINAR IN RESOURCE ECONOMICS
Presentation and discussion of reports on economic theory and current topics on resource development with departmental staff. Prereq: Junior standing. May be repeated. 1 cr.

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. Prereq: Econ. 1. 3 cr.

708. RESEARCH METHODS IN SOCIAL SCIENCES
The scientific method of research. The meaning of logic and the scientific method and on the application of research techniques to identifying and solving problems. Can be used in place of Soc. 702. Prereq: 3 hours of statistics. Mr. Drew. 3 cr.

715. LINEAR PROGRAMMING
Setting up and solving problems by the simplex and distribution methods, variations in linear programming problems, solving input-output and
game theory problems, and parametric programming. Situations dealt with include least cost combinations, maximum profit combinations, transportation and spatial equilibrium, and intersector flows. Prereq: Math. 407 or permission of instructor. Mr. Andrews. 3 cr.

795-796. INVESTIGATIONS IN RESOURCE ECONOMICS
Special assignments in readings and problems to satisfy students' needs. Mr. Andrews, Mr. Bowring, Mr. Christensen, Mr. Drew, Mr. Henry, and Mr. Weeks. 1-3 cr.

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Russian (See German and Russian)

Secretarial (73)

Doris E. Tyrrell, Associate Professor; Myra L. Davis, Assistant Professor

401-402. SHORTHAND
Principles of Gregg shorthand with practice in transcribing from shorthand plates and class notes. Seel. 407-408 must be taken in conjunction with this course or precede it. Miss Tyrrell. Prereq: Permission of instructor. 3 cr.

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. Prereq: Permission of instructor. 5 lab; 1 cr. NLG.

407-408. TYPEWRITING
Practice in acquiring correct typewriting techniques and in arranging letters, tabulations, and simple manuscripts. Miss Davis. Prereq: Permission of instructor. 5 lab; 2 cr. (See Seel. 427).

427. TYPEWRITING
Practice in acquiring correct typewriting techniques, and in arranging letters, tabulations, and simple manuscripts. This course, which begins on November 13, 1966, is to be taken instead of Seel. 407 by Secretarial students who have had Seel. 405 or the equivalent. Prereq: Seel. 405 or equivalent and permission of instructor. Miss Davis. 5 lab; 1 cr.

503-504. ADVANCED SHORTHAND
A review of fundamental principles, the building of shorthand vocabulary, practice in taking dictation at increasing rates of speed, and practice in developing skill and speed in transcription. Miss Tyrrell. Prereq: Seel. 402 or equivalent and permission of instructor. 3 cr.

517. SECRETARIAL OFFICE PROCEDURE
Discussion of secretarial duties and traits; problems in the discharge of various duties; problems in office management. Miss Tyrrell. Prereq: Seel. 503 or this course taken in conjunction with Seel. 517, and permission of instructor. 3 cr.

279
Social Sciences

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. Prereq: 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. No more than 9 credits may be counted toward the completion of major requirements.

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. 3 cr. NLG.

Sociology (68)

Stuart Palmer, Professor and Chairman; Charles W. Coulter, Professor Emeritus; Richard Dewey, Professor; Melville Nielson, Associate Professor; Melvin T. Bobick, Associate Professor; Solomon Poll, Associate Professor; Peter Dodge, Associate Professor; Owen B. Durgin, Associate Professor of Resource Economics; Richard E. Downs, Assistant Professor; Pauline Soukaris, Assistant Professor; Richard Ingersoll, Assistant Professor; Forbes Bryce, Lecturer

Anthropology Courses

411, (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. 3 cr.

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. Prereq: Soc. 411 or the consent of the instructor. 3 cr.
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. Prereq: Soc. 411 or equivalent, or the consent of the instructor. 3 cr.

Social Service Courses
621-622. Introduction to Social Welfare
The field of social welfare: history, public welfare, case work, social group work, community organization for social welfare. For sociology majors and students enrolled in the Social Service curriculum; others may be admitted by permission of the instructor. 3 cr. (Counts for major credit in Sociology at discretion of adviser.)

631. Social Welfare Field Experience
To give the student an understanding of social welfare through observation and participation. Students will work in a social welfare setting for a period of eight weeks (or its equivalent). This field work is generally done during the summer following the junior year. Weekly seminar sessions constitute the classroom work of the course. Prereq: Soc. 621-622 and permission of the instructor. Does not count for major credit in Sociology. 6 cr.

Sociology Courses
(400), 400. Introductory Sociology
Man's social and cultural relationships as revealed in his customs and institutions. Social theory, methods and techniques of research, and current research findings. 3 cr.

