University of New Hampshire Library
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University Calendar

1964 – 1965

June 22, Monday
Summer Session registration
(four- and eight-week)

July 6, Monday
Summer Session registration (six-week)

August 14, Friday
Summer Session ends

September 17, Thursday
September 18, Friday

September 18, Friday
First Faculty meeting

September 18, Friday
Orientation begins

September 21, Monday
Residence halls open for upperclassmen

September 22, Tuesday
Registration, 8 a.m. to 5 p.m.

September 23, Wednesday
Classes begin

September 24, Thursday
Convocation, 1 p.m.

October 2, Friday
Last day to add most courses, 4:30 p.m.

October 20, Tuesday
Last day to drop most courses, 4:30 p.m.

November 16, Monday
Mid-semester reports due, 9 a.m.

November 21, Saturday
Air Force ROTC Officer qualification tests

November 24, Tuesday
Residence halls close for Thanksgiving recess, 7 p.m.

November 29, Sunday
Residence halls reopen, 2 p.m.

November 30, Monday
Classes resume

December 18, Friday
Residence halls close for Christmas recess, 7 p.m.

January 3, Sunday
Residence halls reopen, 2 p.m.

January 4, Monday
Classes resume

January 25, Monday
First Semester examinations begin, 8 a.m.

February 3, Wednesday
Final examinations end, 6 p.m.
Residence halls close, 7 p.m.

February 10, Wednesday
Residence halls reopen, 2 p.m.

February 11, Thursday
Second Semester registration, 8 a.m. to 5 p.m.

February 12, Friday
Classes begin (Monday schedule)

February 13, Saturday
Classes meet (Tuesday schedule)

March 1, Monday
Last day to add most courses

March 11, Thursday
Last day to drop most courses

March 29, Monday
Mid-semester reports due, 9 a.m.

April 2, Friday
Residence halls close for spring recess, 7 p.m.

April 11, Sunday
Residence halls reopen, 2 p.m.

April 12, Monday
Classes resume

May 31, Monday
Second Semester examinations begin, 8 a.m.

June 8, Tuesday
Senior grades due in Registrar’s Office, 9 a.m.

June 9, Wednesday
Final examinations end, 6 p.m.
Residence halls close, 7 p.m.

June 13, Sunday
Commencement Day
Officers and Faculty
of the
University of New Hampshire
Trustees

His Excellency, John W. King, A.B., M.A., LL.B., *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

Lloyd P. Young, B.S., M.A., Ph.D., *ex officio* President of Keene State College

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

Forrest M. Eaton, B.S., Portsmouth Chairman of the Board

Dean P. Williamson, B.S., Concord Vice Chairman of the Board

J. Arthur Tufts, B.S., M.Ed., Exeter Secretary of the Board

Frank W. Randall, B.S., LL.D., Portsmouth

Maurice F. Devine, A.B., LL.B., LL.D., Manchester

J. Fred French, Manchester

Sinclair Weeks, A.B., LL.D., Lancaster

Jean A. Wagner, B.A., Hampton Falls

Albert R. Furlong, B.E., M.E., Keene

Douglas L. Robertson, B.Ed., M.Ed., Plymouth

Norman C. Berube, B.A., M.D., Manchester

Richard Blalock, Portsmouth

George R. Hanna, B.A., LL.B., Keene

Mildred McAfee Horton, B.A., M.A., LL.D., Randolph

Eugene C. Struckhoff, A.B., LL.B., Concord

Bernard I. Snierson, A.B., LL.B., Laconia
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 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
Eugene S. Mills, M.A., Ph.D., Dean of the Graduate School and Coordinator of Research
Robert F. Barlow, Ph.D., Dean of the Whittemore School of Business and Economics
Everett B. Sackett, M.A., Ph.D., Dean of the College of Liberal Arts
C. Robert Keesey, B.A., Dean of Students
Elizabeth A. McQuade, A.M., Associate Dean of Students
Donald E. Vincent, A.M.L.S., A.M., Librarian
Harry R. Carroll, M.A., Director of Admissions
Owen B. Durgin, M.A., Registrar
Samuel W. Hoitt, M.S., Director of the Cooperative Extension Service
Joseph J. Petroski, M.Ed., Ed.A., Director of University Extension Service and Director of Summer Session
James W. Long, M.A., Ph.D., Director of the Division of Physical Education and Athletics
Faculty
As of February 1, 1964

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- )

Batchelder, Lyman J., Instructor Emeritus in Mechanical Engineering, Woodshop (1915- )

Beggs, Ann F., Extension Associate Professor Emeritus of Home Economics
B.S., Nasson College, 1947. (1917- )

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- )

Coulter, 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- )

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

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

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

Howes, Horace L., Professor Emeritus of Physics
B.S., Syracuse University, 1905; Ph.D., Cornell University, 1915. (1918- )

* Indicates part time devoted to Cooperative Extension Service.
† Indicates part time devoted to Agricultural Experiment Station.
Huddleston, Eric T., Professor Emeritus of Architecture  
B.Arch., Cornell University, 1910. (1914- )

Jackson, C. Floyd, Professor Emeritus of Zoology  
B.A., De Pauw University, 1905; M.S., Ohio State University, 1907; D.Sc. (Hon.), University of New Hampshire, 1961. (1908- )

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

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

Latimer, L. Phelps, Associate Professor Emeritus of Horticulture  
B.S., University of California, 1921; M.S., ibid., 1922; Ph.D., ibid., 1926. (1926- )

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

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

O'Connell, Elias M., Instructor Emeritus in Mechanical Engineering  
Graduate, Wentworth Institute, 1923; Graduate, two-year course in pattern making, ibid., 1925. (1925- )

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

Parker, Clifford S., Professor Emeritus of Languages  
A.B., Harvard University, 1912; A.M., ibid., 1914; Ph.D., Columbia University, 1925. (1931- )

Perry, Errol C., Assistant Professor Emeritus of Farm Management, Thompson School of Agriculture  
B.S., Massachusetts State College, 1920. (1929-42, 1946- )

†Phillips, Thomas G., Professor Emeritus of Agricultural and Biological Chemistry  
B.S., Ohio State University, 1912; M.S., ibid., 1913; Ph.D., University of Chicago, 1918. (1925- )

†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, 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  

ABBOTT, MARGUERITE, Associate Professor of Occupational Therapy  

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

†ALLEN, Fred E., Professor of Poultry Science and Veterinarian, Agricultural Experiment Station  
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 Agriculture  
B.S., Pennsylvania State University, 1957; M.F., ibid., 1960. (1962- )

ALLMENDINGER, EUGENE, Associate Professor of Mechanical Engineering  

ALSSEN, NICHOLAS E., Assistant Professor of Foreign Languages and Literatures  
A.M., University of Michigan, 1953. (1961- )

AMELL, ALEXANDER R., Professor of Chemistry  
B.S., University of Massachusetts, 1947; Ph.D., University of Wisconsin, 1950. (1955- )
Andersen, Kenneth K., Assistant Professor of Chemistry
B.S., Rutgers University, 1955; Ph.D., University of Minnesota, 1959. (1960)

Anderson, Charlotte K., Assistant Librarian and Documents Librarian
B.A., University of Michigan, 1935; A.B.L.S., ibid., 1936; A.M.L.S., ibid., 1951. (1943-

Anderson, Paul S., Instructor in Chemistry
B.S., University of Vermont, 1959. (1961-

†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 and Teacher Trainer
B.S., University of Maine, 1951; M.Agric.Ed., University of New Hampshire, 1959; Ed.D., Cornell University, 1961. (1962-

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

Baier, Lee S., Instructor in English
B.A., Reed College, 1948; M.A., Columbia University, 1952. (1960-

Ballard, Horace C., Agricultural Agent, Belknap County
B.S., Cornell University, 1936. (1949-

Balomenos, Richard H., Assistant Professor of Mathematics
B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; Ed.D., Harvard University, 1961. (1961-

Bardsley, Elizabeth S., Extension Home Economist, Belknap County
B.S., University of Maryland, 1953. (1962-

Bardwell, John D., Audio-Visual Coordinator and Lecturer in Education
A.A., Boston University, 1950; B.S., Gorham State Teachers College, 1952; M.Ed., University of New Hampshire, 1955. (1960-

Barlow, Robert F., 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-

Barrett, James P., Assistant Professor of Forestry
B.S., North Carolina State College, 1954; M.F., Duke University, 1957; Ph.D., ibid., 1962. (1962-

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., Assistant 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 Agriculture
B.S., University of New Hampshire, 1928; M.Ed., ibid., 1938. (1939-
Bassett, John H., Instructor in Business and Economics  

Batchelder, Gerald M., Research Associate Professor, Engineering Experiment Station  
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952. (1953- )

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  

Beckett, John A., Forbes Professor of Management  

Beckwith, Marion C., Director and Professor of Physical Education  

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- )

Bergerson, John A., Assistant Professor of Economics  
B.A., Merrimack College, 1954; Ph.D., Massachusetts Institute of Technology, 1959. (1960- )

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

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

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

BOSTON, Clarence E., Associate Professor of Physical Education and Athletics
and Head Football Coach
A.B., Harvard College, 1939. (1949 -)

BOURNE, Elizabeth A., County Club Agent, Rockingham County
Diploma, Framingham Normal School, 1924. (1926 -)

†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 -)

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

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

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

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

BRIGGS, Janet C., Instructor in Animal Sciences
B.S., University of Massachusetts, 1962. (1963 -)

BRITTON, John F., Colonel, Professor of Air Science
B.A., University of Notre Dame, 1936. (1961 -)

BROCKELMAN, Paul T., Instructor in Philosophy
A.B., Dartmouth College, 1957. (1963 -)

BROWNE, Evelyn, Professor of Physical Education
A.B., University of California, 1943; M.A., Teachers College, Columbia
University, 1943; M.A., University of New Hampshire, 1962. (1943 -)

†BRUNS, Paul E., Professor of Forestry
A.B., New York University, 1937; M.F., Yale University, 1940; Ph.D.,
University of Washington, 1956. (1958 -)

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

BUCK, Charles W., County Club Agent, Hillsborough County
B.S., University of Maine, 1951. (1955 -)
Buksbaen, Jacqueline A., Assistant Loan Librarian

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

Burton, David M., Assistant Professor of Mathematics

Butterfield, Marcius R., County Club Agent, Cheshire County
B.S., University of Vermont, 1958. (1962- )

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

Cahill, Laurence J., Jr., Associate Professor of Physics

Caldwell, S. Anthony, Instructor in English

Canning, William B., Lieutenant Colonel, Assistant Professor of Air Science
B.S., Maryland University, 1957. (1963- )

Carroll, Harry R., Director of Admissions

Casas, R. Alberto, Professor of Foreign Languages and Literatures
B.en 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- )

Chasse, Paul P., Instructor in Foreign Languages and Literatures
B.A., University of New Hampshire, 1949; M.A., Laval University, 1951. (1961- )

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

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-

Clark, Ronald R., Assistant Professor of Electrical Engineering
B.S., University of New Hampshire, 1956; M.E., Yale University, 1957. (1957-

Clark, Virginia E., Assistant County Club Agent, Merrimack County
B.E., Keene State College, 1942. (1963-

Clark, William E., Assistant Professor of Mechanical Engineering
B.S., University of New Hampshire, 1931. (1946-

Clark, Winifred M., Associate Professor of The Arts
B.S., Iowa State College, 1945; M.F.A., Cranbrook Academy of Art, 1953. (1954-

Clifford, Robert L., County Club Agent, Belknap County
B.S., University of New Hampshire, 1957. (1960-

Cochren, Donald R., Instructor in Physical Education and Athletics and Physical Therapist
B.S., Purdue University, 1955; Certificate in Physical Therapy, University of Pennsylvania, 1956. (1964-

Cohn, William L., Assistant Reference Librarian
B.A., Vanderbilt University, 1959; M.A., George Peabody College, 1962. (1963-

Colby, Halstead N., Extension Associate Professor of Soil and Water Science
B.S., University of New Hampshire, 1930. (1932-

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-

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

Colovos, Nicholas F., Professor of Dairy Science
B.S., University of New Hampshire, 1927; M.S., ibid., 1931. (1928-

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

Condon, Robert G., Counselor and Assistant Professor of Psychology
A.B., University of California, 1947; Ed.D., Harvard University, 1961. (1952-

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

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Conner, Theodore W., Instructor in Physical Education

Cook, Christopher C., Assistant Professor of The Arts

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

Cortez, Edmund A., Professor 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- )

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

Cushing, Daniel, Honorary Fellow in Metallurgy
Ph.B., Yale University, 1912. (1952- )

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

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

Daggett, G. Harris, Associate Professor of English
A.B., Cornell University, 1928; M.A., ibid., 1929; Ph.D., University of North Carolina, 1941. (1942- )

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

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

Danoff, Alexander P., Assistant Professor of Foreign Languages and Literatures
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Davis, Myra L., Assistant Professor of Secretarial Studies  
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Davis, Ruth E., Extension Associate Professor of Home Economics and Extension Home Economist, Human Relations  

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B.S., Framingham Teachers College, 1928; M.P.H., Massachusetts Institute of Technology, 1930. (1955- )

Dewey, Richard S., Professor of Sociology  
A.A., Pasadena Jr. College, 1934; A.B., College of Wooster, 1936; M.A., Oberlin College, 1939; Ph.D., University of Wisconsin, 1941. (1958- )

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A.B., University of Missouri, 1939; A.M., ibid., 1940; Ph.D., Princeton University, 1948. (1951- )

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

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Fan, Stephen S. T., Assistant Professor of Chemical Engineering
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Hudson, Louis J., Professor of Foreign Languages and Literatures
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Jones, William R., Assistant Professor of History
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Kaufmann, Richard Leo, Assistant Professor of Physics
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Kauppinen, Tenho S., Associate Professor of Mechanical Engineering
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Kay, Brian R., Associate Professor of Psychology
B.A., University of British Columbia, 1948; M.A., ibid., 1949; Ph.D., University of London, 1952. (1956-)

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

Keesey, C. Robert, Dean of Students
B.A., Oberlin College, 1948. (1960-)

Kennedy, Kevin B., Associate Agricultural Agent, Grafton County
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Kennedy, Robert C., Associate Professor of Plant Science, Thompson School of Agriculture
B.V.A., Massachusetts State College, 1940; M.S., University of New Hampshire, 1961. (1941-)

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KiNGBLES, Stanley W., County Forester, Rockingham and Belknap-Strafford Counties
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KiLAMBERT, Robert H., Assistant Professor of Physics
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B.S., Bowling Green State University, 1942; M.A., Ohio State University, 1947; Ph.D., ibid., 1955. (1950- )

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

Norris, Douglas M., Jr., Associate Professor of Mechanical Engineering
B.S., Tufts University, 1951; Ed.M., ibid., 1955; Ph.D., Michigan State University, 1962. (1962- )

Nothmann, Gerhard S., Consulting Psychiatrist
M.D., University of Bern, 1938. (1952- )

Nourse, Robert, Captain, Professor of Military Science

Nulsen, William B., Professor of Electrical Engineering
B.S., California Institute of Technology, 1918; M.S., University of New Hampshire, 1930. (1926- )

O'Donnell, Dorothy C., Extension Associate Professor of Home Economics and Extension Home Economist, Related Arts
B.S., Cornell University, 1946; M.S. in Agricultural Journalism, University of Wisconsin, 1952; M.S. in Related Art, ibid., 1955. (1961- )
OFF, Charles E., Instructor in Business Administration
B.S., University of Illinois, 1956; M.B.A., Harvard University, 1961. (1962-)

OLSON, E. William, Associate Professor of Physical Education and Athletics
B.S., Boston University, 1940; M.S., University of Wisconsin, 1950. (1956-)

OSBORN, Grace E., Assistant Extension Home Economist, Grafton County
B.S., Mansfield State College, 1962. (1962-)

OWENS, Charles W., Assistant Professor of Chemistry
B.S., Colorado College, 1957; Ph.D., University of Kansas, 1963. (1963-)

OWENS, Robert H., Associate Professor of Mathematics
B.S., Webb Institute of Naval Architecture, 1944; M.A., Columbia University, 1948; Ph.D., California Institute of Technology, 1952. (1956-)

PALMER, Robert S., Adjunct Professor of Soil and Water Science
B.S.A.E., Oklahoma State University, 1953; M.Ed., University of New Hampshire, 1957. (1953-57, 1958-)

PALMER, Stuart H., Associate Professor of Sociology
B.A., Yale College, 1949; M.A., Yale University, 1951; Ph.D., ibid., 1955. (1955-)

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

PEARCE, Ruth E., Assistant Professor of Home Economics
B.S., Pennsylvania State University, 1940; M.S., Cornell University, 1948. (1958-)

Peirce, Lincoln C., Professor of Plant Science
B.S., Cornell University, 1952; Ph.D., University of Minnesota, 1958. (1964-)

*†Percival, Gordon P., Associate Professor of Biochemistry
B.S., Massachusetts Agricultural College, 1924; M.S., ibid., 1926. (1926-)

Perkins, Donald M., Assistant Professor of Mathematics
B.S., University of New Hampshire, 1931; M.S., ibid., 1933. (1931-)

PETERS, Joan A., Extension Assistant Professor of Home Economics and Extension Editor, Home Economics
B.Sc., Acadia University, 1953; M.S., Pennsylvania State University, 1955. (1960-)

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

Pettibone, Marian H., Associate Professor of Zoology
B.S., Linfield College, 1930; M.S., University of Oregon, 1932; Ph.D., University of Washington, 1947. (1953-)

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

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

32
Platt, Johnson T., County Club Agent, Strafford County  
B.S., University of Connecticut, 1958. (1960- )

†Platts, Frances E., Associate Professor of Home Economics  
B.S., University of New Hampshire, 1933; M.Ed., ibid., 1941. (1945- )