(500), 500. Social Psychology
Individual actions, attitudes, ideas, and perceptions as influenced by socio-cultural environments. Individual-cultural relations in education, religion, economics, aesthetics, ethics, and deviant behavior. Prereq: Soc. 400 and Psych. 401 or sophomore standing. 3 cr.

(520), 520. The Family
An anthropological and institutional approach comparing customs and organizations in several societies. Not open to freshmen. 3 cr.

(530), 530. Race and Ethnic Relations
Majority-minority group relations. Special attention is given to the nature and results of Negro-White and ethnic group relations in the United States. Not open to freshmen. Prereq: Soc. 400. 3 cr.

(540), 540. Social Problems
How culture in the form of customs and institutions is related to such human problems as crime and delinquency, alcoholism, physical and mental disease, sex pathologies, poverty, old age, broken families, and racial and religious prejudices. Especially for students who do not intend to major in sociology. Prereq: Soc. 400. 3 cr.

550. Population Problems
Basic concepts of population analysis; theories of population change; the world population growth in the past and present; population problems and policies in hungry and affluent nations. 3 cr.
560. RURAL-URBAN SOCIOLOGY
Application of sociology principles to the study of customs and institutions in rural and urban settings. Differentiation between influences upon community organization of culture on the one hand and population size and density on the other. **Prereq:** Soc. 400. 3 cr.

571. COMMUNICATION IN SOCIETY
Social aspects of the communication process. Cultural prerequisites of communication; premises, purposes, and procedures of communication content analysis; communication in crowd, mass, and public; the organization of mass communication systems in traditional totalitarian and democratic societies; and audience reactions to communicated messages. **Prereq:** Permission of the instructor. 3 cr.

640, 641, 642. READINGS IN SOCIOLOGY AND ANTHROPOLOGY
A three-semester reading sequence of specified books. Required of and restricted to sociology majors. 1 cr. per semester.

695, 696. HONORS SEMINAR
Students work individually on a problem selected by the Department member in charge of the Seminar. A number of projects are assigned in which emphasis is placed upon the tools of academic research and upon oral and written reports. 3 cr.

698. SENIOR SEMINAR
Various subject areas of sociology: their growth and development, their relationship to one another, and their current status with regard to research and theory. Recent developments and the newer subject areas of sociology. Future developments as extensions of present trends. Students not majoring in sociology may be admitted by permission of the instructor. 3 cr.

701. STATISTICS
Use of elementary statistical techniques in analysis of prepared data. Topics surveyed include probability, discrete and continuous probability distribution, distributions of sample statistics, small sample theory, elementary analysis of variance, regression, correlation, and the chi square. 3 cr.

702. QUANTITATIVE METHODS OF SOCIAL RESEARCH
Analysis of research problems; designing field studies and experiments; demonstration and practice in sampling, schedule construction, and interviewing techniques. Students not majoring in sociology nor enrolled in Social Service Curriculum may be admitted by permission of instructor. **Prereq:** Soc. 701. 3 cr.

703. CRIMINOLOGY
The scientific study and control of crime. The following are considered; indexes, rates and theories of crime and delinquency, police, courts, probation, prison and parole. 3 cr.

711, 712. DEVELOPMENT OF SOCIOLOGICAL THEORY
Social thought from Plato to the present. First semester: the works of selected individuals from Plato to Comte. Second semester: the 19th century European social philosophers; the ideas of U. S. social scientists, especially their contributions to present day sociological thought. Stu-
Students not majoring in sociology may be admitted by permission of the instructor. 3 cr.

727. 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, reemployment, unemployment insurance, health services, training and retraining, and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prereq: One year's work in economics or sociology. 3 cr. (Also offered as Econ. 727.)

740. Culture Change
The study of various types of society, leading to the development of a theory of culture change. Descriptive studies of institutional as well as theoretic materials selected from the writings of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. Prereq: Soc. 400 or consent of instructor. 3 cr.

743. Social Movements
The factors related to the origin and development of reform, revolutionary, religious, and other social movements. Generalizations concerning the organization, structure, tactics, and leadership of social movements. The purposes and consequences of selected movements, as well as the relationships between social movements and social change. Prereq: Soc. 400. 3 cr.

745. Social Stratification
Nature, functions, patterns, and effects of social stratification. Social mobility. The social class system in the United States. Prereq: Soc. 400. 3 cr.

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. Prereq: Consent of instructor. 3 cr.

795, 796. Reading and Research in Sociology and Anthropology
Allan B. Prince, Professor and Chairman; Gordon L. Byers, Associate Professor; Nobel K. Peterson, Associate Professor; Francis R. Hall, Associate Professor; Paul A. Gilman, Associate Professor of Soil, Water, and Construction, Thompson School of Applied Science.

Soils

501. INTRODUCTORY SOILS
The physical, chemical, and biological properties of soils in relation to plant growth. Mr. Peterson. 3 lec; 1 lab; 4 cr.

502. SOIL-PLANT RELATIONSHIPS
Soils in relation to their natural fertility, productivity, and the practices and amendments employed to maintain or increase fertility. Mr. Peterson. Prereq: S. and W. 501. 3 cr.

701. METHODS OF SOIL ANALYSIS
Principles and practices of the more important physical and chemical methods of soil analysis including sampling techniques, particle size distribution, moisture retention, rheological properties, particle density, volume weight, cation exchange capacity, mineral element analysis, etc. Opportunity for experience in the application of flame photometry, spectrophotometry, and isotopic tracer techniques to soil analytical problems will be provided. Mr. Prince. Prereq: Biochem. 501 or Chem. 517 or their equivalent. 1 lec; 2 labs; 3 cr. (Alternate years; offered in 1966-67.)

702. PHYSICS AND CHEMISTRY OF SOIL
Physical and chemical properties of soils; their measurement and relation to structure, water movement, temperature; and liberation, absorption, and fixation of elements in soils. Mr. Prince. Prereq: Chem. 401-402 or Chem. 403-404 or their equivalent. 3 cr. (Alternate years; offered in 1966-67.)

704. SOIL CLASSIFICATION AND MAPPING
The genesis, morphology, classification and mapping of soils. Mr. Peterson. Prereq: S. and W. 501 and Geol. 401 or 407. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

709. SOIL INTERPRETATION FOR COMMUNITY PLANNING
A review of the soil classification system in use in the United States. Interpretation of soils data as it affects housing, recreation, conservation, transportation, surface runoff, sewage effluent disposal, or other contamination problems. Examples of special soils maps prepared on a town or city basis for community planning. Mr. Peterson. 2 cr.

795-796. INVESTIGATIONS IN:
1. Physics and Chemistry of Soil: Mr. Prince
2. Soil-Plant Relationships: Mr. Peterson
3. Agricultural Engineering: Mr. Byers
Elective only after consultation with the instructor in charge. Hours to be arranged. 1-4 cr.
797-798. **Soil and Water Science Seminar**
Library and reference work on special phases of soil and water problems. Practice in looking up literature and in preparation and presentation of reports and abstracts. Staff. Required each semester of seniors and graduate students majoring in Soil and Water Science; elective for other qualified students. 1 cr.

**Hydrology**

503. **Soil and Water Control**
Elementary surveying and its application to agricultural problems. The design principles, mapping, and layout of drainage, erosion control, and irrigation systems along with the presentation of construction practices for farm ponds, diversion ditches, terraces, and other mechanical methods of water control. Farmstead water systems and pumps are included. Mr. Byers. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

507. **Introductory Hydrology**
An introduction to the field of hydrology from the viewpoint of the hydrologic cycle and hydrologic budget, with particular emphasis on drainage basins as natural hydrologic units. Topics to be covered include precipitation, evaporation, evapotranspiration, runoff, infiltration, ground water and water quality. Some consideration will be given to water law, water economics, and water problems. Mr. Hall. 3 cr.

703. **Soil and Water Engineering**
The hydrologic, soil, vegetal, and stream flow factors involved in the design and operation of erosion control structures, drainage systems, and irrigation systems. Mr. Byers. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

710. **Ground-Water Hydrology**
Basic principles with emphasis on physical properties of water-bearing materials, Darcy's law and the coefficient of permeability, selected steady and non-steady state solutions of the basic flow equation for ground-water motion, well hydraulics, and chemical quality of water. Mr. Hall. Prereq: S. and W. Sci. 703 or permission of instructor. 3 lec; 1 lab; 4 cr.

**Mechanized Agriculture**

404. **Fabrication Technology**
An introductory study of the nature of metals and plastics used in agriculture which deal specifically with heating, welding, forming, and repairing. Lectures, demonstrations, and laboratory practices are provided. Mr. Gilman. 1 lec; 2 lab; 3 cr.

504. **Agricultural Power**
Tractors, tractor engines, and electrical energy in farm work. The factors involved in the management, preventive maintenance, and repair procedures required by tractor motors and their power transmission systems. Mr. Byers. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)

505. **Agricultural Machinery**
The selection, care, operation, and management of conventional farm machinery and processing equipment involved in the production of farm commodities. Mr. Byers. 2 lec; 1 lab; 3 cr. (Alternate years; not offered in 1966-67.)
506. **AGRICULTURAL BUILDINGS**
The planning and design of agricultural structures for animals and crops. Construction practices, farmstead layout, building material selection and application, material estimates, heating systems, lighting, refrigeration, sewerage disposal, ventilation, environmental controls, certain phases of crop processing, and basic concepts of architectural drafting are introduced. An agricultural building problem, related to the student's major or field of interest, serves as the base for the application of all principles presented in lecture. Mr. Byers. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

**Agricultural Engineering**

705. **FIELD MACHINERY**
The design of the engineering elements of farm machinery; capacity and power requirements of farm implements. Mr. Byers. Prereq: or concurrently: M.E. 26. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

708. **FARM TRACTORS**
The design and operation of farm tractors, tractor power units, chassis mechanics, tractor tests and performances. Mr. Byers. Prereq. or concurrently: M.E. 26; M.E. 33. 2 lec; 1 lab; 3 cr. (Alternate years; offered in 1966-67.)