Pollack, Jerome M., Associate Professor of Geology  
B.S., University of Oklahoma, 1949; M.S., ibid., 1951; Ph.D., ibid., 1959. (1961- )

Pollack, Ruth M., Lecturer in Psychology  
B.A., University of Wisconsin, 1947; M.S., University of Oklahoma, 1952. (1962- )

Potash, Herbert M., Psychologist  
B.A., University of Chicago, 1959; M.A., Kent State University, 1960. (1963- )

Potter, Alfred R., Assistant Professor of The Arts  

Potter, Hugh M., III, Instructor in English  

†Prince, Allan B., Professor of Soil and Water Science  
B.S., Rutgers University, 1947; Ph.D., ibid., 1950. (1954- )

Pritchard, Hugh C., Reference Librarian  

Prough, Elizabeth A., County Club Agent, Coos County  
B.S., Pennsylvania State University, 1958. (1960- )

Rahman, Wasiur, Research Associate in Chemistry  
B.Sc., D.A.V. College, Kanpur (India), 1947; M.Sc., Muslim University Aligarh, 1949; Ph.D., ibid., 1957. (1962- )

Rand, M. Elizabeth, Associate Professor of Home Economics  
A.B., Wheaton College, 1930; M.Ed., Boston University, 1946. (1948- )

Reed, Robert C., Assistant Order Librarian  

Reske, Hermann W., Associate Professor of Foreign Languages and Literatures  

Reske, Hildegard S., Lecturer in Foreign Languages and Literatures  

†Rich, Avery E., Professor of Botany  
B.S., University of Maine, 1937; M.S., ibid., 1939; Ph.D., State College of Washington, 1950. (1941-43, 1950- )
Rich, Wayne S., County Club Agent, Merrimack County
B.S., University of Maine, 1934. (1946-
)

†Richards, Mathias C., Associate Dean of the College of Agriculture and
Professor of Botany
B.S., Utah State Agricultural College, 1932; Ph.D., Cornell University, 1938. (1941-
)

Richards, Tudor, Forester, Cheshire and Sullivan Counties
A.B., Harvard College, 1938; B.S.F., University of Michigan, 1952. (1954-
)

Richardson, Edythe T., Professor of Zoology
B.S., New Hampshire College, 1922; M.S., University of New Hampshire, 1924. (1922-
)

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

Richter, Maurice N., Jr., Assistant Professor of Sociology
B.A., Bard College, 1952; M.A., University of Chicago, 1954; Ph.D., ibid., 1962. (1960-
)

Riggs, Margaret M., Lecturer in Psychology
A.B., Smith College, 1944; M.A., Radcliffe, 1945; Ph.D., ibid., 1949. (1963-
)

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

Robertson, Malcolm B., Captain, Assistant Professor of Air Science
B.A., Lawrence College, 1955. (1961-
)

Robinson, Frederick J., Assistant Professor of Mathematics
B.S., University of New Hampshire, 1949; M.A., ibid., 1955. (1949-
)

†Rogers, Owen M., Assistant Professor of Horticulture
B.V.A., University of Massachusetts, 1952; M.S., Cornell University, 1954;
Ph.D., Pennsylvania State University, 1959. (1959-
)

Roper, Elizabeth R., County Club Agent, Carroll County
B.A., University of New Hampshire, 1928. (1928-
)

Rosen, Sam, Professor of Economics
A.B., University of Wisconsin, 1942; A.M., Harvard University, 1948;
Ph.D., ibid., 1952. (1957-
)

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

Rothwell, Kenneth J., Associate Professor of Economics
B.A., University of Western Australia, 1949; M.A., University of Stockholm, 1955; Ph.D., Harvard University, 1961. (1963-
)

†Routley, Douglas G., Associate Professor of Biochemistry
B.S.A., University of British Columbia, 1952; M.S., Pennsylvania State
University, 1953; Ph.D., ibid., 1957. (1957-
)

Rutherford, Richard R., Agricultural Agent, Grafton County
B.S., University of New Hampshire, 1940. (1940-42, 1948-
)
Sackett, Everett B., Dean of the College of Liberal Arts and Professor of Education
B.A., Hamline University, 1923; M.A., University of Minnesota, 1925; Ph.D., Columbia University, 1931. (1938-)

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-)

Sastry, Gopala Krishna T. S., Research Associate in Physics
B.Sc., University of Mysore, 1945; Diploma Radio Technology, Government of Mysore, Bangalore, 1947; M.Sc., Gujarat University, Ahmedabad, 1954; Ph.D., ibid., 1960. (1963-)

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

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

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

Schaefer, Cecil J., Professor of Geology
A.B., Harvard University, 1943; A.M., ibid., 1949; Ph.D., Cornell University, 1954. (1949, 1954-

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

Schultz, J. Howard, Professor of English
B.A., University of Texas, 1933; M.A., ibid., 1934; M.A., Harvard University, 1939; Ph.D., ibid., 1940. (1946-

Sherlock, Ruth L., Instructor in Home Economics
B.S., University of Vermont, 1957; M.S., Cornell University, 1961. (1963-

Shih, Eugenia, Cataloger

†Shimer, Stanley R., Professor of Biochemistry
B.S., Muhlenberg College, 1918; M.S., Pennsylvania State College, 1923. (1924-)

Silva, J. Donald, Instructor in Communications, Thompson School of Agriculture
B.A., University of New Hampshire, 1957. (1963-)

Silverman, Robert J., Professor of Mathematics
B.S., University of Chicago, 1947; M.S., ibid., 1948; Ph.D., University of Illinois, 1952. (1962-

Skelton, Russell R., Professor of Civil Engineering
B.S., Purdue University, 1924; C.E., ibid., 1934; S.M., Harvard University, 1939. (1928-)

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SKOGLUND, Winthrop C., Professor of Poultry Science  
B.S., University of New Hampshire, 1938; M.S., Pennsylvania State College, 1940; Ph.D., Pennsylvania State University, 1958. (1950-  )

SIMPSON, Robert E., Assistant Professor of Physics  
B.S., University of Rochester, 1955; M.A., Harvard University, 1956; Ph.D., ibid., 1960. (1963-  )

†SLANETZ, LAWRENCE W., Professor of Microbiology  
B.S., Connecticut State College, 1929; Ph.D., Yale University, 1932. (1932-  )

SLATTERY, William C., Instructor in History  

SLOAN, ROGER P., Assistant Professor of Forestry and County Forester Leader  
B.S., University of New Hampshire, 1942; M.P.A., Harvard University, 1960. (1946-  )

*SMITH, GERALD L., Associate Professor of Animal Science  
B.S., University of New Hampshire, 1948; M.S., Pennsylvania State College, 1951. (1948-  )

†SMITH, SAMUEL C., Assistant Professor of Biochemistry and Poultry Science and Microbiologist  

SNIVELY, A. Barr, Jr., Assistant Professor of Physical Education and Athletics  
B.S., Princeton University, 1923; M.A., Columbia University, 1941. (1953-  )

SOUKARIS, Pauline, Instructor in Sociology  

STANHOPE, Chester W., Instructor in Electrical Engineering  
B.S., Worcester Polytechnic Institute, 1960; M.S., ibid., 1962. (1962-  )

STANSON, Betty Jean, Instructor in Occupational Therapy  
B.S., Ohio State University, 1956; M.A., Kent State University, 1963. (1963-  )

STAUGAARD, Burton C., Instructor in Zoology  
A.B., Brown University, 1950; M.S., University of Rhode Island, 1954. (1961-  )

STEARNS, Josephine S., Assistant County Club Agent, Hillsborough County  
B.S., University of New Hampshire, 1958. (1960-  )

STEERE, Donald E., Professor of Music  

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

STEVENS, Robert A., Assistant State Club Leader, Cooperative Extension Service  
B.S., University of New Hampshire, 1937. (1955-  )
Stewart, Glenn W., Associate Professor of Geology
B.S., University of New Hampshire, 1935; M.S., Syracuse University, 1937. (1938-39, 1941-)

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-)

Stocking, Marion I., Extension Home Economist, Carroll County
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B.A., Haverford College, 1943; M.A., Columbia University, 1948; Ph.D., ibid., 1954. (1963-)

Stolworthy, E. Howard, Professor of Mechanical Engineering
B.S., Tufts College, 1922. (1922-)

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

Stone, Joan T., Assistant Professor of Physical Education

*Stout, Richard G., Assistant Professor of Poultry Science
B.S., University of Maine, 1950; M.S., University of New Hampshire, 1954; Ph.D., ibid., 1961. (1954-)

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

Sweet, Paul C., Professor of Physical Education and Athletics
B.S., University of Illinois, 1923; M.A., University of Southern California, 1941. (1924-)

Sylvester, Robert P., Assistant Professor of Philosophy

*Symenko, Joseph A., County Forester, Sullivan County
B.S., University of New Hampshire, 1954. (1957-)

Tavares, Marilyn D., Assistant Professor of Physical Education
B.S., Sargent College, Boston University, 1953; M.A., Ohio State University, 1958. (1962-)

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

Tempone, Vincent J., Assistant Professor of Psychology
B.A., Pennsylvania State University, 1955; M.A., Temple University, 1959; Ph.D., Texas University, 1962. (1962-)

Thomas, George R., Professor of The Arts
B.Arch., Carnegie Institute of Technology, 1930. (1930-)

37
Thompson, Wilbur E., Forester, Merrimack County
B.S., University of New Hampshire, 1927. (1945-)

†Tirrell, Loring V., Professor of Animal Science
B.S., Massachusetts Agricultural College, 1920; M.S., Massachusetts State College, 1941. (1921-25, 1930-)

Tomlinson, Paul D., Captain, Assistant Professor of Military Science
United States Military Academy (West Point), 1953. (1962-)

Tranberg, Carl C., Assistant Professor of Mathematics
B.S., Boston University, 1957; A.M., Rutgers University, 1962. (1963-)

Turner, Harry J., Lecturer in Zoology
B.A., Yale College, 1935; M.S., Yale University, 1942. (1956-)

Tyrrell, Doris E., Associate Professor of Secretarial Studies
B.S., University of Minnesota, 1926; M.A., ibid., 1932. (1938-)

Uhl, Donald P., Captain, Assistant Professor of Air Science
B.A., Brown University, 1956. (1963-)

Underwood, Dale S., Professor of English
B.A., University of Kansas, 1937; M.A., Yale University, 1947; Ph.D., ibid., 1952. (1958-)

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

Urban, Willard E., Jr., Assistant Professor of Biometrics and Statistician, Agricultural Experiment Station
B.S., Virginia Polytechnic Institute, 1958; M.S., Iowa State University, 1960. (1963-)

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

Valenza, Daniel L., Instructor in The Arts

Verrette, Paul F., Instructor in Music
B.A., University of New Hampshire, 1952. (1962-)

Vincent, Donald E., Librarian

†Wallace, Oliver P., Associate Professor of Forestry
B.S., University of New Hampshire, 1937; B.S.F., University of Michigan, 1938; M.F., ibid., 1947; Ph.D., ibid., 1954. (1953-)

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

Wang, Tung-Ming, Associate Professor of Civil Engineering
B.S.C.E., National Chiao-Tung University, 1945; M.S.C.E., University of Missouri, 1954; Ph.D., Northwestern University, 1960. (1961-)

38
Warren, Richard, Professor of Poultry Science
B.S., Cornell University, 1934; M.S., ibid., 1935. (1937- )

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

Weber, James H., Assistant Professor of Chemistry
B.S., Marquette University, 1959; Ph.D., Ohio State University, 1963. (1963- )

Webster, Robert G., Professor of English
B.A., University of New Hampshire, 1926; M.A., ibid., 1930. (1927- )

Weeks, Silas B., Associate Professor of Resource Economics
B.S., Cornell University, 1937. (1954- )

Weston, Ruth C., Associate State Club Leader, Cooperative Extension Service
B.A., New Hampshire College, 1921; M.Ed., University of Maryland, 1953. (1929- )

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

Whitlock, John B., Associate Professor of Music
B.Ed., Southern Illinois Normal University, 1937; M.A., State University of Iowa, 1941; Ph.D., ibid., 1958. (1958- )

Wicks, John D., Assistant Professor of Music
A.B., Harvard University, 1944; A.M., ibid., 1947; Ph.D., ibid., 1959. (1956- )

Wilkins, Davis G., Instructor in The Arts

Williams, Paul A., Lecturer in Mechanical Engineering
B.M.E., Rensselaer Polytechnic Institute, 1951. (1963- )

Williams, Thomas A., Jr., Assistant Professor of English

Williamson, Phyllis D., Instructor in Speech
B.A., Louisiana State University, 1945; M.A., ibid., 1953. (1957- )

Wilson, John A., Instructor in Mechanical Engineering
B.S. in M.E., Tufts University, 1958; M.S. in M.E., Northeastern University, 1960. (1960- )

Wingersky, Bary G., Research Associate in Mathematics
A.B., Tufts University, 1942. (1960- )

Winn, Alden L., Professor of Electrical Engineering
B.S., University of New Hampshire, 1937; S.M., Massachusetts Institute of Technology, 1948. (1948- )

Wong, Sheeh, Cataloger
Woodruff, Ruth J., Professor of Economics
A.B., Bryn Mawr, 1919; A.M., ibid., 1920; Ph.D., Radcliffe College, 1931. (1931-)

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

†Wright, Paul A., Professor of Zoology
S.B., Bates College, 1941; A.M., Harvard University, 1942; Ph.D., ibid., 1944. (1958-)

Wu, Mu Tsu, Research Associate in Chemistry
B.Sc., National Taiwan University, 1951; D.Sc., Tohoku University, 1961. (1962-)

Wurzburg, Frederic W., Assistant Professor of Government
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Wybourn, Marjory A., Professor of Home Economics
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Wyman, Christine O., Assistant County 4-H Club Agent, Strafford County
B.S., University of New Hampshire, 1944. (1963-)

Yank, Wei Tseung, Assistant Professor in Mechanical Engineering
B.S., National Sun Yat-sen University, 1945; M.S., Michigan College of Mining and Technology, 1958; D.Eng., Yale University, 1963. (1963-)

Yarrington, Eugene N., Jr., Assistant Professor of English
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Yount, John A., Instructor in English
B.A., Vanderbilt University, 1960; M.F.A., State University of Iowa, 1962. (1962-)

Zei, John J., Jr., Assistant Professor of Music
B.M., Lawrence Conservatory, 1953; M.M., University of Michigan, 1959. (1959-)

Zervas, Nicholas P., Honorary Fellow in Poultry Science
B.Sc., Agricultural College of Athens, 1950; M.Sc., Cornell University, 1954; Ph.D., Agricultural College of Athens, 1959. (1960-)

Zevos, Nicholas, Instructor in Chemistry
B.A., St. Anselm’s College, 1954. (1962-)

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-)

Zuckerman, Harvey S., Instructor in English
B.A., City College of New York, 1957; M.A., Columbia University, 1959. (1962-)

Zweizig, Douglas L., Instructor in English

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Administrative Staff

George W. Bamford, Alumni Fund Director

John D. Bardwell, Audio-Visual Coordinator, University Extension Service

Ronald C. Barrett, Director of Memorial Union

Leslie L. LaFond, Assistant Director of Admissions

Doris Beane, Assistant for Institutional Studies

Kathleen R. Beckingham, Supervisor of Testing

Richard M. Brayton, Director of Physical Plant Development

Burnell V. Bryant, Alumni Executive

Robert G. Congdon, Counselor

Henry W. Corrow, Jr., Extension Editor

William D. Crandall, m.d., Assistant Director of University Health Service

John E. Enos, Assistant News Editor

Daniel A. Ferber, Director of Development

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

Dayton M. Henson, Manager, University Bookstore

Charles H. Howarth, m.d., Director of University Health Service
Frederick M. Jervis, Director of Counseling
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
William W. Lothrop, Counselor
W. Kent Martling, Assistant Treasurer
Harriet B. Nason, r.n., Supervising Nurse
Keith J. Nighbert, Station Manager of WENH-TV, Channel 11
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
Mary Semitros, Alumni Recorder
Russell C. Smith, Purchasing Agent
Jane B. Stearns, Financial Aids Officer
Richard F. Stevens, Alumni Activities Director
Albert D. Van Allen, Director of University Relations
Admission
to the
University of New Hampshire
Methods of Admission

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 Writing Sample taken during the senior year. Applicants to the College of Liberal Arts and the Whittemore School of Business and Economics are required to submit achievement tests in a foreign language, including the supplementary listening comprehension test. Other achievement tests, not required but strongly recommended, are the English achievement test and, for applicants to the College of Agriculture or the College of Technology, an area or areas generally related to the student’s prospective major, i.e., advanced mathematics 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 character, leadership, and initiative are taken into account.

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-residents throughout their entire attendance at the University unless their parents have gained bona fide residence in New Hampshire.

Except for early decision candidates, application 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 a month before the beginning of the academic year. A non-refundable application fee — $5.00 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>
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<tr>
<th>Agriculture</th>
<th>Liberal Arts</th>
<th>Technology</th>
<th>WSBE</th>
</tr>
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<tbody>
<tr>
<td>4 units</td>
<td>4 units</td>
<td>4 units</td>
<td>4 units</td>
</tr>
<tr>
<td>2 units</td>
<td>3 units</td>
<td>3 units</td>
<td>3 units</td>
</tr>
<tr>
<td>(of a single foreign language)</td>
<td>(including algebra, plane geometry, and trigonometry)</td>
<td>(including algebra, plane geometry and trigonometry)</td>
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<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Laboratory Science (excluding general science)</th>
<th>Social Studies</th>
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</thead>
<tbody>
<tr>
<td>3 units</td>
<td>3 units</td>
<td>3 units</td>
</tr>
<tr>
<td>(including algebra, plane geometry, and trigonometry)</td>
<td>(including algebra, plane geometry and trigonometry)</td>
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</tbody>
</table>

The University will consider applicants who have taken less than the recommended programs with the following minimums: Agriculture — English 4, languages 0, mathematics 2, science 1, and social studies 2; Liberal Arts — English 4, language 2, mathematics 2, science 1, and social studies 2; Technology — English 4, mathematics 3½, science 2 (physics and chemistry), language 0, and social studies 2; Whittemore School minimums are similar to those of Liberal Arts. In any event, the number of academic units must total 12 and include the subject matter minimums specified.