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**Spanish and Classics**

Charles H. Leighton, Associate Professor and Chairman; John S. Walsh, Professor Emeritus; R. Alberto Casás, Professor; John C. Rouman, Assistant Professor; Orlirio Fuentes, Instructor; Richard V. Desrosiers, Instructor; W. Scott Johnson, Instructor; Isabel Z. Fuentes, Lecturer

**Greek (58)**

New students will be assigned to the proper course on the basis of their scores on the Greek placement examination.

401-402. **ELEMENTARY GREEK**
Grammar, composition, translation. Prereq: Permission of the instructor. 4 cr. (Students who offer two or more entrance units of high school work in Greek will not be permitted to register for credit for Greek 401.) No credit toward a major.

503-504. **INTERMEDIATE GREEK**
Review: Plato's 'Apology'; Selections from Homer and Elegiac Poets. Prereq: Gr. 402. 3 cr.

795, 796. **SPECIAL STUDIES IN GREEK LITERATURE**
Guided studies in special topics with training in bibliography and organization of material. Examples of topics which may be selected by
instructor and student are: (1) the Greek epic, (2) Greek poetry, (3) Greek drama, (4) Greek History. Prereq: Permission of the instructor. Variable credit.

**Latin (60)**

New students will be assigned to the proper course on the basis of their scores on the Latin placement examination.

401-402. **ELEMENTARY LATIN**
Elements of grammar, reading of simple prose. The changes in meaning and form of English and Romance language derivatives from Latin. 4 cr. (Students who offer two or more entrance units of high school work in Latin will not be permitted to register for Latin 401 for credit.) *No credit toward a major.*

503-504. **INTERMEDIATE LATIN**
A review of Latin grammar and vocabulary, followed by readings in prose and poetry. Prereq: Lat. 402 or the equivalent. 3 cr.

505-506. **LATIN PROSE AND POETRY**
Selections from Livy, Catullus, Ovid, Phaedrus, Martial, and the odes of Horace. Translation, lectures and study of the influence of Latin on English poetry. Prereq: Lat. 504 or equivalent. 3 cr.

695, 696. **HONORS WORK IN CLASSICS**
For seniors writing a research paper in the Honors program in Classics. Prereq: Permission of Major Supervisor. Variable credit.

751-752. **ROMAN SATIRE**
Horaces 'Satires' and 'Epistles', selected works of Persius, Juvenal, and Martial, and a study of Roman life and thought as reflected in these works. Prereq: Lat. 506 or the equivalent. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

753-754. **THE HISTORIANS**
Livy, Suetonius, and Tacitus in selected works. Illustrated lectures and outside readings on the historical, social, and political background of Rome essential to the student or teacher of Latin. Prereq: Lat. 506 or equivalent. 3 cr; 4 cr. for Honors. (Alternate years; offered in 1966-67.)

755-756. **THE GOLDEN AGE**
Roman literature of the classical period, particularly the work of Caesar, Cicero, and Virgil. Prereq: Lat. 506 or its equivalent. 3 cr; 4 cr. for Honors. (Alternate years; not offered in 1966-67.)

**LATIN-EDUCATION (LAT-ED) 792. PROBLEMS IN TEACHING HIGH SCHOOL LATIN**
This course is carried on concurrently with work in composition. Prereq: Permission of the instructor and Education 758 with grade of C or better. 3 cr.

795, 796. **SPECIAL STUDIES IN LATIN LITERATURE**
Guided studies in special topics with training in bibliography and organization of material. Examples of topics which may be selected by in-
Spanish and Classics

structor and student are: (1) Roman Comedy and Elegy, (2) The Ro-
man Epic, (3) Roman Drama, (4) The Silver Age. Prereq: Permission
of the Major Supervisor. Variable credit.

Spanish (62)

New students will be assigned to the proper course on the basis of their
scores on the Spanish placement examination.

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. 5 rec; 2 lab; 4 cr. (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.)

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. 3 rec; 1 lab; 3 cr. Open by placement exami-
nation, 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.

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 En-
glish. 3 cr. 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.

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 ses-
sessions. Prereq: Spanish 503 or 504 or equivalent. 3 lec; 2½ hr. lab; 3 cr.

695, 696. HONORS WORK IN SPANISH
For seniors writing a research paper in the Honors program in Spanish.
Prereq: Permission of Major Supervisor. Variable credit.

751. SPANISH LITERATURE UP TO 1600
Readings and discussion of the great human creations of early Spanish
literature such as El Poema del Mio Cid, El Libro de Buen Amor and

* 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.
La Celestina, and their social and historical background. Conducted in Spanish. Prereq: Sp. 505 or equivalent. 3 cr; 4 cr. for Honors.

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. Prereq: Sp. 506 or equivalent. 3 cr; 4 cr. for Honors.

754. CERVANTES
This course traces 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. Prereq: Span. 506 or equivalent. 3 cr; 4 cr. for Honors.

755. LITERATURE OF THE NINETEENTH CENTURY

756. CONTEMPORARY SPANISH LITERATURE
Starting with the generation of 1898, the reading and discussion of the work of such writers as Unamuno, Azorín, Baroja, Machado, J. R. Jiménez, Ortega y Gasset, García Lorca, Pérez de Ayala, Benavente, Casona, plus a survey of Spanish literature and thought since 1939. Conducted in Spanish. Prereq: Sp. 506 or equivalent. 3 cr; 4 cr. for Honors.

765, 766. 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. Prereq: Sp. 506 or equivalent. 3 cr; 4 cr. for Honors.

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) 18th, 19th or 20th century literature in Spain; (2) literature and civilization in Spain in the Golden Age; (3) the literature of individual Latin-American countries. Conducted in Spanish. Prereq: Permission of the Major Supervisor. Variable credit.
301. SPEECH IMPROVEMENT
All entering freshmen and transfer students are required to take a speech test. They are classified as Group I, having no apparent problem; Group II, needing speech improvement; or Group III, having a relatively serious speech problem. Those students classified in Group III are required to meet individually or in groups with the staff and students in clinical practice for non-credit Speech Improvement until such time as they have made sufficient improvement. A student may be remanded to Speech Improvement by any instructor with the approval of the Speech staff. Mrs. Jaffe. No cr.

401, (401). BASIC SPEECH
The social, psychological, physiological, and phonetic bases of speech. Projects in informal public speaking, oral interpretation, discussion, and elementary phonetic transcription to illustrate the bases and for the improvement of the individual student. Strongly recommended for those students who are classified in Group II on the speech test. Required of all majors, but without major credit. Staff. 3 cr.

403, (403). SPEECH COMMUNICATION
An analysis of the process of speech communication, emphasizing the relationship between the speaker and his listeners. Presentation of ideas and materials in terms of organization, choice of language, adaptation to audience, delivery techniques, and theory of persuasion. Practice in the various forms of speaking with evaluation by instructor and audience. Staff. 3 cr.

431. INTRODUCTION TO THEATER ARTS
The basic elements common to the varied media of theater; legitimate, musical, cinema, and television. The place of the theater in our lives. An introduction to theater practices from the script to production. Mr. Batcheller and Mr. Davenport. 2 lec; 1 lab; 3 cr.

436. THEATER AND ITS DRAMA
The relation of theater and its drama to the society in which it is produced. A comparative study of outstanding modern plays and historical counterparts. Mr. Batcheller and Mr. Edwards. 1 lab; 3 cr.

457. ORAL INTERPRETATION OF LITERATURE
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 performance, and, consequently, literature. Mr. Edwards. 3 cr.
Speech and Drama

459, (459). STAGECRAFT
Stage and television scenery, costumes, properties, lighting, sound, and backstage organization. Practical application in University Theater productions. Mr. Davenport. 1 lec; 2 lab; 3 cr.

503. DISCUSSION
The means and ends, values, and limitations of the various types of discussion. Group dynamics, logic and evidence, and parliamentary procedure as applied to learning and problem solving. Practice in using various methods to gain the objectives of discussion. Mr. Gilsdorf. 3 cr. (Formerly 411)

504. DEBATE
The various forms of advocacy as an extension of discussion. The analysis of propositions, the construction of a case, logic and ethical persuasion, and the presentation of speeches of advocacy. Mr. Gilsdorf. 3 cr.

508. SPEECH FOR PROSPECTIVE TEACHERS
Developing an adequate conversational form of speaking before the class; speech improvement for the prospective teachers; voice recording and analysis; oral interpretation of both prose and poetry; making and using visual aids; and the means of developing a communicative speaker-audience relationship. Staff. 3 cr.

521. SPEECH AND VOICE SCIENCE
Anatomy and physiology of the vocal and auditory mechanisms. Neurological basis of speech. Study of the processes of respiration, phonation, resonance, articulation and audition. Staff. 3 cr.