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. The University will give prospective applicants an indication of admission based upon scholastic attainment of three years under an early decision procedure. The plan is specifically appropriate for well qualified students who have made the University their first choice and who submit a regular application including junior SAT’s with a signed statement that the University is the number one choice and that applications to other colleges will be withdrawn if he is admitted under the early decision procedure.

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.
Fees and Expenses

The cost for the freshman year at the University averages about $1,300 for a resident of New Hampshire and $1,875 for a non-resident.

Tuition is $380 ($925 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.

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 seniors and graduate students.

Books and classroom supplies cost between $75 and $100. These may be purchased at the University Bookstore.

There is a Memorial Union assessment of $12 and an activity tax of $10 which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities.

Personal expenses average $200. 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. Every student participating in the program of Physical Education and Athletics for Men and Physical Education for Women must pay $1 for locker and towel service.

**University Housing**

Room rents average $230. The University has nine residence halls for women and eight 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 $165 to $290.

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.

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.

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.

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 Manager 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 23 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.

**Financial Aid**

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 resident of New Hampshire is eligible for consideration for a tuition grant. The amount varies from $100 to full tuition, and the basic consideration is financial need. There are scholarships available for both resident and non-resident students. The basis of these awards may be either scholastic attainment, meeting particular requirements as outlined by the donor, participation in extra-curricular activities, or other. 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, New Jersey.

In-state students may secure applications for grants or scholarships as well as the parents’ confidential statement from high school principals or guidance counselors. Out-of-state and transfer students may secure applications for grants or scholarships from the Financial Aids Office, UNH, and the parents’ confidential statement from high school principals or guidance counselors. Applications are due February 15.

**Loans**

There are two loan funds administered by the University: the UNH Loan Fund and the National Defense Student Loan Fund. Financial need must be clearly demonstrated and loans may be used for expenses incurred in pursuing a college education. Applications for loans may be secured from the Financial Aids Office, UNH. Applications are due July 15.

**Employment**

Various types of employment are usually available to students wishing to work part time. Freshmen and transfer students are not encouraged to work during their first semester.

For additional information, contact the Financial Aids Office.
The Colleges

of the

University of New Hampshire
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; 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; 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  Home Economics
Biochemistry    Plant Science
Botany          Resource Economics
Entomology      Soil and Water Science
Forestry

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.

Bachelor of Science Degree

In recent years the size of farms and marketing agencies have greatly increased. As a result, new professional careers are available for our graduates. In addition to the positions for serving agricultural industries there are demands for people trained in resource development and conservation, particularly in rural areas.

Because United States farmers have unquestioned supremacy in food production the newly-created countries throughout the world are asking colleges of agriculture for assistance in all phases of agriculture, including forestry and home economics. As a result of these requests for technical assistance our graduates are obtaining employment in foreign countries.

The following are examples of employment agencies 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.

Majors and Specializations

Agricultural and Cooperative Extension Education
Animal Sciences
  Animal Science
  Dairy Science
  Poultry Science
  Pre-Veterinary Medicine
Biochemistry
Botany
Entomology
Plant Science
  Field Crops
  Horticulture
Resource Economics
Soil and Water Science
   Soil Science
   Hydrology
   Mechanized Agriculture

Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required, including the following special requirements:
   Undergraduate women register for Physical Education for their first four semesters, undergraduate men for their first two semesters.
   Male undergraduate students entering as freshmen may register for Reserve Officers Training Corps during their first four semesters.
   All students must complete English 401 and 402 and History 401 and 402.
   Six credits in each of groups B, C, and D are required. Completion of thirty or more credits in three or more departmental areas within a group also satisfy the requirements of that group. Advanced placement with credit at the time of admission also satisfies the requirements of that group.

   Group B — Biology 401, 402; Botany 411; Zoology 412; Chemistry 401, 402, 403, 404; Geology 401, 402; Mathematics 407, 408; Physical Science 401, 402; Physics 401, 402.

   Group C — Economics 401, 402; Geography 401, 402; Government 405, 406, 408; Psychology 400, 405; Sociology 400, 411, 540.

   Group D — Arts 475, 476; English 513, 514, 515, 516; Humanities 501, 502; Music 403, 404; Language 501, 502; Foreign Languages 503, 504, 505, 506; Philosophy (two courses); Speech and Drama 431, 436.

   Students must achieve and maintain a 2 grade-point for good standing and graduation. (A equals 4), (B equals 3), (C equals 2), (D equals 1), (F equals 0).
   The student must complete those courses specified by the department or major adviser and obtain a written recommendation for graduation.

Agricultural and Cooperative Extension Education

The Agricultural and Cooperative Extension 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 are 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 Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

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 with courses in botany, zoology, microbiology, genetics, and biochemistry, including an opportunity to participate in basic research in the major field during the senior year. A good background in mathematics is desirable and, if the student indicates an interest in physical science, the program can be organized to provide strength in physics.
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 5-6 and for Mathematics 21-22 in the freshman year. An early conference with the chairman of the department, preferably prior to registration in the freshman year, is highly desirable for orderly planning of the curriculum.

**Botany**

Students interested in a broad background in the plant sciences should consider majoring in Botany. The principal areas of specialization are: (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 cell, cytological techniques, and chromosome studies; (7) Preparation for botanical technicians; and (8) Preparation for secondary-school teaching.

The undergraduate courses to be taken in all these fields are nearly the same until the junior and senior years. Some specialization should then be made. The student who graduates in Botany may take graduate work in Botany or in the related fields of Horticulture, Forestry, and Agronomy which require an extensive background in Botany. Assistantships, research positions, and full-time teaching jobs are more available at present than in previous years. Opportunities for able botanists also occur 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.

**Plant Science**

Student specializing in Plant Science obtain a basic knowledge of the physical and biological sciences in addition to learning the principles of breeding, genetics, nutrition, production, packing, storage, processing, and marketing of agronomic and horticultural crops. Plant Science majors will
be qualified for employment in crop production, plant breeding, turf and nursery management, orcharding, weed control, plant introduction, and in various positions with agricultural industries. Students are also qualified to take Federal Civil Service examinations for positions in the United States Department of Agriculture or may be employed in the Cooperative Extension Service.

Superior students will be encouraged to obtain intensive training in the basic sciences which will enable them to do successful graduate work if they so desire. Graduate training has become essential for a professional career in research, teaching, or extension in universities, in the federal government, and in many agricultural industries. Advisers in the department will assist the student in determining his major area of interest.

The extensive University laboratories, growth chambers, greenhouses, and experimental farms are available for use in teaching and research.

**Resource Economics**

This program formerly named Agricultural Economics continues to teach courses on the economic and business aspects of agriculture, farm management, food marketing and consumption, agricultural price policy, and world food supply. The broader aspects of resource development and growth are also covered in the teaching program, including resource economics, public resource policy, and conservation economics.

The student in Resource Economics is trained primarily in the science of economics and its use in problem solving by households, firms, and governmental units. In addition the student is encouraged to take courses leading to a broad university education. Students interested in the economic or business aspects of agriculture should also take courses in the Animal and Plant Sciences; those concerned with resource conservation and use should take courses in Forestry and Soil and Water Science. All students will be expected to take courses in the Whittemore School of Economics and Business.

Training for careers in farming, with business firms and banks, or for teaching and research in agricultural colleges or government agencies can be done in Resource Economics.

**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 all water resources in the atmosphere and 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.

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 forests. 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. In 1963 lumber and paper production were 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 Forestry. 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 junior 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 field trips and the June field session.

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

The curriculum that follows fulfills both the University and College course requirements. A minimum of 128 semester credits are required for the B.S. degree in Forestry.

**FRESHMAN YEAR**

<table>
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<th>Course</th>
<th>Credits</th>
<th>First Semester</th>
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<tr>
<td>Chem. 401, 402</td>
<td>General Chemistry</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bot. 411</td>
<td>General Botany</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>For. 425, 426</td>
<td>Dendrology; Wood Identification</td>
<td>4</td>
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<tr>
<td>Engl. 401, 402</td>
<td>Freshman English</td>
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<td>Agr. 401</td>
<td>Introduction to College</td>
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<tr>
<td>C. E. 501</td>
<td>Surveying</td>
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<td>R.O.T.C.</td>
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<td>3</td>
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<td>P. E. 431-432</td>
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**SOPHOMORE YEAR**

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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
<td>3</td>
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<tr>
<td>For. 527, 528</td>
<td>Silvics; Applied Statistics</td>
<td>3</td>
<td>3</td>
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<tr>
<td>S. and W. 501</td>
<td>Introductory Soils</td>
<td>4</td>
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<tr>
<td>Math. 405 or</td>
<td>Introduction to College Mathematics</td>
<td>3–5</td>
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</tr>
<tr>
<td>Math. 421 or</td>
<td>Calculus</td>
<td></td>
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</tr>
<tr>
<td>Math. 407-408</td>
<td>Fundamental Mathematics</td>
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<td>Ent. 506</td>
<td>Forest Entomology</td>
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<td>Econ. 401</td>
<td>Principles of Economics</td>
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<td>For. 544</td>
<td>Forest Economics</td>
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JUNIOR YEAR

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<td>B</td>
<td>Biochemistry, Physics, and Calculus*</td>
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<td>For. 543, 650</td>
<td>Mensuration; Logging Economics</td>
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<td>For. 629</td>
<td>Silviculture</td>
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<td>Bot. 751</td>
<td>Plant Pathology</td>
<td>3</td>
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<tr>
<td>S. and D. 501</td>
<td>Public Speaking</td>
<td>3</td>
<td></td>
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<tr>
<td>Gov. 406</td>
<td>Principles of American Government</td>
<td>3</td>
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<td>Bus. Adm. 633</td>
<td>Business Management</td>
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SPRING FIELD SESSION (JUNE)

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SENIOR YEAR

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<td>(Arts)</td>
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<tr>
<td>For. 659</td>
<td>Forest Protection</td>
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<tr>
<td>For. 651</td>
<td>Forest Utilization</td>
<td>4</td>
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<td>Bus. Adm. 668</td>
<td>Personnel Administration</td>
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<td>Engl. 523</td>
<td>Writing of Technical Reports</td>
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<td>Elective courses</td>
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<td><strong>Total</strong></td>
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</table>

Bachelor of Science in Home Economics

The Home Economics curriculum offers opportunity to combine education for home and family life with professional preparation in one of four major areas. The requirements in the freshman and sophomore years are essentially the same for all students. Sometime in the sophomore year the student selects one of the following four professional specializations:

General (Family Relations, Child Development)

A careful selection of courses provides students with preparation for positions in nursery schools, community agencies, consumer services, Cooperative Extension Service, communications, business, or foreign service.

Home Economics Education

This program prepares students for teaching positions in junior and senior high schools, adult programs, Cooperative Extension Service, business, Peace Corps, and with university projects abroad and other related areas.

* A combination totalling 8 credits required.
Clothing and Textiles

Graduates of this area of specialization hold positions in merchandising, retailing, promotional work with pattern companies and manufacturers, advertising, and the Cooperative Extension Service.

Food and Nutrition

In this major there are many career choices for those who qualify: as hospital dietitians, in college and industrial food services, in school lunch programs, with food and equipment companies, with newspapers, radio television, advertising agencies, or with public and private health services. With additional preparation the home economist does research in foods and nutrition in industry, with the government, or in universities.

A candidate for the Bachelor of Science degree in Home Economics must complete 128 credits and the University academic requirements. Where courses in the University requirements are the same as those required by the Department, one course fulfills both requirements.

Departmental Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 401-402 or Chem. 403-404</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>Bio. 401-402 or Bot. 411 and Zool. 412</td>
<td>Man and the Living World, General Botany, General Zoology</td>
</tr>
<tr>
<td>Econ. 401</td>
<td>Principles of Economics</td>
</tr>
<tr>
<td>H.E. 404</td>
<td>Textiles</td>
</tr>
<tr>
<td>H.E. 407</td>
<td>Professional Seminar</td>
</tr>
<tr>
<td>H.E. 415</td>
<td>Personality and Courtship</td>
</tr>
<tr>
<td>H.E. 425</td>
<td>Child Development</td>
</tr>
<tr>
<td>H.E. 757</td>
<td>Home Management</td>
</tr>
<tr>
<td>H.E. 573</td>
<td>Nutrition</td>
</tr>
<tr>
<td>S. and D. 401 or 501</td>
<td>Basic Speech, Public Speaking</td>
</tr>
<tr>
<td>or 508</td>
<td>Speech for Prospective Teachers</td>
</tr>
</tbody>
</table>
Suggested Program

FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>Arts 431</td>
<td>Basic Design</td>
<td>2</td>
</tr>
<tr>
<td>Bio. 401-402 or</td>
<td>Man and the Living World</td>
<td>6</td>
</tr>
<tr>
<td>Bot. 411 and</td>
<td>General Botany</td>
<td></td>
</tr>
<tr>
<td>Zool. 412 or</td>
<td>General Zoology</td>
<td></td>
</tr>
<tr>
<td>Chem. 401-402 or</td>
<td>General Chemistry</td>
<td>7–8</td>
</tr>
<tr>
<td>Eng. 401-402</td>
<td>Freshman English</td>
<td>6</td>
</tr>
<tr>
<td>Hist. 401-402</td>
<td>Introduction to Contemporary Civilization</td>
<td>6</td>
</tr>
<tr>
<td>H.E. 404 or</td>
<td>Textiles</td>
<td></td>
</tr>
<tr>
<td>H.E. 418</td>
<td>Principles of Food Selection and Preparation</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 407</td>
<td>Professional Seminar</td>
<td>1</td>
</tr>
<tr>
<td>H.E. 415</td>
<td>Personality and Courtship</td>
<td>3</td>
</tr>
<tr>
<td>P.E.</td>
<td>Physical Education</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Elective courses</td>
<td>3–5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>32</strong></td>
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SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio. 401-402 or</td>
<td>Man and the Living World</td>
<td>6–8</td>
</tr>
<tr>
<td>Bot. 411 and</td>
<td>General Botany</td>
<td></td>
</tr>
<tr>
<td>Zool. 412 or</td>
<td>General Zoology</td>
<td></td>
</tr>
<tr>
<td>Chem. 401-402 or</td>
<td>General Chemistry</td>
<td>6–8</td>
</tr>
<tr>
<td>Econ. 401</td>
<td>Principles of Economics</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 425</td>
<td>Child Development</td>
<td>3</td>
</tr>
<tr>
<td>S. and D. 401 or 501</td>
<td>Basic Speech</td>
<td>3</td>
</tr>
<tr>
<td>or 508</td>
<td>Public Speaking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Speech for Prospective Teachers</td>
<td></td>
</tr>
<tr>
<td>P.E.</td>
<td>Physical Education</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Electives, required courses and/or professional specialization</td>
<td>15–17</td>
</tr>
</tbody>
</table>

Professional Specialization

A student plans the professional sequence with her adviser, using one of the following four curricula as a guide. Electives are planned to strengthen personal and professional interests and to broaden the general education background of the student.

GENERAL (FAMILY RELATIONS, CHILD DEVELOPMENT)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.E. 426</td>
<td>Child Development</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 531</td>
<td>Interior Design</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 783</td>
<td>Family Relationships</td>
<td>3</td>
</tr>
<tr>
<td>Hum. 501-502</td>
<td>Humanities</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Electives in Psychology and Sociology</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Electives in Food and Nutrition</td>
<td>3</td>
</tr>
</tbody>
</table>

Professional specialization and electives to bring total credits for junior and senior years to 64.
Electives and professional specialization to bring total credits for junior and seniors years to 64.

CLOTHING AND TEXTILES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts 432</td>
<td>Drawing and Design</td>
<td>2</td>
</tr>
<tr>
<td>Res. Econ. 507</td>
<td>Economics of Consumption</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Res. Econ. 402</td>
<td>Economics of Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 431</td>
<td>Interior Design</td>
<td>3</td>
</tr>
<tr>
<td>Psych. 437</td>
<td>Developmental Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 400</td>
<td>Introductory Sociology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 411</td>
<td>Cultural Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 500</td>
<td>Social Psychology</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych. 544</td>
<td>Psychology of Personality</td>
<td>3</td>
</tr>
<tr>
<td>or</td>
<td>Electives in Clothing and Textiles</td>
<td>12–15</td>
</tr>
</tbody>
</table>

Electives and professional specialization to bring total credits for junior and senior years to 64.
This curriculum enables a student to fulfill the American Dietetic Association requirements for the Dietetic Internship Program.

<table>
<thead>
<tr>
<th>B.A. 668</th>
<th>Personnel Administration</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psych. 532</td>
<td>Industrial Psychology</td>
<td>3</td>
</tr>
<tr>
<td>B.A. 401</td>
<td>Principles of Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Biochem. 501</td>
<td>Organic and Biological Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Ed. 481</td>
<td>Educational Psychology</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ed. 757</td>
<td>Principles of Learning</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 418</td>
<td>Principles of Food Selection and Preparation</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 419</td>
<td>Menu Planning and Meal Service</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 521</td>
<td>Quantity Foods and Purchasing</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 653</td>
<td>Organization and Management of Institutional Food Service</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 674</td>
<td>Nutrition in Health and Disease</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 771</td>
<td>Experimental Foods</td>
<td>3</td>
</tr>
<tr>
<td>H.E. 797</td>
<td>Nutrition Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Microb. 503</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>Zoo. 507</td>
<td>Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>Zoo. 508</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives and professional specialization to bring total credits for junior and senior years to 64.