524. PHONETICS OF AMERICAN ENGLISH
An introduction to phonetics through the 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. 3 cr.

531. SPEECH CORRECTION
Further study of the psychological, physiological, and phonetic bases of speech with the addition of the neurological, genetic and physical bases towards the end of recognizing abnormalities of speech, some of their causes, and their basic therapy. Delayed speech, articulatory and voice disorders, foreign dialects, stuttering, aphasia, cerebral palsy, and audiology are the principal problems studied. Prereq: Basic Speech or approval of the instructor. Mrs. Jaffe and Mr. Wakstein. 3 cr.

551. ACTING I
Basic movement and vocal training for the actor. Historical development of acting. Relation of actor to writer, director and audience. Prereq: 6 credits in Speech and Drama or approval of the instructor. Mr. Edwards. 1 lec; 2 lab; 3 cr.

552. ACTING II
A continuation of 551 with concentration on characterization and development of the actor's skills. Prereq: 551 or the equivalent. Mr. Edwards. 1 lec; 2 lab; 3 cr.
555. TELEVISION AND RADIO WORKSHOP
The application of basic theater techniques to electronic means of mass communication. The place of television and radio in our society. Production techniques. Actual practice in campus studios. Mr. Gilsdorf. 1 lec; 2 lab; 3 cr.

601, (601). SPEECH PRACTICE
Application of the theory of specific speech areas, other than theater, i.e. Discussion, Debate, Speech and Hearing Therapy, in individual or group projects. May be repeated to 8 credits toward graduation but cannot be counted for major credit. Prereq: the basic courses in which practice credit is taken and the approval of the instructor. Mr. Batcheller and Staff. 1-3 cr.

605. BASES OF THEATER ARTS
The fundamental factors common to all types of theater art with emphasis upon appreciation through involvement as well as theoretical study. Not open for credit to students who have taken Speech and Drama 431. (Summer Session only.) 3 cr.

611. RHETORIC IN THE WESTERN WORLD
Great speeches in the history of western civilization; an analysis of the reasons for their success or failure on a basis of the speaker, his materials, the logical and persuasive appeals, the audience background and attitude, and the occasion. Of special interest to history, political science, sociology, and psychology majors as well as students interested in relationships of language and social problems. Prereq: 6 credits in Speech and Drama or approval of the instructor. 3 cr. (Alternate years.)

617. ORAL INTERPRETATION OF LITERATURE
Prose and poetry with the view of problems which will be found in the performance of selected works. Reading performances, solo and group performances, with attention to problem of high school teachers of literature and speech. (Summer Session only.) 3 cr.

622. THEATER FOR CHILDREN
The art of theater for children, including a dual study of creative dramatics as a teaching technique for both school and recreation programs, and the formal presentation of plays for children. Students will observe actual classes in creative dramatics and will take part in the production of a play for children. Mrs. Davenport. 3 cr.

632. CLINICAL METHODS
A continuation of speech correction dealing with the theory of remedial practices for various speech problems and providing experience in speech therapy by demonstration and laboratory in conjunction with speech improvement. Prereq: Speech Correction. Staff. 1 lec; 2 lab; 3 cr. (Alternate years.)

634. PROCEDURES AND PRACTICES IN REHABILITATION METHODS
Student experience in diagnosis and therapy of speech handicapped children and adults. Theory of the problems of differential diagnosis and special therapeutic techniques. Clinical affiliation under supervision emphasizing preparation, administration and discussion of therapy lessons, parent conferences, staff conferences, and continued observation of techniques in diagnosis and treatment. Prereq: Clinical Methods. Staff and Mrs. Bowes. 1 lec; 1 lab; 3 cr.
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 are considered. Individual measurement and observation of children's language functioning. Prereq: Approval of instructor. Mr. Wakstein. 3 cr.

641. THEATER PRACTICUM
Roles, production techniques, etc., combining class lecture and demonstration with actual rehearsal and production experience in the Summer Theater program. This course and/or Speech and Drama 655 may be repeated to a total of 8 credits toward graduation. (Summer Session only.) 3 cr.

643. SPEECH FOR TEACHERS IN SERVICE
Unit one: Voice analysis and recordings; pronunciation, enunciation, speech rate, pitch changes, inflections, quality. Unit two: interpretative speech; poetry, prose, story; the manuscript; the techniques of delivery on stage and radio. Unit three: Choric speech for lower and upper grades and for adults. Unit four: Forms and requirements of public address. Unit five: Simple parliamentary procedure. Unit six: Topic or area suggested by the class (optional). For juniors, seniors, or graduate students. (Summer Session only.) 3 cr.