Non-majors, both men and women, may elect courses in the Department of Home Economics. A curriculum leading to the Master of Science degree in Home Economics is outlined in the Graduate Catalogue.

**Thompson School of Agriculture**

**PHILIP S. BARTON, Director**

The Thompson School is a unit of the College of Agriculture. It offers a two-year program 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 68 semester credits, plus completion of two summers of supervised placement, lead to the degree of Associate in Applied Science.


Applicants desiring admission in Forest Technology and Soil and Water Conservation Technology 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 Agriculture, Putnam Hall, University of New Hampshire, Durham, N. H. 03824
The College of Liberal Arts

EVERETT B. SACKETT, Dean
MELVILLE NIELSON, Associate Dean

DEPARTMENTS

The Arts    Microbiology
Education   Music
English     Occupational Therapy
Foreign Languages    Philosophy
and Literatures    Psychology
Geology and Geography    Sociology
Government    Speech and Drama
History      Zoology

The departments of Chemistry, Mathematics, and Physics in the College of Technology, the departments of Botany and Entomology in the College of Agriculture, and the Division of Physical Education and Athletics offer programs for students in the College of Liberal Arts.

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 offerings of the College of Liberal Arts consist of three groups: the General Liberal Arts Curriculum, the Prescribed curricula, and the Prescribed Curricula in Teacher Preparation.

The General Liberal Arts curriculum is intended primarily to provide a broad liberal program and general education leading to the Bachelor of Arts degree. Students in this curriculum will major in one of the following fields: The Arts (options in Painting and Graphics, Crafts, and History of Art), Biology, Botany, Chemistry, Elementary Education, English Literature, English Teaching, Entomology, French, General Physical Science, Geography, Geology, German, Government, History, History and Literature, Latin,
Mathematics, Microbiology, Music (options in Music History, Applied Music, and Music Theory), Philosophy, Physics, Psychology, Sociology, Spanish, Speech and Drama (options in General Speech and in Drama), Zoology. Requirements for the Bachelor of Arts degree, and information regarding these majors, are presented in the section entitled General Liberal Arts Curriculum.

The Prescribed curricula and the Prescribed Curricula in Teacher Preparation consist of several prescribed 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 conserving the breadth and general culture of the students enrolled in them. Both types of Prescribed curricula lead to the Bachelor of Science degree. Prescribed curricula are offered in Medical Technology, Nursing, Occupational Therapy, Pre-Medical, and Social Service. Prescribed Curricula in Teacher Preparation are offered in Art Education, Music Education, Physical Education Teacher Preparation for Men (options in Physical Education, Academic Teaching, and Recreation Education), and Physical Education Teacher Preparation for Women (options in Physical Education and Recreation Education). Requirements for the Bachelor of Science degree, and information regarding these curricula, are presented in the two sections entitled Prescribed curricula and Prescribed curricula in Teacher Preparation.

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. The minor may be in any discipline in the College of Liberal Arts or any discipline in which a student may major in the General Liberal Arts Curriculum. 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 prescribed 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-Dental

Students who plan to enter a school of dentistry may follow the Pre-medical curriculum or they may elect to major in almost any field offered under the General Liberal Arts curriculum. The student’s program should include courses in morphogenesis, physics, and organic chemistry. Students who plan to enter a school of dentistry, either before or after achieving the bachelor’s degree, are advised to consult with Professor Paul E. Schaefer, Department of Zoology.

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 Government.

Students who plan to enter law school after graduation are advised to consult with Professor John H. Holden, Chairman of the Department of Government, 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. General Liberal Arts curriculum 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.

Prescribed Curricula in Teacher Education. There are prescribed curricula for preparing teachers in the fields of Agriculture, Art, Commercial, Home Economics, Music, and Physical Education. These curricula are described in the section entitled Prescribed Curricula in Teacher Preparation.

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 General Liberal Arts Curriculum.
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, and the Director of Student Teaching, Professor Eugene Jorgensen. 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 on or before May 1 of the preceding academic year. Those for second semester student teaching must be filed on or before November 15 of the preceding semester.

To be eligible for student teaching the student must have completed the prerequisite sequences of courses in the appropriate Prescribed 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.

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 Government 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, Foreign Languages and Literatures, Government, History, Psychology, and Sociology. 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 in-
volved 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. Professor Robert C. Gilmore is Director of the Honors Program.

The Ford Foundation Scholarship Program

A limited number of freshmen each year are selected from those who apply for a special five-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 General Liberal Arts 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 special seminars, complete special work in mathematics or philosophy, languages, reading, and writing. During the last three years of the program, he will be assigned to his major department as an intern in teaching.

Prospective freshmen with superior high school records who are interested in this program should consult the principal or counselor in their high schools or write to the Director of Admissions at the University for more information.

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.
General Liberal Arts Curriculum

The General Liberal Arts curriculum is intended primarily to provide a broad liberal program and general education leading to the Bachelor of Arts degree.

Degree Requirements

Each candidate for a Bachelor of Arts degree in the College of Liberal Arts who enters the College between July 1, 1964 and June 30, 1965 must earn 128 semester hour credits with at least a 2.0 grade-point average in all courses completed at the University of New Hampshire and satisfy the following requirements.

College Requirements

Satisfaction of the following College requirements ensures satisfaction of the University course requirements:

1. Men students must complete two semesters of Physical Education; women students must complete four semesters of Physical Education.
2. English 401-402.
3. History 401, 402.
5. 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‡.
6. 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); Government 405, 406; Psychology 401-402; Sociology 400, 540.
7. 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 503-504 or 505-506; Greek 503-504; Latin 503-504 or 505-506; Russian 503-504 or 505-506; Spanish 503-504 or 505-506; Music 403-404; Speech and Drama 431, 436.
8. Special Language: Proficiency in a foreign language at the level achieved by satisfactory work in a five- or six-hour college level course is required of all students. This requirement may be fulfilled by achieving a satisfactory score on College Board tests (both the written and oral comprehension tests for modern languages) or by completion of beginning courses in language at the University of New Hampshire (French 401,

* Students electing a Biological Science during their freshman year must elect a Physical Science during their sophomore year or vice versa.
† Chemistry 401-402 does not fulfill the requirement for Biology majors nor the prerequisite for further courses in Chemistry.
‡ Students who expect to major in Physics should not register for Physics 401-402, but should elect Mathematics 421-422 and Physics 404 in the freshman year.

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German 401, Spanish 401-402; Italian 401-402; Latin 401-402; Russian 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.

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. (A Major may be selected at the end of the student’s freshmen year and must be selected prior to the junior year.)

Time Sequence for Requirements

The requirements in the General Liberal Arts curriculum are to be satisfied in the appropriate class years as indicated in the following schedule:

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. E. 401, 402</td>
<td>Physical Education (Women)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 431-432</td>
<td>Physical Education (Men)</td>
<td>( \frac{1}{2} )</td>
<td>( \frac{1}{2} )</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Biological or Physical Science*</td>
<td>3, 4, 6</td>
<td>3, 4, 6</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td></td>
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<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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Majors in the General Liberal Arts Curriculum

The objectives, opportunities, and department requirements of majors in the General Liberal Arts curriculum are described in the paragraphs which follow.

* Courses to meet these requirements are listed under College Requirements.
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 prescribed Curriculum leading to the Degree of Bachelor of Science in Art Education). 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. Courses to be pursued include art history and electives in the crafts. Students will be prepared for continued professional study in the fields of painting, design, and commercial art. Those students seeking careers in college or secondary school teaching will be qualified to enter programs of graduate study leading to the master of fine arts and 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 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 the graduate 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 twofold purpose. First they make available for students in the general 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.

**Applied Biology.** 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, 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.
Botany

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.

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. Courses in other departments closely related to the major courses may be counted 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; 661-662; 683-684; and at least one Chemistry course in 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 5 credits) with French or 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.

Education

The Department of Education 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 schools do not major in the Department of Education. They major either in the subject-matter department in the General Liberal Arts curriculum, electing the courses in the University Teacher Preparation Program (see section entitled Preparation for Teaching) or they elect one of the prescribed curricula in teaching (see section entitled Prescribed Curricula in Teacher Preparation).

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 General Liberal Arts curriculum. 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 Literature major and the Teaching major.

The Literature major must complete English 513 and must earn grades of C or better in 24 semester credits in literature courses numbered above 700; 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 Teaching major must meet the state certification requirements for teaching. He must also take the following courses, 24 credits of which must be passed with the grade of C or better:

- English 513, 514
- English 516
- English 706
- 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 Sylvester H. Bingham.

**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. A more intensive program in Entomology may be secured in the curriculum offered in the College of Agriculture.

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.

**Foreign Languages and Literatures**

A major in Foreign Languages and Literatures may be of interest to the following groups of students:

1. Those who wish to do college teaching in foreign languages and literatures. Graduate study is indispensable for such work, but preparation may be made for it by a certain amount of undergraduate specialization.

2. Those who plan to teach foreign languages in secondary schools. As most high school language teachers are obliged to teach more than one language, or one language in combination with other subjects, such students should plan to concentrate in a single language and its literature, but should map out a program including another language, or a number of courses in English, history, or the social sciences. Prospective teachers should consult the Chairman of the Department, Professor R. Alberto Casas, and the Chairman of the Department of Education.

3. Those who intend to enter other professional fields in which a background in foreign languages and literatures is desirable. Such a field, for example, might be that of library service. Most library schools require two foreign languages.

4. Any students who feel free to plan their college program without too specific reference to a vocation, and who have a special interest in foreign languages and literatures.

Since most graduate schools require a knowledge of two foreign languages, all students who may possibly do graduate work in any field should obtain a reading knowledge of French and German.

Each section of the Department of Foreign Languages and Literatures which offers a major also offers an Honors program in each particular field of specialization. This program consists of: extra work in the junior and senior years amounting to the equivalent of one semester hour done in con-
connection with each one of a minimum of five three-hour semester courses counting towards a major in courses 641 and above, a senior research project and paper (695, 696 courses) to be the equivalent of six semester hours, and a comprehensive examination on the literature and language of the respective field. The evaluation in each section will be made by a committee consisting of the members of that section and one other member in the Humanities Division directly concerned with the field in which the student specializes. The project and paper will be read by this committee sometime in the spring.

Students majoring in the Department of Foreign Languages and Literatures must designate French, German, Latin, or Spanish as their particular major. The following courses cannot be counted for major credit: French 401-402, 503-504; German 401-402; Greek 401-402; Italian 401-402; Latin 401-402; Russian 401-402; Spanish 401-402. A major must comprise a minimum of 24 major credits, 21 of them in a particular language and its literature. The remaining 3 credits may be earned in other designated courses in the Department.

The supervisor for majors in French is Professor Louis J. Hudon; for majors in German, Professor Hermann W. Reske; for majors in Latin, Professor George Doig; for majors in Spanish, Professor R. Alberto Casas.

Attention is called to the combined major in History and Literature.

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 Jerome M. Pollack.

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, and most recently 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 construct the physical and biological history of the earth by the study of the formative processes acting on the earth. This includes knowledge of the constituents that make up the earth, an understanding of the evolution of the earth’s structural framework and surface features, and the interpretation of changes in life and the biological environment through time.

Students who are interested in the earth sciences, both those who expect to make some phase of geology their life work, and those who desire to build a program of liberal studies around a core of geological and related subjects, are advised to register as majors in Geology.

The search for new sources of essential mineral resources and the development of new uses for certain minerals have emphasized the need for men trained in the earth sciences. 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 satisfactory paper or pass a written comprehensive examination.

Students who are interested in majoring in Geology are advised to consult with the supervisor, Professor Jerome M. Pollack. 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.

Government

The courses offered by the Department of Government are designed to aid the student in gaining a knowledge of the nature, functions, and problems of government, and of the place of government in the modern world. For this general purpose, courses are offered in public affairs — local, state, national, and international. Some courses listed by the Department are
chiefly intended to provide information needed for intelligent and responsible citizenship and to provide a part of a liberal education. Others are of a specialized nature and have been planned to provide basic preparation for professional work. A few are intended to stress the historical and philosophical development of the growth of political thought and institutions.

By specializing in one of the several programs in government, a student may prepare himself for further study in graduate school in law, political science and government, or public administration. He may enter an advanced program for more extensive work in some aspect of the foreign service or in regional studies. Social science research, government employment, publications, public relations, and teaching are occupations seeking graduates of government programs. Nearly all leading graduate schools require the prospective student to do the Graduate Record Examination during his senior year. Information may be secured in the Government Department office. Students who are preparing to teach government courses in the secondary schools should check their planned program of study with the Department of Education. Ordinarily, prospective teachers of government courses will find it necessary to teach related courses in the social sciences.

Majors in Government have an unusual opportunity for mastering research techniques and gaining practical information concerning state and local government in New Hampshire through work as an intern in an approved public or private agency. For this program the student should enroll in Social Science 681 with the prior permission of the Chairman of the Department of Government. Further opportunity for similar research may be gained in Government 771.

Majors in Government are required to take Government 405 and Government 406 with grades of C or better. Students who expect to major in Government are advised to register for these courses during the freshman or sophomore year. Students majoring in Government are also required to complete a research paper approved by the staff. This project constitutes the chief part of Government 771. A major consists of a minimum of 24 semester credits of work with grades of C or better in Government 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 Government as a major should meet with the supervisor, Professor John T. Holden.

History

History, as a field in which to major, may be of interest to the following groups of students: (1) Those who wish to do college teaching in history. Graduate study is indispensable for such work, but preparation may be made for it 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 keep in touch with the Department of Education, as well as with the Department of History, with a view to satisfying teaching certification standards and building a well-rounded program of studies. (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 the 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 prearranged day shortly before April 15.

Students planning to major in History should consult with the supervisor, Professor Marion E. James.

History and Literature

Students who desire a broad education may take a combined major in History and Literature. Students who plan to enter library service may also find here a desirable major. The program of this major offers an opportunity to study the history and literature together of France, of Germany, or of Spain. A still broader survey of European history and of its literature is also possible. The program involves the completion of 24 semester credits with grades of C or better in one of the following groups of courses, of which 12 credits should be in History and 12 credits in Languages:


A student who has met the major requirements in History and Literature and other requirements of the General Liberal Arts curriculum will be recommended for the degree of Bachelor of Arts with the notation “History and Literature” on the Commencement program.

Students’ registration cards may be signed by either Professor Marion E. James, Chairman of the Department of History, or by the Supervisor of the Foreign Language major.

Students electing option I, II, or III will be encouraged to do a considerable part of their reading for the History courses in Spanish, French, or German, respectively.

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 in Organic Chemistry is 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 Lawrence W. Slanetz.

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 re-
citals, 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 Prescribed Curriculum leading to the Bachelor of Science degree with a major in Music Education.)

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, 423-424, 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 bass (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 401-402; 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 supervisor, Professor Karl H. Bratton.

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, life, 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 and 411 at the introductory level, are designed to

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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.

William James once said that, ultimately, the really important question is why there is something rather than nothing. Students who agree with James might consider a major in Philosophy. They should take Philosophy 500, 501 as early as possible since this course is the foundation for most of the advanced work in the department.

Students who major in Philosophy must earn a minimum of 24 semester credits in Philosophy or related subjects with grades of C or better, including the following courses in Philosophy: 400, 500, 501, 610, 620 and six hours of work in the 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) selected by the student.

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 421-422, 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 teach-
ing 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, Professor John A. Lockwood, early in their college program.

**Psychology**

A primary function of the Department of Psychology is the provision of an academic major which will contribute to the liberal education of the undergraduate student. It is intended that the experiences which are provided by the major will help to develop the broad viewpoint which is so highly valued as a characteristic of the liberal arts graduate. By majoring in Psychology it is hoped that 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 advanced study and a career in one of the following fields: college teaching and research; personnel work in industry or government; supervision and psychological testing in mental hospitals, juvenile courts, city school systems and child guidance clinics; counseling and guidance in secondary schools and colleges; or clinical practice. For non-majors, the study of psychology will be helpful in teaching, nursing, social work, business or industrial management, or in professions such as medicine and law in which human relations are of primary importance.

Students who major in Psychology are required to complete 24 semester credits with grades of C or better in courses in Psychology and in such related courses as may be approved by the supervisor. Each student majoring in Psychology must complete six credits from the following group: Psychology 667, 757, 758, 776, 783; also, he must complete six credits from Psychology 437, 544, 654, 663, 760. Finally, all majors must take Psychology 697 and pass a departmental comprehensive which is offered as a part of this course.

Psychology 695 is an honor’s course which is open to senior students who have a 3.0 grade point average in Psychology and are sponsored by a member of the staff. Psychology 757 and 667 should be taken by all Psychology majors who are planning to enter graduate school.

Students who wish to major in Psychology are advised to consult with the supervisor, Professor Walter R. Duryea.

**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 prescribed Social Service curriculum permits.

(The Department also offers a Prescribed 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.)

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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 better 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 Work majors may be admitted to the program if they have a University grade point average of 3.0 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 the supervisors: Professor Richard Dewey or Professor Stuart Palmer.

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), Discussion (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: 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 Group, 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, 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 curriculum, 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.

Prescribed Curricula

The Prescribed Curricula permit considerable specialization in preparation for several professional activities while conserving the breadth and general
culture associated with Liberal Arts programs. All *Prescribed* Curricula lead to the *Bachelor of Science* degree.

**Degree Requirements**

Each candidate for a Bachelor of Science degree in the College of Liberal Arts, who enters the College between July 1, 1964 and June 30, 1965, must earn 128 semester hour credits with at least a 2.0 grade-point average in all courses completed at the University of New Hampshire and must satisfy the following University Curriculum requirements.

**University Requirements**

1. These requirements are those listed under University Academic Requirements on page 50. They include: 2 semesters of Physical Education (for men) or 4 semesters of Physical Education (for women); English 401-402; History 401, 402; Group B (Natural Sciences); Group C (Social Sciences); and Group D (Humanities).

2. These requirements will have been satisfied if the requirements listed under the particular *Prescribed* curriculum are followed.

**Curriculum Requirements and Time Sequence**

These requirements are presented in the detailed listing of the Curricula that follows. Note that some Curricula have special quality requirements. Students following Prescribed Curricula are expected to complete the prescribed courses generally in the sequence in which they are arranged in the curriculum.

**The Curricula**

**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.

Students who are interested in this field should register in the Prescribed 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 General Liberal Arts curriculum, such as Microbiology or some other biological science. In such case, they would have to satisfy requirements of the General Liberal Arts curriculum.

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

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<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>P. E. 431-432</td>
<td>Physical Education (Men)</td>
<td>½</td>
<td>½</td>
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<tr>
<td>P. E. 401, 402</td>
<td>Physical Education (Women)</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Biol. 401-402</td>
<td>Man and the Living World*</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Math. 407-408</td>
<td>Fundamental Mathematics</td>
<td>3</td>
<td>3</td>
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<td></td>
<td>Electives</td>
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<tr>
<th>SOPHOMORE YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tr>
<td>P. E. 403, 404</td>
<td>Physical Education (Women)</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Microb. 503</td>
<td>General Microbiology</td>
<td>4</td>
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<tr>
<td>Microb. 702</td>
<td>Pathogenic Microbiology</td>
<td>4</td>
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<tr>
<td>Chem. 517</td>
<td>Introductory Quantitative Analysis</td>
<td>4</td>
<td></td>
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<tr>
<td>Chem. 545</td>
<td>Organic Chemistry</td>
<td>5</td>
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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Group D</td>
<td>Humanities</td>
<td>3</td>
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<td></td>
<td>Electives</td>
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<tr>
<th>JUNIOR YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>Bio. Ch. 756</td>
<td>Physiological Chemistry</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Microb. 705</td>
<td>Immunology and Serology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Zool. 507, 508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Group C</td>
<td>Social Sciences</td>
<td>3</td>
<td>3</td>
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<td></td>
<td>Electives</td>
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<tr>
<th>SENIOR YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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</thead>
<tbody>
<tr>
<td>Microb. 761-762</td>
<td>Clinical Laboratory Methods†</td>
<td>16</td>
<td>16</td>
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</table>

* Botany 411 (4 credits) and Zoology 412 (4 credits) may be taken in place of Biology 401-402.
† This course starts about June 20 at the Mary Hitchcock Memorial Hospital School of Medical Technology and includes lecture and laboratory work in microbiology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. The credits are awarded in time for graduation in June of the following year after receipt of an official transcript of the grades obtained at the School of Medical Technology and certification by the director of this school and the supervisor of the curriculum that the work has been successfully completed.
Nursing Curriculum

Any student who is interested in nursing as a career is encouraged to consider the Nursing curriculum. It affords opportunity for examinations for registration as a nurse and enables the student also to secure a college degree. The breadth of training beyond that usually received in a hospital training school is increasingly in demand, particularly for those who aspire to executive or supervisory positions. The curriculum prepares for nursing and also permits the student some specialization in other fields related to nursing.

The student must satisfactorily complete three years of work (a minimum of 96 credits) in residence at the University of New Hampshire with a minimum cumulative grade point average of 2, and graduate from a school of nursing approved by the University. The length of the training period will vary with the several schools of nursing. This curriculum is intended to precede hospital training.

Students interested in selecting the Nursing curriculum are advised to consult with the supervisor, Professor Edythe T. Richardson.

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<tr>
<th>FRESHMAN YEAR</th>
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<td>First Semester</td>
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<tr>
<td>P. E. 401, 402</td>
<td>Physical Education (Women)</td>
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<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>
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<tr>
<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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<tr>
<td>Chem. 403-404</td>
<td>General Chemistry</td>
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<td>Electives</td>
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<th>SOPHOMORE YEAR</th>
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<tr>
<td>P. E. 403, 404</td>
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<tr>
<td>Zool. 507-508</td>
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<tr>
<td>Group D</td>
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<tr>
<th>JUNIOR YEAR</th>
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<tbody>
<tr>
<td>Bio, Ch. 501</td>
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<tr>
<td>Zool. 730</td>
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<tr>
<td>Group C</td>
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<tr>
<th>TRAINING PERIOD</th>
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<tr>
<td>Credit earned in training at an approved hospital will apply toward a Bachelor's degree. The University should be informed of the training school affiliation. A transcript of the hospital record must be submitted upon completion of the training program, and an application for a degree must be filed.</td>
</tr>
</tbody>
</table>

* A more intensive introduction will be obtained by electing Botany 411 and Zoology 412, 4 credits each.
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 judgement, 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.

The course admits both men and women who can meet entrance requirements.

Before the beginning of the sophomore year, in the case of freshman students who are interested in the Occupational Therapy curriculum (or before admission into this curriculum in the case of students who transfer from other majors or from other colleges), a series of tests will be given to assist the supervisor in advising the student of his or her fitness for entering this curriculum.

Because of the highly specialized nature of the Occupational Therapy curriculum, students are advised to enter this program not later than the beginning of their sophomore year; otherwise, they should expect to spend additional time in working toward the Bachelor of Science degree. Students seeking to transfer to the University of New Hampshire from other accredited collegiate institutions must arrange, through the Admissions Office, an appointment 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.

The curriculum in Occupational Therapy is designed to satisfy the occupational therapy curriculum requirements of the Council on Education and Hospitals of 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 the medical fields as well as a wide range of skills and crafts used as therapeutic occupational therapy modalities in the treatment of patients.

It is recommended that the student interested in the Occupational Therapy curriculum spend one summer in an occupational therapy department in either a hospital or a camp caring for handicapped persons. This should be done before the student enters the clinical affiliation program.

At the completion of the requirements of the curriculum, the student will spend a minimum of nine months in student affiliation in approved hospitals or services under the direction of a registered occupational therapist. The occupational therapy student is expected and should plan to take the nine months’ clinical affiliation period in a continuous sequence directly after receiving her assignments from the supervisor of the curriculum. 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.

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

General Medicine, Surgery, and Pediatrics — three months
Psychiatry — three months
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 student affiliates. Students will furnish 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.

Students who are registered in the curriculum must obtain grades of C or better in the following courses: Zoology 507, 508, 601, 606; Occupational Therapy 411, 522, 524, 526, 702, 681, 682, 698. Students interested in the curriculum are advised to consult with Professor Marguerite Abbott, Chairman of the Department.

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<th>FRESHMAN YEAR</th>
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<td>First Semester</td>
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<tr>
<td>P. E. 431-432</td>
<td>1/2</td>
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<tr>
<td>P. E. 401, 402</td>
<td>1</td>
</tr>
<tr>
<td>Biol. 401-402</td>
<td>3</td>
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<tr>
<td>Engl. 401-402</td>
<td>3</td>
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<tr>
<td>Hist. 401, 402</td>
<td>3</td>
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<tr>
<td>Arts 431, 432</td>
<td>3</td>
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<tr>
<td>Psych. (401)</td>
<td>3</td>
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<tr>
<td>Soc. (400)</td>
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<tr>
<td>P. E. (403), (404)</td>
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<tr>
<td></td>
<td>(Ele. Games; Rec. Workshop)</td>
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<tr>
<td>H. E. (425)</td>
<td>3</td>
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<tr>
<td>O. T. 411</td>
<td>2</td>
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<tr>
<td>O. T. 412</td>
<td>3</td>
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<tr>
<td>Psych. 402</td>
<td>3</td>
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<tr>
<td>Zool. 507-508</td>
<td>4</td>
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<tr>
<td>Group D</td>
<td>3</td>
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</table>

* Botany 411 and Zoology 412 satisfy this requirement.
JUNIOR YEAR

O. T. 515 Therapeutic Crafts, Advanced 3
O. T. 522 Application of O. T. in General Medicine 2
O. T. 681 General Medical Lectures 3
O. T. 682 Orthopedic Medical Lectures 2
Psych. 654 Psychopathology 3
Zool. 601 Kinesiology 3
Zool. 606 Neurology 4
O. T. Group I† Skills and Techniques 6
O. T. Group II‡ Skills and Techniques 3

SENIOR YEAR

O. T. Group I† Skills and Techniques 6
O. T. 524 Application of O. T. in Psychiatry 2
O. T. 526 Application of O. T. in Physical Disabilities 2
O. T. 683 Medical Lectures, Psychiatry 2
O. T. 698 Advanced Reading Seminar 3
O. T. 702 Administration and Organization 2

Pre-Medical Curriculum

Young men and women who are interested in careers as physicians or surgeons may select the Pre-Medical curriculum. Students who successfully complete this curriculum will be eligible for admission to Class A medical schools. However, owing to the large number of applicants for admission to medical schools, usually only those students who stand in the upper third of their class can expect to be admitted.

It is highly desirable that a pre-medical student secure a bachelor’s degree, although some medical schools do not require it as a condition of admission. The four years of pre-medical work will not only give the student a foundation for his future medical training, but will also give him an opportunity to secure a broad general education.

Students pursuing the Pre-Medical curriculum must obtain a grade point average of 2.5 or better for the required courses in Biology, Chemistry, Physics, and Zoology.

Students who are interested in this curriculum should consult with the supervisor, Professor Paul E. Schaefer.

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<th>FRESHMAN YEAR</th>
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<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>P. E. 401, 402 Physical Education (Women)</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 431-432 Physical Education (Men)</td>
<td>1/2</td>
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<tr>
<td>Chem. 403-404 General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Engl. 401-402 Freshman English</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 401, 402 Introduction to Contemporary Civilization</td>
<td>3</td>
</tr>
<tr>
<td>Math. 407-408 Fundamental Mathematics (or 405-407 if appropriate)</td>
<td>3</td>
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</table>

† 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 — 3 cr. elected from: Arts 402, Ceramics; Arts 426, Woodworking; Arts 413, Jewelry; or Arts 451, Photography.
SOPHOMORE YEAR

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>P. E. 403, 404</td>
<td>Physical Education (Women)</td>
<td>1</td>
</tr>
<tr>
<td>Bot. 411</td>
<td>General Botany</td>
<td>4</td>
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<tr>
<td>Zool. 412</td>
<td>Principles of Zoology</td>
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</tr>
<tr>
<td>Chem. 521</td>
<td>Semimicro Qualitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Language*</td>
<td>3 or 5</td>
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<tr>
<td>Phys. 401-402</td>
<td>Introductory Physics</td>
<td>4</td>
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<tr>
<td>Social Sciences†</td>
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JUNIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>Chem. 651-652</td>
<td>Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Language*</td>
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<tr>
<td>Group C</td>
<td>Social Sciences†</td>
<td>3</td>
</tr>
<tr>
<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
<td>4</td>
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<td>Elective‡</td>
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SENIOR YEAR

<table>
<thead>
<tr>
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<tr>
<td>Group D</td>
<td>Humanities</td>
<td>3</td>
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<tr>
<td>Social Sciences†</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Elective‡</td>
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</tr>
</tbody>
</table>

Social Service Curriculum

Social Service includes, among others, the following fields: family case work, child care, child placement, settlement and neighborhood house, institutional work for defectives and dependents, state and local welfare work, probation, correctional school and prison service, Y.M.C.A. and Y.W.C.A. service, municipal playground direction, child guidance clinics, community chest work.

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 the 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.

Students interested are advised to consult with the Supervisor, Miss Pauline Soukaris, Department of Sociology.

* Either French or German. If the student passes an entrance reading test in either French or German, one year of the same language will fulfill the language requirement. To fulfill this requirement the student must complete either French 402, or 503, or 504; or German 402, or 503, or 504.
† The student must complete 12 semester credits selected from courses in the following departments: Economics, Government, History (other than 401, 402), Psychology, or Sociology. Courses from at least three of the five departments must be presented.
‡ No more than 24 semester credits of Biology (including Botany, Entomology, Microbiology, and Zoology), Chemistry, and Physics in addition to the required courses may be taken as electives.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. E. 431-432</td>
<td>Physical Education (Men)</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>P. E. 401, 402</td>
<td>Physical Education (Women)</td>
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<td>1</td>
</tr>
<tr>
<td>Biol. 401-402</td>
<td>Man and the Living World</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>Freshman English</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Civilization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soc. 400</td>
<td>Introductory Sociology</td>
<td></td>
<td>3</td>
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<tr>
<td></td>
<td>Electives</td>
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### Sophomore Year

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<tbody>
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<td>Physical Education (Women)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Microb. 501</td>
<td>Public Health and Sanitation</td>
<td>3</td>
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</tr>
<tr>
<td>Psych. 401-402</td>
<td>General Psychology</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 520</td>
<td>The Family</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Soc. 500 or</td>
<td>Social Psychology</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Psych. 544</td>
<td>Psychology of Personality</td>
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<td>3</td>
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<tr>
<td>Group D</td>
<td>Humanities</td>
<td></td>
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<td></td>
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### Junior Year

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<tr>
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<tbody>
<tr>
<td>Soc. 703</td>
<td>Criminology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 621, 622</td>
<td>Introduction to Social Welfare</td>
<td>3</td>
</tr>
<tr>
<td>Group B</td>
<td>Physical Sciences*</td>
<td>4</td>
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<tr>
<td></td>
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### Senior Year

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<tbody>
<tr>
<td>Psych. 654</td>
<td>Psychopathology</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 701, 702</td>
<td>Methods of Social Research</td>
<td>3</td>
</tr>
<tr>
<td>Soc. 631</td>
<td>Social Welfare Field Experience</td>
<td>6</td>
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<tr>
<td></td>
<td>Electives</td>
<td></td>
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</tbody>
</table>

### Prescribed Curricula in Teacher Preparation

#### Programs in Other Colleges

Special teacher preparation programs are offered in other Colleges of the University. Details regarding these programs are presented in the appropriate College's section of this catalogue. These special programs are:

- Agricultural Teacher Preparation (College of Agriculture).
- Commercial Teacher Preparation Option (Whittemore School of Business and Economics)
- Home Economics Education (College of Agriculture)

**College of Liberal Arts Program**

The statements on degree requirements, given for Prescribed Curricula on page 86, apply to these Teacher Preparation Curricula.

*Must be satisfied by a physical science course.*
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 grade of C or better must be achieved in all Arts courses required in the curriculum.

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.

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>First</td>
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<tr>
<td></td>
<td>Semester</td>
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<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>Group B</td>
<td>Biological or Physical Sciences</td>
</tr>
<tr>
<td>Arts 431</td>
<td>Basic Design</td>
</tr>
<tr>
<td>Arts 432</td>
<td>Drawing and Design</td>
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<td></td>
<td>First</td>
</tr>
<tr>
<td></td>
<td>Semester</td>
</tr>
<tr>
<td>P. E. 403, 404</td>
<td>Physical Education (Women)</td>
</tr>
<tr>
<td>Arts 401, 404 or</td>
<td>Ceramics</td>
</tr>
<tr>
<td>Arts 402, 403</td>
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<tr>
<td>Arts 541, 542</td>
<td>Advanced Drawing and Painting</td>
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<tr>
<td>Educ. 481</td>
<td>Educational Psychology</td>
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<tr>
<td>Group C</td>
<td>Social Sciences</td>
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<tr>
<td>Group D</td>
<td>Humanities</td>
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<td></td>
<td>Elective</td>
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</table>
SENIOR YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts 643 or</td>
<td>Advanced Painting and Composition</td>
<td>3</td>
</tr>
<tr>
<td>Arts 544</td>
<td>Water Media</td>
<td></td>
</tr>
<tr>
<td>Art-Ed. 792</td>
<td>Problems of Teaching Art in Elementary Schools</td>
<td>3</td>
</tr>
<tr>
<td>Art-Ed. 791</td>
<td>Problems of Teaching Art in Secondary Schools</td>
<td>3</td>
</tr>
<tr>
<td>Educ. 759</td>
<td>Principles of Education</td>
<td>3</td>
</tr>
<tr>
<td>Ed.-Art 794</td>
<td>Supervised Teaching</td>
<td>14</td>
</tr>
<tr>
<td>H. E. 765</td>
<td>History of Costume</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td></td>
</tr>
</tbody>
</table>

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 grade of C or better must be achieved in all music and education courses required in the curriculum.*

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.