645. EDUCATIONAL TELEVISION WORKSHOP FOR TEACHERS
Basic philosophy of educational television; studio equipment and techniques; use of lighting facilities and cameras; methods of producing a TV program; use of films; lay-out of a TV program for a school system; magnetic sound recording; laboratory experience with the facilities of WENH-TV; educational trips to metropolitan TV stations; guest lecturers. (Summer Session only.) 3 cr.

647. PLAY PRODUCTION IN HIGH SCHOOL
The stage as an environment of the action of a script. Problems of scenery, lighting, costumes, properties, and sound effects as applied to the high school situation. Application in laboratory and public performance. (Summer Session only.) 3 cr.

649. PRINCIPLES AND METHODS OF DRAMA
The philosophy of educational theater. Courses of study and extracurricular programs. The problems of dramatic activities. Practical solutions applied in laboratory and public performance sessions. (Summer Session only.) 3 cr.

652. SCENIC DESIGN AND LIGHTING
A study of the problems of stage design and lighting for theater and television. Individual projects, models, and participation in University Theater and television productions. Prereq: Stagecraft or approval of the instructor. Mr. Davenport. 1 lec; 2 lab; 3 cr.

655. (655). THEATER PRACTICE
Application of the theory of acting, directing, or the technical aspects of production to specific assigned responsibilities in University Theater productions. This course and/or Speech and Drama 641 may be repeated to a total of 8 credits toward graduation, but cannot be counted for
Speech and Drama

major credit. Prereq: the basic courses in which the practice credit is taken and approval of the instructor. Mr. Batcheller and Staff. 1-3 cr.

658. DIRECTING
The analysis of the script, the determination of specific treatment of the production, the development of a prompt script, casting, rehearsal, and production for legitimate theater and television. Prereq: 6 credits in Speech and Drama or approval of the instructor. Mr. Edwards. 1 lec; 2 lab; 3 cr.

704. AUDIOLOGY
Attributes of sound and the mechanism of hearing as they pertain to classical study of science of audiology. Elementary physics of sound and the decible; anatomy of the aural mechanism; essentials of hearing theory; pathologies of the auditory and related systems; basic pure tone audiometry technique. Prereq: Approval of instructor. Mr. Wakstein. 3 cr.

706. SPEECH READING AND AUDITORY TRAINING
Principles, techniques, and materials for teaching speech reading to the hard-of-hearing and deaf individual. Classical speech reading procedures surveyed. Emphasis given to the combined approach of speech reading, auditory training and speech/language development. Prereq: 521, 524 or approval of instructor. Mr. Wakstein. 3 cr.

Technology (79)

401. PROBLEMS IN ENGINEERING
To acquaint students with the broad scope of the engineering profession and to help them develop the ability to analyze, to formulate, and to solve engineering problems. The relation of engineering problems to problems and techniques from science and mathematics. Although the problems considered must be relatively simple because of the limited experience of students, they are true engineering problems designed to demonstrate that engineering problems, in general, may have many possible solutions and that professional decisions must often be based on limited data. The use of machine computation techniques are discussed and each student may use the IBM 1620 Computer to solve a simple problem. The course is directed by a committee consisting of Mr. Zimmerman, Mr. Winn, and Mr. Zoller and Mr. Corell; lectures on various phases of engineering and related fields are also given by other engineering faculty members. Required of new freshmen engineering students, but it may be elected by freshmen majoring in mathematics or the physical sciences or by other freshmen who wish to learn more about the activities of engineers. 3 cr.

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 and probability distributions. Correlation and regression analysis. Design of experiments; factorials, fraction factorials, designs for process optimization. Introduction to quality control; construction and analysis control charts for variables and attributes; statistical aspects of tolerance. 3 cr.
Zoology (70)

Paul A. Wright, Professor and Chairman; C. Floyd Jackson, Professor Emeritus; George M. Moore, Professor; Lorus J. Milne, Professor; Edythe T. Richardson, Professor; Wilbur L. Bullock, Professor; Emery F. Swan, Professor; Paul E. Schaefer, Associate Professor; Philip J. Sawyer, Associate Professor; Marcel E. Lavoie, Associate Professor; Arthur C. Borror, Assistant Professor; Burton C. Staugaard, Assistant Professor; Frank K. Hoornbeek, Assistant Professor; John J. Saasner, Assistant Professor; Edward N. Francq, Instructor

412. Principles of Zoology
Concepts of animal biology, including ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Mr. Swan. Prereq: Biol. 405 or Bot. 411. 3 lec; 1 lab; 4 cr. Not open to students who have credit for Biol. 402 and 404.

507-508. Mammalian Anatomy and Systemic Physiology
The anatomy and physiology of mammals with a strong emphasis on man's morphological heritage and relationships. Mr. Lavoie. Prereq: Biol. 402 or Zool. 412. 3 lec; 1 lab; 4 cr.