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

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

| P. E. 401, 402 | Physical Education (Women) | 1 | 1 |
| P. E. 431-432 | Physical Education (Men) | 1/2 | 1/2 |
| Engl. 401-402 | Freshmen English | 3 | 3 |
| Hist. 401, 402 | Introduction to Contemporary Civilization | 3 | 3 |
| Group B | Biological and Physical Sciences | 3, 4 | 3, 4 |
| | Applied Music* | 2 | 2 |
| Mus. 421-422 | Sightsinging, Ear Training, Dictation I | 0 | 0 |
| | Music Laboratory | 1 | 1 |
| Electives | | | |

### SOPHOMORE YEAR

| P. E. 403, 404 | Physical Education (Women) | 1 | 1 |
| | Applied Music* | 2 | 2 |
| Educ. 481 | Educational Psychology | | |
| Mus. 423-424§ | Harmony I | 2 | 2 |
| Mus. 521-522 | Sightsinging, Ear Training, Dictation II | 1 | 1 |
| Mus. 405-406 || History of Music and Literature | 3 | 3 |
| Mus. 525-526 | Conducting Methods — Instrumental and Choral | 1 | 1 |
| | Music Laboratory | 1 | 1 |
| Group C | Social Sciences | 3 | 3 |
| Elective | | | |
| Recitals‡ | | | |

### JUNIOR YEAR

| Educ. 757 | Principles of Learning | 3 | 3 |
| Educ. 758 | Principles of Teaching | 3 | 3 |
| Group D | Humanities | 3 | 3 |
| Mus. 523-524 | Harmony II | 2 | 2 |
| Mus. 725-726 | Orchestration and Choirestration | 2 | 2 |
| | Music Laboratory | 1 | 1 |
| Mu-Ed. 792 | Problems in the Teaching of Elementary School Music | 3 | 3 |
| Mu-Ed. 553 | Techniques and Methods in Brass and Percussion Instruments | 3 | 3 |

* A minimum of 16 semester credits in Applied Music must be offered by students in this curriculum.

† Qualified students are exempted from this requirement upon proper notification to the College dean's office and the University Registrar.

‡ 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.

§ Although Mus. 421-422 is normally a prerequisite to 423-424, the latter may be taken in the freshman year concurrently with Music 421-422, provided that the student is familiar with the keyboard and can read simple piano music.

|| This course may be taken during the freshman year.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>Edu. 759</td>
<td>Applied Music*</td>
<td>2</td>
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<tr>
<td>Mu.-Ed. 791</td>
<td>Principles of Education</td>
<td>3</td>
</tr>
<tr>
<td>Mu.-Ed. 551</td>
<td>Problems in the Teaching of Secondary School Music</td>
<td>3</td>
</tr>
<tr>
<td>Mu.-Ed. 552</td>
<td>Techniques and Methods in String Instruments</td>
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</tr>
<tr>
<td>Mu.-Ed. 552</td>
<td>Techniques and Methods in Woodwind Instruments</td>
<td>3</td>
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<td></td>
<td>Music Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>Ed.-Mu. 793</td>
<td>Supervised Teaching of Elementary School Music</td>
<td>7</td>
</tr>
<tr>
<td>Ed.-Mu. 794</td>
<td>Supervised Teaching of Secondary School Music</td>
<td>7</td>
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<td>Electives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recitals‡</td>
<td></td>
</tr>
</tbody>
</table>

### Physical Education Teacher Preparation Curriculum for Men

There are three options in this curriculum: Physical Education Option, Recreation Education Option, Academic Teaching Subject Option.

The Physical Education Option 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 grade of C or better must be achieved in 24 semester credits in the physical education courses required in this option but only six credits of Applied Techniques may be included in this total.

Those students desiring to concentrate in the field of Recreation Education may do so by substituting this option for the Physical Education Option at the end of their sophomore year. The students in the Recreation Education option must complete, with a grade of C or better, 24 semester credits in the physical education, arts, music, outdoor education, and drama courses offered in this option. Additional information regarding this option, and the course requirements for the junior and senior years, are presented under the description of the Physical Education Teacher Curriculum for Women, Recreation Education Option.

Students planning to teach an academic subject in addition to teaching Physical Education and coaching in secondary school, should elect the Academic Teaching Subject Option.

All students interested in these programs should consult with the Chairman, Department of Physical Education for Men, or the Director of the Division of Physical Education and Athletics.
(Physical Education Option)

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
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<tbody>
<tr>
<td>P. E. 441-442</td>
<td>Physical Education Activity Courses</td>
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<tr>
<td>Biol. 401-402*</td>
<td>Man and the Living World</td>
<td>3</td>
<td>3</td>
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<td>Eng. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
<td>3</td>
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<td>P. E. 453</td>
<td>Principles of Physical Education Electives</td>
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<tbody>
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<td>P. E. 443-444</td>
<td>Physical Education Activity Courses</td>
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<tr>
<td>P. E. 582</td>
<td>Personal and Community Health</td>
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<td>Educ. 481</td>
<td>Educational Psychology</td>
<td>3</td>
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</tr>
<tr>
<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
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<td>4</td>
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<tr>
<td>P. E. 521; 553; 525; 527; 529 (select one)†</td>
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<tr>
<td>P. E. 522; 524; 526; 528 (select one)†</td>
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<td>P. E. 520</td>
<td>Physiology of Exercise</td>
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<td>Humanities Electives</td>
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<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>Educ. 757</td>
<td>Principles of Learning</td>
<td>3</td>
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<tr>
<td>Educ. 759</td>
<td>Principles of Education</td>
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<td>P. E. 521; 553; 525; 527; 529 (select two)†</td>
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<tr>
<td>P. E. 522; 524; 526; 628 (select one)†</td>
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<tr>
<td>P. E. 652</td>
<td>Kinesiology; Adaptive Physical Education</td>
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<tr>
<td>P. E. 756</td>
<td>Problems of Health Education</td>
<td>3</td>
<td></td>
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<td>Group C</td>
<td>Social Sciences Electives</td>
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<th>Second Semester</th>
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<tbody>
<tr>
<td>P. E. 765</td>
<td>Administration of Physical Education in Secondary Schools</td>
<td>3</td>
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<td>P. E. 768</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>
<td>3</td>
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<tr>
<td>P. E. 622</td>
<td>First Aid-Safety; Athletic Training</td>
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<td>Ed.-P. E. 790</td>
<td>Directed Teaching of Physical Education</td>
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<td>P. E. 521; 553; 525; 527; 529 (select one)†</td>
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<td>Electives</td>
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</table>

* A more intensive introduction would be obtained by electing 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. 553, 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.
(Academic Teaching Subject Option)

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
<th>First Semester</th>
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<td>Physical Education Activity Courses</td>
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<tr>
<td>Biol. 401-402*</td>
<td>Man and the Living World</td>
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<tr>
<td>Hist. 401, 402</td>
<td>Introduction to Contemporary Civilization</td>
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<td>Engl. 401-402</td>
<td>Freshman English</td>
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<tr>
<td>P. E. 453</td>
<td>Principles of Physical Education</td>
<td>3</td>
<td></td>
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<tr>
<td>Electives†</td>
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<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
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<tbody>
<tr>
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<td>Physical Education Activity Courses</td>
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</tr>
<tr>
<td>Zool. 507-508</td>
<td>Mammalian Anatomy and Systemic Physiology</td>
<td>4</td>
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<tr>
<td>Educ. 481</td>
<td>Educational Psychology</td>
<td>3</td>
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<tr>
<td>P. E. 521; 553; 525; 527; 529</td>
<td>Theory and Applied Technique Courses (select one)‡</td>
<td>2</td>
</tr>
<tr>
<td>P. E. 522; 524; 526; 528</td>
<td>Theory and Applied Technique Courses (select one)‡</td>
<td>2</td>
</tr>
<tr>
<td>P. E. 582</td>
<td>Personal and Community Health</td>
<td>3</td>
</tr>
<tr>
<td>P. E. 520</td>
<td>Physiology of Exercise</td>
<td>2</td>
</tr>
<tr>
<td>Group D</td>
<td>Humanities</td>
<td>3</td>
</tr>
<tr>
<td>Electives†</td>
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<tbody>
<tr>
<td>Educ. 757</td>
<td>Principles of Learning</td>
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</tr>
<tr>
<td>Educ. 758</td>
<td>Principles of Teaching</td>
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</tr>
<tr>
<td>Educ. 759</td>
<td>Principles of Education</td>
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<tr>
<td>P. E. 652</td>
<td>Kinesiology: Adaptive Physical Education</td>
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<td>Group C</td>
<td>Social Sciences</td>
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<tr>
<td>P. E. 522; 524; 526; 528</td>
<td>Theory and Applied Technique Courses (select one)‡</td>
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<tbody>
<tr>
<td>P. E. 622</td>
<td>First Aid-Safety; Athletic Training</td>
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<td>P. E. 765</td>
<td>Administration of Physical Education in Secondary Schools</td>
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<tr>
<td>——— Ed. 791</td>
<td>Problems in Teaching the Academic Subject</td>
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<tr>
<td>Ed.—— 794</td>
<td>Supervised Teaching of the Academic Subject in the Secondary School Electives†</td>
<td>6 or 14</td>
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</table>

* A more intensive introduction would be obtained by electing 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.
Physical Education Teacher Preparation Curriculum for Women

For women students who plan to prepare themselves for positions as teachers of physical education or for positions in recreation education, the University has organized the Physical Education Teacher Preparation curriculum for Women. This curriculum will enable women to elect, at the end of the sophomore year, the Physical Education Option or the Recreation Education Option. 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 and to assist in recreation programs, under supervision, in nearby schools and recreation centers.

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 choosing the Physical Education Option, the following courses offered by other departments are suggested as valuable electives: Arts 408, Microbiology 501, Speech 501, Humanities 501-502, Music 403, 404, Psychology 437, Psychology 438, Sociology 400, Sociology 560. Physical Education 454 is also recommended. Students in this Option are advised to choose non-professional electives whenever possible. Those planning to enter graduate study should elect a foreign language.

In the Physical Education Option a grade of C or better must be achieved in 24 semester credits in the Physical Education courses required in the Option. A minimum of one summer as a camp counselor or playground leader is highly recommended for students choosing the Physical Education Option.

Students choosing the Recreation Education Option are advised to become skilled in at least two of these five fields: art, drama, music, outdoor education, or physical education. The following courses offered by other departments are suggested as valuable electives for recreation specialists: Arts, Speech 501, Government 406, Music 470, Music-Education 792, Psychology 663, Sociology 411. Physical Education 756 and Physical Education 563, 564 are also recommended.

Recreation Education students desiring a major emphasis in Forestry Recreation and outdoor education are advised to take Forestry 763. Those interested in a major emphasis in Hospital Recreation are advised to take Zoology 601 and Physical Education 755.

To make certain that the Recreation Education Option contains some experience under working conditions, each student is required to secure during a summer before graduation a minimum of 8 points in actual leadership of recreational activities in such places as community centers, hotels, playgrounds, and camps where supervision will be authorized. A record of such activities will be kept by the student and submitted to the supervisor of the curriculum for crediting. Each week will constitute 1 point.

The students in the Recreation Education Option must complete, with a grade of C or better, 24 semester credits in the physical education, arts, music, outdoor education, and drama courses offered by the curriculum.

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 freshman year the student will generally have the following, listed: fundamentals, soccer, skiing, lacrosse, swimming, and basketball, volleyball; in the sophomore year, tennis (int.), hockey, stunts and tumbling, figure skating, elementary games, folk and square dance, modern dance, badminton, outdoor education and archery; in the junior year, golf, folk and square dancing, and modern dance (int.); in the senior year, track and field and apparatus and gymnastics.

For those who are highly skilled in the activities mentioned and for Recreation Education majors, substitutions are made with the approval of the supervisor. (For example, practice leadership and American country dance are required in the Recreation Option.) Further dance and other activities not listed are included in courses for students in the Prescribed curriculum.

Students who are following any teacher preparation curriculum in the University are urged to include for Physical Education: American country dancing, folk dancing, recreation workshop, hockey, basketball, volleyball, and softball.

For further information concerning this curriculum consult the supervisor, Professor Marion C. Beckwith.

(Physical Education Option)

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Credits</th>
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<td>Engl. 401-402</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
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<tr>
<td>Group D</td>
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<tr>
<th>SOPHOMORE YEAR</th>
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<tbody>
<tr>
<td>P. E. 413, 414</td>
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<td>P. E. 423, 424</td>
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<td>P. E. 453</td>
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<td>P. E. 455</td>
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<tr>
<td>Educ. 481</td>
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<td>P. E. 520</td>
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<tr>
<td>P. E. 582</td>
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<tr>
<td>Zool. 507-508</td>
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<td>Group D</td>
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<tbody>
<tr>
<td>P. E. 415, 416</td>
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<td>Educ. 757</td>
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<td>P. E. 553, 554</td>
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<td>P. E. 756</td>
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<tr>
<td>P. E. 563, 564</td>
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<tr>
<td>Zool. 601</td>
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## Senior Year

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<tr>
<td>Ed. P. E. 790</td>
<td>Directed Teaching of Physical Education</td>
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<tr>
<td>P. E. 755</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. 768</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>
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<td>Electives other than Physical Education</td>
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(Recreation Education Option)

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<tr>
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## Freshman Year

Same as for Physical Education Option

## Sophomore Year

Same as for Physical Education Option

## Junior Year*  

<table>
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<td>P. E. 415, 416</td>
<td>Stagecraft</td>
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<tr>
<td>Sp. 459</td>
<td>Arts 408</td>
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<tr>
<td>Educ. 757</td>
<td>Crafts</td>
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<tr>
<td>For. 538</td>
<td>Principles of Learning</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 454</td>
<td>Nature Education</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 526 or</td>
<td>Organized Camping</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 573, 574</td>
<td>The Theory of Teaching Individual Sports for Men</td>
<td>1</td>
</tr>
<tr>
<td>P. E. 553, 554</td>
<td>Individual Sports for Women</td>
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</tr>
<tr>
<td>Soc. 400, 540</td>
<td>The Theory of Teaching Dance</td>
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<tr>
<td></td>
<td>Introductory Sociology; Social Problems</td>
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<td>Elective</td>
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</table>

* Students desiring to teach Physical Education should also plan to take P. E. 421, 422.
## Senior Year*

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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<tr>
<td>Sp. 658</td>
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<tr>
<td>Music 403†</td>
<td>Introduction to Music Literature</td>
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</tr>
<tr>
<td>P. E. 765</td>
<td>Administration of Physical Education in Secondary Schools</td>
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</tr>
<tr>
<td>P. E. 783</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>
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<tr>
<td>Soc. 500</td>
<td>Social Psychology</td>
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<td>Group D‡</td>
<td>Humanities</td>
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<td>Group C</td>
<td>Social Sciences</td>
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<tr>
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<td>Elective</td>
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</table>

* In addition to the requirements listed, each student is required to secure before graduation a minimum of 8 points of community recreation or camping credits.

† If Music has already been taken in the sophomore year, 3 additional hours in Group D must be taken in the senior year.

‡ This senior requirement may be fulfilled by any two semester courses from the Group D listing; they need not be sequential.
The College of Technology

ROBERT N. FAIMAN, Dean
JOHN B. HRABA, Associate Dean

DEPARTMENTS

Chemical Engineering  Mathematics
Civil Engineering    Mechanical Engineering
Chemistry            Physics
Electrical Engineering

General Information

The College of Technology is organized to offer its students a vigorous professional education in engineering, the physical sciences, or mathematics. All programs require study in the humanistic-social area in addition to a thorough grounding in the basic aspects of mathematics and the physical sciences and the 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 is drawing engineering applications and their scientific bases more closely together, the engineering curricula are oriented to emphasize the theoretical-scientific aspects of engineering with a corollary deemphasis of its more applied phases. The importance of the role and responsibility of the engineer or scientist in modern society is emphasized through study in the humanistic-social areas.

Requirements for Degrees

The College of Technology offers the following baccalaureate degrees: Bachelor of Science in Chemical Engineering, Bachelor of Science in Chemistry, Bachelor of Science in Civil Engineering, Bachelor of Science in Electrical Engineering, Bachelor of Science in Mathematics, Bachelor of Science in Mechanical Engineering, and Bachelor of Science in Physics.

Each candidate for a degree must satisfy all general University requirements for graduation, complete at least 144 semester credits, including the courses required in one of the four-year curricula described below, and achieve a minimum grade-point average of 2.

For information concerning advanced degrees, see the Graduate School catalog.

Curricula

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 and objectives which must ordinarily be satisfied will be those which are in effect at the time of graduation. Specific programs accomplishing this will be prepared by the student and his adviser for approval by the Executive Committee of the College.

The following four-year curricula are offered:

**Chemical Engineering**

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 phases of chemistry.

**Chemistry**

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 French 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.

**Civil Engineering**

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 those basic sciences which are essential to the practice of Civil Engineering, and the application of those 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.

**Electrical Engineering**

This curriculum provides instruction intended to prepare the student for graduate study or to begin his career in professional electrical engineering.
In the first two years the student concentrates on mathematics and basic sciences which provide essential preparation for the engineering science, analysis, and design courses of the last two years.

Since the emphasis is on fundamentals, the curriculum does not provide for specialized training in any particular sub-branch of electrical engineering. In the junior and senior years, however, the student is provided an opportunity to elect courses in particular areas of interest.

**Mathematics**

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.

**Mechanical Engineering**

The Mechanical Engineering curriculum is intended to prepare young men and women either for graduate study or to enter the field of professional mechanical engineering. The curriculum provides a firm foundation in the basic physical sciences and the engineering sciences, augmented by a co-ordinated sequence of social-humanistic courses. Training is provided in the organization and utilization of principles, personnel, and physical resources for the solution of mechanical engineering problems.

**Physics**

The Technology curriculum in Physics is intended to offer 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 advanced degrees. The diversified opportunities in Physics necessitate a flexible curriculum, enabling the student to supplement his studies in Physics with other science and engineering courses.

**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

#### FRESHMAN YEAR

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<td>R.O.T.C.*</td>
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#### SOPHOMORE YEAR

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#### JUNIOR YEAR

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*All freshman and sophomore male students should enroll in either Air Science or Military Science or in approved humanistic-social courses. This will add a total of six credits to these two years.

†Sequence will be assigned on the basis of mathematics entrance examination.

‡Students in the Math. 421-422, 523 sequence will normally enroll in Math. 528 in the junior year.
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* All freshman and sophomore male students should enroll in either Air Science or Military Science or in approved humanistic-social courses. This will add a total of six credits to these two years.
† Sequence will be assigned on the basis of mathematics entrance examination.
‡ Students in the Math. 425-426 sequence will substitute a technical elective here.
# CIVIL ENGINEERING

## FRESHMAN YEAR

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## SOPHOMORE YEAR

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## JUNIOR YEAR

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Copied to total: 19-20 18

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Total Credits: 18 17
ELECTRICAL ENGINEERING

FRESHMAN YEAR

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16½-17½  17½-18½

SOPHOMORE YEAR

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18-19  17-18

JUNIOR YEAR

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18-19  18

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§ Electives are selected with the advice and consent of the adviser.
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**Total Credits:** 18 | 17
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### Sophomore Year

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<th>Course Code</th>
<th>Course Title</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ger. 401-402</td>
<td>Elementary German</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Math. 629</td>
<td>Methods of Applied Math. I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Math. 755</td>
<td>Fundamentals Concepts of Geometry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Math. 761-762</td>
<td>Higher Algebra I and II</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Elective or</td>
<td>Approved Elective</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Math. 528‡</td>
<td>Multidimensional Calculus</td>
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</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 784</td>
<td>Topology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Math. 788</td>
<td>Complex Analysis</td>
<td>4</td>
<td></td>
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<tr>
<td>Math. 698</td>
<td>Senior Seminar</td>
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<tr>
<td>Math. 767-768</td>
<td>Real Analysis I and II</td>
<td>4</td>
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</tr>
<tr>
<td>Group C or D</td>
<td></td>
<td>3</td>
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</tr>
<tr>
<td>Elective</td>
<td>Approved Non-Technical Elective</td>
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<tr>
<td>Elective</td>
<td>Approved Elective</td>
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<td></td>
</tr>
</tbody>
</table>

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* All freshman and sophomore male students should enroll in either Air Science or Military Science or in approved humanistic-social courses. This will add a total of six credits to these two years.  
† Sequence will be assigned on the basis of mathematics entrance examination.  
‡ Students in the Math. 421-422, 523 sequence will normally enroll in Math. 528 in the junior year.
# MECHANICAL ENGINEERING

## FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. E. 431, 432</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>R.O.T.C.*</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Math. 421-422†</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>or Math. 425-426</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>M. E. 405</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Phys. 404</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Tech. 401</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Elective</td>
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<td>1/2</td>
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**Total Credits:** 16 1/2 - 17 1/2

## SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.O.T.C.*</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Math. 523-527‡</td>
<td>4</td>
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<td>1/2</td>
</tr>
<tr>
<td>or Math. 527-528</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
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<td>M. E. 510</td>
<td>3</td>
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<td>1/2</td>
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<td>M. E. 522</td>
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<td>1/2</td>
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<td>M. E. 525</td>
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<td>1/2</td>
<td>1/2</td>
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<td>M. E. 526</td>
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<td>1/2</td>
<td>1/2</td>
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<td>Phys. 501-502</td>
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<td>1/2</td>
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<tr>
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**Total Credits:** 18 - 19

## JUNIOR YEAR

<table>
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<td>1/2</td>
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<td>Group C or D or</td>
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<td>1/2</td>
<td>1/2</td>
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<tr>
<td>Math. 528‡</td>
<td>4</td>
<td>1/2</td>
<td>1/2</td>
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<tr>
<td>M. E. 533-534</td>
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<td>1/2</td>
</tr>
<tr>
<td>M. E. 527</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>M. E. 536</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
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<tr>
<td>M. E. 537-538</td>
<td>1</td>
<td>1/2</td>
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<tr>
<td>Electives</td>
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</tbody>
</table>

**Total Credits:** 17 - 18

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*All freshman and sophomore male students should enroll in either Air Science or Military Science or in approved humanistic-social courses. This will add a total of six credits to these two years.

† Sequence will be assigned on the basis of mathematics entrance examination.

‡ Students in the Math. 421-422, 523 sequence will normally enroll in Math. 528 in the junior year.

§ Technical Elective courses must be approved by the Department.
<table>
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<tr>
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<th>Hours</th>
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<td>E. E. 641</td>
<td>Electrical Engineering</td>
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<td>M. E. 663</td>
<td>Engineering Materials</td>
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<tr>
<td>M. E. 697-698</td>
<td>Mechanical Engineering Seminar</td>
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<tr>
<td>M. E. 643-644</td>
<td>Machine Design and Analysis</td>
<td>3 3</td>
</tr>
<tr>
<td>M. E. 657-658</td>
<td>Heat and Power Systems</td>
<td>4 4</td>
</tr>
<tr>
<td>M. E. 691</td>
<td>Engineering Economy</td>
<td>3 3</td>
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<td>Group C or D</td>
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<tr>
<td>Electives</td>
<td>Approved Technical Elective$</td>
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**Total:** 20 17
# Technology Curriculum in Physics

## Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>P. E. 431, 432</td>
<td>1/2</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>R.O.T.C.*</td>
<td>( )</td>
<td>( )</td>
<td></td>
</tr>
<tr>
<td>Chem. 403-404</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Engl. 401-402</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math. 421-422†</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or Math. 425-426</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Phys. 40‡</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Elective</td>
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<td><strong>Total</strong></td>
<td>16½</td>
<td>17½–18½</td>
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## Sophomore Year

<table>
<thead>
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<th>Second Semester</th>
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<tbody>
<tr>
<td>R.O.T.C.*</td>
<td>( )</td>
<td>( )</td>
<td></td>
</tr>
<tr>
<td>Hist. 401, 402</td>
<td>3</td>
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</tr>
<tr>
<td>Language</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Math. 523 or†</td>
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<td>3</td>
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<tr>
<td>Math. 527</td>
<td>4</td>
<td>4</td>
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</tr>
<tr>
<td>Phys. 501-502</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
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<tr>
<td></td>
<td>15–19</td>
<td>16–19</td>
<td></td>
</tr>
</tbody>
</table>

## Junior and Senior Year

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.

Non-technical electives must be chosen to satisfy the University-wide requirements and group requirements: Group C (Social Sciences) and Group D (Humanities).

Honors program students should consult their departmental advisor about requirements.

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* All freshman and sophomore male students should enroll in either Air Science or Military Science or in approved humanistic-social courses. This will add a total of six credits to these two years.
† Sequence will be assigned on the basis of mathematics entrance examination.
‡ Students in the Math. 421-422, 523 sequence will normally enroll in Math. 527 in the junior year.
The Whittemore School of Business and Economics

ROBERT F. BARLOW, Dean

Accounting  Economics
Business Administration  Secretarial Curriculum
Hotel Administration

General Information

The Whittemore School of Business and Economics, formerly a department in the College of Liberal Arts, was established as the fourth undergraduate degree-granting college at the University of New Hampshire on July 1, 1962.

The basic purpose of the School is to provide for its students a broad academic background, with professional training in one of the disciplines of accounting, business administration, economics, hotel administration, or the secretarial curriculum. Students will be required to take a substantial part of their course work in the other colleges of the University. In no sense should the basic purpose of the School be interpreted narrowly.

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 and 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, and achieve a minimum grade-point average of 2.0.

A student currently enrolled in the School may receive his degree under the terms of the catalogue in force at the time of his admission to the School. In the event specific courses are no longer offered, substitutions will be approved by the faculty. Students currently enrolled will be expected, however, to substitute new requirements for previously existing ones wherever feasible.
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 senior in the Whittemore School of Business and Economics may register for 6 to 12 semester credits of independent study, provided: (a) his cumulative academic average is 3.0 or better, and (b) he has submitted a plan for independent study that has been approved by his adviser. The student accepted for independent study is designated a “Whittemore Scholar”. A Whittemore Scholar must meet all general School requirements. He may, at the discretion of his adviser, submit independent study credits in whole or in part for required course credits in the economics curriculum or for elective credits in the accounting, business administration, hotel administration, and secretarial curricula.

The student is to 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 freshmen each year are selected from those who apply for a special five-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, incorporate a minor area of study as well as a major and complete special work in mathematics, languages, reading, and writing. During the last three years of the program he will be assigned to duties as an intern in teaching economics.

Prospective freshmen with superior high school records who are interested in this program should consult the principal or counselor in their high schools or write to the Director of Admissions at the University.

Minor Program

A minor is not required in the Economics, Accounting, 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 such a minor program may be granted only by the Executive Committee of the School, which shall consider 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 is 18 semester hours with grades of C or better. No more than 6 credits used to satisfy area of concentration requirements shall be used for a minor.
A JOINT-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.

CURRICULA

Accounting

Students electing to concentrate in accounting will follow a program of study which devotes substantial time to the study of accounting principles. This study will include courses in cost accounting, intermediate accounting, advanced accounting, auditing and business systems, and federal taxation, among others. In general, they will be qualified upon graduation for employment as accountants with either private business firms or public accounting firms.

It is also expected that they will have a knowledge of the other aspects of over-all business administration in addition to accounting, as well as a broad background in various related disciplines. A student who elects to concentrate in this program will also find that he is well qualified to do graduate work in either accounting or general business administration.

Students must obtain a cumulative academic average of 2.0 or better in the business administration and economics courses required in this curriculum. Of the required courses in business administration and economics, at least 18 semester credits shall be earned at the University of New Hampshire, and at least 6 of these semester credits shall be in accounting courses.

Business Administration

Students concentrating in business administration will be required to take courses in those areas, such as accounting and statistics, with which a business man should be familiar. In addition, they will be required to obtain a knowledge of the several functional areas of business management, the economy within which the business firm functions and the cultural, social, and political environment within which the business firm exists.

For students interested in marketing and distribution, in finance, or in labor and personnel administration, a list of courses in these areas is offered. Students may choose electives from these groups. In the main, however, students in the general business administration curriculum will obtain a broad knowledge of business management principles as well as of the problems confronting and the solutions available to contemporary business management.

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.

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.

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 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 summer practicums 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 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.

Secretarial Curriculum

The Secretarial curriculum is designed to prepare the student for the type of secretarial position in which both excellence in secretarial skills and breadth of background are essential. Because such positions are available in a number of different professions and businesses, the requirement of 18
credits in another discipline (the minor) has been established in order to encourage the student to follow an interest which, in combination with secretarial skills and knowledge, may be expected to lead to satisfying employment in the field of the minor. For example, a student interested in obtaining employment with a government agency would probably select courses in government for the minor. Office experience for a minimum of ten weeks in the summer between the junior and senior years will be required for graduation. The work must be done in a business or professional office approved by the supervisor of the curriculum. It is expected that remuneration for the work will be at the current rate for the kind of work done.

Students in the curriculum must earn grades of C or better in the following secretarial courses: 503-504, 509-510, 511, 513, and 517, a total of 17 credits. In addition, students in this curriculum must earn a C grade or better in 9 credits of work from the following group: Secretarial 622, 523-524, Economics 401-402, Business Administration 401-402, 621, and 633.

Students transferring from collegiate institutions and high school students with previous training in secretarial subjects are required to take the following courses: Secretarial 503-504, 509-510, 511, 513, and 517.

Transfer and high school students who have had one year of Gregg shorthand (or the equivalent of one year) in another institution and have earned a grade of 80 or better (where the passing grade is 70) will not be allowed to enroll in Secretarial 401 for credit; likewise, those students who have had one year of typewriting (or the equivalent) in another institution and have earned a grade of 80 or better (where the passing grade is 70) will not be allowed to enroll in Secretarial 407 for credit (see below).

Students who have had Secretarial 405 at the University of New Hampshire or a similar course in another collegiate institution, or one semester of typewriting in high school or preparatory school, will be required to enter Secretarial 427 instead of Secretarial 407.

The Commercial Teacher Preparation program, an option in the Secretarial curriculum, will prepare the student to teach commercial subjects in secondary schools. The student in this program will not be required to take a minor but will be expected to take Education 481 in the sophomore year, Education 757 and Education 758 in the junior year; Ed.-Cs. 791 in the first semester of the senior year, and Ed.-Cs. 794 (Supervised Teaching of High School Commercial Subjects) in the second semester of the senior year.

Students interested in registering for either the Secretarial curriculum or the Commercial Teacher Preparation option should consult with Professor Doris Tyrrell.

University and School Group Requirements

Students admitted to the University for the first time in the fall of 1964-65 are required to complete six semester hours in each of the following groups. Completion of 30 or more credits in three or more areas in a given group shall satisfy the requirements of that group and advanced placement in any one of these groups satisfies the requirement of that group.

Group A — History 401-402.


Group C — Economics 401-402, Geography 401-402, Government 405, 406, and 408, Psychology 401-402, Sociology 400, 411, and 540.
Group D — Arts 475 and 476, English 513, 514, 515, and 516, Humanities 501-502, Music 403-404, Foreign Languages at the 503-504 or 505-506 level, Philosophy, any two courses, Speech and Drama 431 and 436.

Some of the courses in the above groups are the same as those required by the School. With the exception of Economics 401-402, those courses shall be considered to fulfill both the School and University requirements. Attention is called to the fact that in order to fulfill the School requirements in Group B, with the exceptions of the Hotel Administration and Secretarial curricula, students must take a year’s work (two sequential semesters) in both a biological science and a physical science; in Group C, with the exception of the Secretarial curricula, students must take 6 semester hours of work in psychology and/or sociology and 6 semester hours of work in government and/or geography, with a maximum of 3 semester hours in geography; in Group D, with the exceptions of the Hotel Administration and Secretarial curricula, students must take 12 semester hours of work. Students majoring in Accounting, Business Administration, or Economics are strongly advised to elect Mathematics 407-408 to fulfill the School requirements in the physical sciences.

### ACCOUNTING

#### FRESHMAN YEAR

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</tr>
<tr>
<td>P. E. 431, 432</td>
<td>1/2</td>
</tr>
<tr>
<td>Hist. 401-402</td>
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<td>Engl. 401-402</td>
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<td>B. A. 401-402</td>
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<td>Group C</td>
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124
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**Total Credits:** 16 16

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**Total Credits:** 16 16

Students planning to take the examination for the Certified Public Accountant Certificate are advised to elect B.A. 755 and 760.

### BUSINESS

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**Total Credits:** 16 16

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| Electives       | 16             | 16              |

125
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### ECONOMICS

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**Electives**

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### SENIOR YEAR

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All students are required to pass a test of general competence in one of the following languages: Classical Greek, French, German, Italian, Latin, Russian, or Spanish. The test is based on the achievement of students after completion of courses in languages at the University of New Hampshire (French 501, Spanish 501, German 501, Russian 501-502, Latin 501-502, Greek 501-502, Italian 501-502). Usually two or three years of high school work are adequate preparation for this test. This examination will consist of an oral-aural test as well as a comprehensive written examination and will test the student's ability to comprehend and read texts of moderate difficulty and answer questions based on that text.

A student may also complete his college requirement by passing one of the following courses: French 501, Spanish 501, German 501, Russian 502, Latin 502, Greek 502, Italian 502, or any language course numbered higher.

In the event a student does not pass the competence examination he must make a written application for permission to repeat the examination showing that he has improved his preparation through completion of a course or through tutoring or supervised study. Application forms are available in the office of the Department of Foreign Languages and Literatures.

The competence tests are normally given three times a year; during Orientation week, on the last week of classes in May, and at the end of the Summer Session.

Those graduating in February who have not previously passed the examination may take it at the end of January by petition.

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.
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SENIOR YEAR

Micro. 501  Public Health and Sanitation  3
B. A. 668  Personnel Administration  3
H. Ad. 667  Stewarding and Catering  3
H. Ad. 666  Hotel Promotion and Sales  2
H. Ad. 516  Lectures on Hotel Management  3  1/2
Group C

Electives  16  16

Practical Experience. To be eligible for graduation a student must have had approved on-the-job allied work for two summers or satisfy the Department Head that equivalent experience has been completed.

SECRETARIAL

FRESHMAN YEAR

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Electives  16  16

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<tr>
<td>Secl. 513</td>
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<td>Electives</td>
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Office Practice. To be eligible for graduation, a student must work during the summer between the junior and senior years in a business office approved by the supervisor of the curriculum.

### SECRETARIAL

(Commercial Teacher Preparation Option)

<table>
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<tr>
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<th>FRESHMAN YEAR</th>
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<th>CREDITS</th>
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<td>First Semester</td>
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<tr>
<td>P. E. 401, 402</td>
<td>Physical Education (Women)</td>
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<td>Engl. 401-402</td>
<td>Freshman English</td>
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<td>Hist. 401-402</td>
<td>Introduction to Contemporary Civilization</td>
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<td>Group B</td>
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<td>Secl. 407-408</td>
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<td>Electives</td>
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### SOPHOMORE YEAR

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<tr>
<td>P. E. 403, 404</td>
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<td>B. A. 401-402</td>
<td>Principles of Accounting</td>
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<td>Econ. 401-402</td>
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<td>Educ. 481</td>
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<tr>
<td>Secl. 401-402</td>
<td>Beginning Shorthand*</td>
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<td>Secl. 523-524</td>
<td>Business Writing</td>
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* A grade of C or better in Secl. 408 will be required of a student electing Secl. 509-510; and a grade of C or better in Secl. 402 will be required of a student electing Secl. 503-504. A student who has had high school courses in typing or shorthand may, when consulting the supervisor of the curriculum, be placed in a more advanced course in typing or shorthand.
### JUNIOR YEAR

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<tr>
<th>Course</th>
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<td>B. A. 621</td>
<td>Commercial Law</td>
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<td>B. A. 633</td>
<td>Managerial Organization</td>
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<tr>
<td>Educ. 757</td>
<td>Principles of Learning</td>
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<td>Educ. 758</td>
<td>Principles of Teaching</td>
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<td>Secl. 503-504</td>
<td>Advanced Shorthand</td>
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<td>Advanced Typing</td>
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<td>Secl. 513</td>
<td>Office Machines</td>
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<td>Group C or D†</td>
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| Total        | 17                               |

### SENIOR YEAR

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Cs.-Ed. 791</td>
<td>Problems of Teaching Commercial Subjects in Secondary Schools</td>
<td>3</td>
</tr>
<tr>
<td>Ed.-Cs. 794</td>
<td>Supervised Teaching in High School Commercial Subjects</td>
<td>14</td>
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<tr>
<td>Secl. 511</td>
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<td>Office Procedures</td>
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<tr>
<td></td>
<td>Electives</td>
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</table>

| Total        | 16                                                           |

Office Practice. To be eligible for graduation, a student must work during the summer between the junior and senior years in a business office approved by the supervisor of the curriculum.
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.