510. Functional Anatomy and Neurology
The anatomy and physiology of those systems of the human body which are not covered by Zool. 507, with special emphasis on the nervous system. Enrollment limited to O.T. students. Mr. Lavoie. Prereq: Zool. 507. 3 lec; 1 lab; 4 cr.

512. Ornithology
Birds, their identification, migration, life histories, and economic importance, with special reference to those of eastern North America, Mr. Borror. Prereq: Biol. 402 or equivalent. 1 lec; 2 lab or field trips; 3 cr.

530. Zoological Techniques
A functional background of specialized technical 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. Staugaard. Prereq: Biol. 402 or Zool. 412 and permission of instructor. 1 lec; 2 lab; 3 cr.

610. Introduction to Pathology
Concepts of the effect of disease on the body, emphasizing variations in anatomy, physiology, and biochemistry. Consideration of inflammation, infection, mechanical injury, vascular disturbances, degenerations, congenital defects, neoplasms, endocrine, and functional disturbances. Allen W. Handy, M.D., and Paul C. Young, Jr., M.D. Prereq: Zool. 508 or 510 concurrently. 1 lec; 1 cr. No credit toward a major.

701, (701). Principles of Ecology
The interrelationships of plants and animals with both their living and non-living environments. Energy relationships, limiting factors, com-
munity organization, succession, and biogeography. Staff. Prereq: Zool. 412 or equivalent. 3 cr.

(704). COMPARATIVE ENDOCRINOLOGY
The various endocrine organs, vertebrate and invertebrate, with particular emphasis on endocrines which relate to physiology of reproduction. Mr. Wright. Prereq: Zool. 508 or equivalent and Organic Chemistry. 3 cr.

(706). GENETICS
The physical basis of inheritance, expression, and interaction of the hereditary units, linkage, and variation. The application of Mendelian principles of plant and animal breeding. Mr. Hoornbeek. Prereq: Zool. 412 or equivalent. 3 lec; 1 lab; 4 cr.

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. Prereq: General Zoology and Zool. 508. 2 rec; 2 labs; 4 cr.

712. MAMMALOGY
The origin and diversification of mammals, their ecology and economic importance. Laboratories will emphasize techniques of the mamalogist and identification of local forms. Mr. Francq. Prereq: General Zoology and Zool. 508. 2 lec; 1 lab; 3 cr.

713. ANIMAL BEHAVIOR
Individual and group behavior patterns of animals with the role of anatomy, physiology, and prior experience emphasized. Techniques and the practical application of the study of animal behavior. Mr. Francq. Prereq: One year of Zoology. 3 cr.

715. NATURAL HISTORY OF MARINE INVERTEBRATES
A field and laboratory course aimed at acquainting 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 (collections and observation) will constitute a major part of the course and the student must be prepared to assume some travel expense. Mr. Moore. Prereq: General Zoology. 1 lec; 3 labs; 4 cr. (Also offered in Summer Session annually.)

721. PARASITOLOGY
An introductory course on some of the more important parasites causing diseases of man and animals. Living materials will be used as far as possible. Mr. Bullock. Prereq: One year of Zoology. 2 lec; 2 lab; 4 cr.

725. GENERAL PHYSIOLOGY
The fundamental physiological properties of excitability, contractility, conductivity, metabolism, growth, and reproduction. Mr. Sasner. Prereq: One year of Zoology, and Organic Chemistry. 3 lec; 1 lab; 4 cr.

729. VERTEBRATE MORPHOGENESIS
A comparative study of the organ systems of the vertebrate body and their embryonic development. Mr. Staagaard. Prereq: Zool. 507-508 or equivalent or permission. 3 lec; 2 lab; 5 cr.
Zoology

730. **Elements of Histology**
The microscopic anatomy of principal tissues and organs of vertebrates with an introduction to general histological techniques. Mr. Bullock. Prereq: Zool. 508 or equivalent or permission. 2 lec; 2 lab; 4 cr.

736. **Advanced Genetics**
Genetic recombinations and mutations; gene action in terms of physiological effects during development and as adults. Mr. Hoornbeek. Prereq: Zool. 706 or equivalent. 3 cr.

738. **Advanced Genetics Laboratory**
Problems and projects with small mammals and Drosophila, stressing physiological genetics. Student background and interest to determine content. Mr. Hoornbeek. Prereq: Zool. 736 or equivalent, concurrently. 2 lab; 2 cr.

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. Prereq: Permission of the Department Chairman and staff concerned. 1-6 credits. (Limit of 12 credits from the sections of this course.) Section numbers and subject matter fields are:

3. Endocrinology 12. Zoogeography
5. Embryology 14. Parasitology
8. History of Zoology 17. Systematics
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