Degrees

Graduate programs are offered in the following disciplines: Agricultural Education, Animal Science (Livestock, Dairy, and Poultry), Biochemistry, Botany, Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Entomology, Forestry, Home Economics, Mathematics, Mechanical Engineering, Microbiology, Physics, Plant Science (Horticulture), Resource Economics (Agricultural 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, Mathematics, Microbiology, Physics, Plant Science (Horticulture), and Zoology.

Assistantships, Scholarships, and Fellowships

Graduate assistantships are available in several departments. These involve work in research, teaching, general service, or some combination thereof. Scholarships are also available which provide exemption of tuition charges. A limited number of fellowships provided by the National Defense Education Act of 1958 are available in Botany, Chemistry, and Microbiology.

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
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 |

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.

* A grade of C or better in Seel. 408 will be required of a student electing Seel. 509-510; and a grade of C or better in Seel. 402 will be required of a student electing Seel. 503-504. A student who has had high school courses in typing or shorthand may, when consulting the supervisor of the curriculum, be placed in a more advanced course in typing or shorthand.

† If a group C course is elected in the freshman year, a Group D course or courses must be elected in the junior year. If the Group D requirement is met in the freshman year, the Group C requirement must be met in the junior year.


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. (Formerly 1)

Agricultural Education (22)

William H. Annis, Assistant Professor

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. (Formerly 88)

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 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 Preparation curriculum. 1 lab.; 1 cr. (Formerly 89-90)

(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. (Formerly 91)

(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. 11 cr. (Formerly 93)

795. Preparation for Conducting and Supervising Adult Education Programs
The techniques of adult education in terms of identifying needs, program planning, methods of teaching, supervision, and evaluation. Mr. Annis. Prereq.: Ag. Ed. 650 or permission of instructor. 3 cr. (Formerly 95)

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. Preq.: Supervised Practice or 6 hours in Agricultural Education. 1 cr. (Formerly 98)

Agricultural Economics
(See Resource Economics)

Agricultural Engineering
(See Soil and Water Science)

Agronomy
(See Soil and Water Science)

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

Winthrop C. Skoelund, Professor; 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. Terrell, Professor; Alan C. Corbett, Associate Professor; Herbert C. Moore, Associate Professor; Gerald L. Smith, Associate Professor; James B. Holter, Assistant Professor; Samuel C. Smith, Assistant Professor; Richard G. Strout, 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. (Formerly Dy. Sc. 5)
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. (Formerly An. Sc. 2)

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. (Formerly Py. Sc. 2)

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. (Formerly An. Sc. 23)

501. Animal Anatomy and Physiology

The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 cr. (Formerly An. Sc. 15).

502. Animal Diseases

The prevention, control, and treatment of the bacterial and parasitic diseases of domestic animals Mr. Allen. Prereq.: An. Sci. 501 or permission of instructor. 3 cr. (Formerly An. Sci. 16)

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. (Formerly An. Sc. 18)

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. (Formerly An. Sc. 21)

507. (507). The Scientific Approach to Equine Discipline

The psychological development, control and education stressing bitting, longeining, collection. Mrs. Briggs. Prereq.: Sci. 405 or equivalent and permission of instructor. 1-3 credits. May be repeated. (Formerly An. Sci. 25)

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. (Formerly Dy. Sc. 30)
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. (Formerly An. Sci. 11)

602. **Livestock Management**

Selection, feeding, breeding, management and preparation for the show ring of beef cattle, swine, and sheep, with special reference to New England conditions. Mr. Tirrell and Mr. Smith. 2 lec.; 1 lab.; 3 cr. (Formerly An. Sci. 19 and 20)

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. (Formerly An. Sc. 13)

605. **Physiology of Reproduction**

A study of physiology, embryology, endocrinology reproduction and lactation in domestic animals and birds. Staff. Not offered in 1964-65. 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. (Formerly Dy. Sc. 65)

608. **Ice Cream, Butter, and Cheese**

The making, handling, and marketing. Mr. Moore. 2 lec.; 1 lab.; 3 cr. (Formerly Dy. Sc. 66)

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. (Formerly Dy. Sc. 63)

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 1964-65.) (Formerly Py. Sc. 26)

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 1964-65.) (Formerly Py. Sc. 51-52)

697-698. **Animal Sciences Seminar**

A survey of recent literature and research in the Animal Sciences. Staff. 1 cr. May be repeated. (Formerly An. Sc. 52)
703. Animal Genetics
The principles of Mendelian and quantitative genetics applied to livestock and poultry; selection and breeding systems in genetic improvement and their evaluation. Prereq.: Zool. 706 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. (Formerly Dy. Sc. 62)

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. (Formerly Dy. Sc. 64)

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, as follows: Hours to be arranged. 1-3 cr. May be repeated.

The Arts (46)

George R. Thomas, Professor; John W. Hatch, Professor; John Laurent, Associate Professor; Winifred Clark, Associate Professor; Richard D. Merritt, Assistant Professor; James A. Fasanelli, Assistant Professor; Christopher C. Cook, Assistant Professor; Alfred R. Potter, Assistant Professor; Daniel L. Valenza, Instructor; David G. Wilkins, 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 arts 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, $8.00. (Formerly 15, 16)

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, $8.00. (Formerly 17, 18)

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. (Formerly 3)

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. (Formerly 4)

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, $7.00. (Formerly 45-46)

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, $7.00. (Formerly 6)
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 jointery. 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. (Formerly 47-43)

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. (Formerly 66)

Courses in Painting and Graphics, Sculpture, Architecture

431. Basic Design
A basic course in the structural and expressive use of the 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, and Mr. Cook. Elective by permission. 1 lec.; 2 lab.; 2 cr. No credit toward a major. (Formerly 23)

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, and Mr. Cook. Prereq.: Arts 431 and permission. 2 lab.; 2 cr. Course fee for materials, $2.50. No credit toward a major. (Formerly 24)

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, $8.50. (Formerly 39)

455. Drafting and Space Planning
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. For Hotel Administration students; also elective by permission. 1 lec.; 2 lab.; 3 cr. (Formerly 20)

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. Potter. Elective by permission. 2 lab.; 3 cr. (Formerly 11)

536. Graphic Arts
Expression and experimentation in a variety of graphic techniques, i.e., linoleum and wood block printing, etching, lithography, serigraphy, etc., in
black and white and color, Mr. Laurent. Elective by permission. 2 lab.; 3 cr. Course fee for materials, $8.00. (Formerly 27)

538. Advertising Design and Illustration

Creative design problems in various media and techniques in an introduction to the fields of advertising design and illustration. Mr. Laurent. Elective by permission. 2 lab.; 3 cr. (Formerly 28)

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 and Mr. Laurent. Elective by permission. 2 lab.; 3 cr. (Formerly 25, 26)

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; not offered in 1964-65.) (Formerly 78)

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 $10.50. (Alternate years; not offered in 1964-65.) (Formerly 40)

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. (Formerly 29, 30)

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. (Formerly 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. (Formerly 99)
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, Mr. Fasanelli and Mr. Wilkins. 3 cr. Not open to freshmen. No credit toward a major. (Formerly 31, 32)

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 1964-65.) (Formerly 81) (Formerly 81)

582. 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-8th 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. (May be offered in 1964-65.) (Formerly 82)

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 1964-65.) (Formerly 83)

584. 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 1964-65.) (Formerly 84)

585. 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; offered in 1964-65.) (Formerly 85)

586. 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; may be offered in 1964-65.) (Formerly 86)

(587). 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 585, but is differently oriented. Mr. Fasanelli. 3 cr. (Alternate years; may be offered in 1964-65.) (Formerly 87)

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. (Formerly 88)

(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. (Formerly 97)

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. Mr. Thomas. Prereq.: Educ. 758 with a grade of C or better. 2 lec.; 1 lab.; 3 cr. (Formerly Art-Ed. 92)

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 material; teaching techniques which may be advantageously employed in the elementary schools. Mr. Thomas. Prereq.: Educ. 758 with grade of C or better. 2 lec.; 1 lab.; 3 cr. (Formerly Art-Ed. 91)

Education-Art (Ed-Art) 794. Supervised Teaching in Art
Prereq.: Art-Ed. 791, 792. One semester of supervised teaching. 14 cr. (Formerly Ed-Art 94)
Biochemistry (26)

Edward J. Herbst, Professor; Thomas G. Phillips, Professor Emeritus; Arthur E. Teeri, Professor; Stanley R. Shimer, Professor; Miyoshi Ikawa, Professor; Douglas G. Routley, Associate Professor; Samuel S. Smith, Assistant Professor

501. BIOLOGICAL CHEMISTRY
An introduction to organic chemistry and a brief survey of biological chemistry. Mr. Shimer and Mr. Routley. Prereq.: Chem. 402 or 404. 3 lec.; 2 lab.; 5 cr. (Formerly 1)

504. ANIMAL NUTRITION
The chemistry of animal nutrition. Mr. Shimer. Prereq.: Biochem. 501 or equivalent. 2 lec.; 1 lab.; 3 cr. (Formerly 4)

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. (Formerly 51-52)

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 and quantitative analysis. 3 lec.; 2 lab.; 5 cr. (Formerly 56)

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. (Formerly 2)

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, both plant and animal, of which he is a part. 2 lec.; 1 lab.; 3 cr. No credit toward a major. (Formerly 1-2)

404. GENERAL BIOLOGY
This course is intended as a supplement for those students who wish more advanced courses in biology after completion of Biol. 401-402, by filling in technical details which Biol. 401-402 do not cover. Designed to be taken concurrently with Biol. 402. 1 lec.; 1 lab.; 2 cr. No credit toward a major. Not open to students electing Bot. 411 or Zool. 412. (Formerly Zool. 4)
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. (Formerly 91)

Education-Biology (Ed.Biol.) 794. SUPERVISED TEACHING OF HIGH-SCHOOL BIOLOGY

See description under Education. (Formerly 93, 94)

Botany (27)

ALBION R. HODGDON, Professor; M. C. RICHARDS, Professor; AVERY E. RICH, Professor; STUART DUNN, Professor; CHARLOTTE G. NAST, Professor; RICHARD SCHREIBER, Associate 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. (Formerly 1)

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. 401-402 or Bot. 411 and Bio. 402. 2 lec.; 2 lab.; 4 cr. (Formerly 3)

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. (Formerly 6)

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. (Formerly 42)

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. (Formerly 51)

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 1964-65.) (Formerly 52)
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. (Formerly 53)

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. (Formerly 54)

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 1964-65.) (Formerly 55)

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. (Formerly 56)

795, 796. **Investigations in Botany**

1. Systematic Botany — Mr. Hodgdon. 2. Plant Physiology — Mr. Dunn. 3. Plant Pathology — Mr. Rich. 4. Plant Anatomy, and Morphology — Miss Nast. 5. Plant Ecology — Mr. Hodgdon. 6. Aquatic Plants — Mr. Hodgdon. 7. Cytology — Mr. Schreiber. Elective only after consultation with the instructor in charge. Hours to be arranged. 2 to 6 cr. (Formerly 57, 58)

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. (Formerly 59, 60)

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 1964-65.) (Formerly 62)

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. (Formerly 64)

766. **Morphology of the Algae and Bryophytes**

The study of form, life histories, and classification of the main divisions of the Algae and Bryophytes. Identification and recognition of common species will be included. *Prereq.*: Bot. 411 or Bot. 503. 2 lec.; 2 lab. (Alternate years; not offered in 1964-65.)

768. **Mycology**

Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Mr. Richards. 1 lec.; 2 lab.; 3 cr. (Formerly 68)
Business Administration (71)

Arthur W. Johnson, Professor Emeritus; Carroll M. Decler, Professor; John A. Beckett, Professor; Ronald W. Michman, Assistant Professor; Russell W. Johnson, Instructor; John H. Bassett, Instructor; Charles E. Off, Instructor; Joseph E. Michael, Jr., Lecturer; Leon S. Graubard, Part-time Instructor

401-402. Principles of Accounting
A survey of accounting with emphasis on accounting as a tool of management. Designed as an introductory course for accounting and business administration majors. Staff. 3 cr. (Formerly 1-2)

405, (405). Managerial Accounting
Concepts and techniques basic to modern accounting method. Description and analysis of selected problems in the measurement of the performance and status of a business enterprise. Needs for data-information, its uses, and its limitations from the manager's point of view. Not open to business and accounting majors. Staff. 3 cr.

503-504. Intermediate Accounting
A study of accounting theory and principles through cases and problems. The form, content, and uses of financial statements and the valuation of and accounting for inventories, receivables, investments, and fixed assets. Also included are statement analysis and a discussion of capital stock, surplus, and reserves. Mr. Russell Johnson. Prereq.: B.A. 402. 3 cr. (Formerly 3-4)

508. Cost Accounting
Analysis of the purposes and limitations of costs for use in the formation of corporate policy. Observation through case materials of the costing practices of a wide variety of companies. Mr. Beckett. Prereq.: B.A. 402. 3 cr. (Formerly 8)

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. Russell Johnson. Prereq.: B.A. 402. 3 cr. (Formerly 9)

525, (525). Marketing
A study of the marketing behavior of the firm and its consequences for the economy as a whole. Topics include price and non-price competition, wholesaling, retailing, marketing consumer and industrial goods, consumer behavior, and the influence of technology on market structure. Prereq.: Econ. 402. 3 cr. (Formerly 25)

621-622. Commercial Law
The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Open to juniors and seniors. Mr. Michael. 3 cr. (Formerly 21-22)

(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. *Prereq.*: Econ. 402. 3 cr. (Formerly 27)

633. Managerial Organization

The firm in industry. Structure, organization, and operation of business enterprise. Management tools and techniques. Mr. Beckett. *Prereq.*: Econ. 402 and junior standing. 3 cr. (Formerly 33)

643, (643). Production Management

Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. *Prereq.*: Econ. 402. 3 cr. (Formerly 43)

647. Advertising

Advertising as an element of marketing strategy for the firm. Management considerations involved in media selection, campaign planning, effectiveness testing, budget allocation, and consumer behavior studies. Consideration is given to the social and economic characteristics of advertising policy. *Prereq.*: B.A. 525. 3 cr. (Formerly 47)

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. (Formerly 58)

668. Personnel Administration

Methods, techniques, and psychology employed in personnel administration from the standpoint of the manager. The case study method is used. *Prereq.*: Econ. 402. 3 cr. (Formerly 68)

671. Corporations

A study of the role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combination, and concentration. Mr. Degler. *Prereq.*: Econ. 402. 3 cr. (Formerly 71)

672. Corporation Finance

A study of sources and uses of corporate funds; securities and securities market; methods of financing; and financial policy. *Prereq.*: Econ. 402. 3 cr. (Formerly 72)

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. *Prereq.*: Econ. 402. 3 cr.

750. Marketing Management

A study of the interrelation of marketing, production, and finance. Topics include planning and developing the product, testing, brand management, packaging, sales organization, forecasting, and control. Policy formulation and decision making are emphasized. *Prereq.*: B.A. 525. 3 cr. (Formerly 50)

752. Marketing Research

The study of marketing research as a basis of 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. Prereq.: B.A. 525. 3 cr. (Formerly 52)

755. Advanced Accounting I
Similar in format to B.A. 503-504, with emphasis on the partnership form of business organization, consignment and installment sales, consolidations and mergers, liquidations, and other topics of an advanced nature. Prereq.: B.A. 504. 3 cr. (Formerly 55)

756. Federal Taxation
Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Mr. Russell Johnson. Prereq.: B.A. 504. 3 cr. (Formerly 56)

757. Auditing and Business Systems
The work of the independent public accountant and the company-employed auditor with reference to the establishment and use of internal control and data processing systems for managerial and other purposes. Case materials in the conduct of an audit. Introduction to the practice of management consulting and to systems and procedures work. Mr. Beckett. Prereq.: B.A. 504 or permission of instructor. 3 cr. (Formerly 57)

759. Corporate Accounting and the Public
Contemporary corporate accounting as a principal means of communication to interested outsiders about the affairs of the corporation. Consideration of theory and practice through study of corporate annual reports, pronouncements of professional bodies, current literature, and case materials. Prereq.: B.A. 402 or 405. 3 cr.

760. Advanced Accounting II
Problems and questions in theory, practice, and auditing. Preparation for C.P.A. examinations and review of past examinations. Prereq.: B.A. 755. 3 cr. (Formerly 60)

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. 3 cr. (Formerly 74)

Chemical Engineering (80)

Oswald T. Zimmerman, Professor; Irvin Lavine, Professor; Stephen S. T. Fan, Assistant Professor; David H. Chittenden, Assistant Professor

512. Chemical Engineering Principles I
Systems of units, and dimensional analysis; material and energy balances; heats of reaction; chemical equilibria, introduction to fluid flow and heat transfer; introduction to thermodynamics, including the classical laws and their application to flow and non-flow processes. Mr. Lavine. 4 cr. (Formerly 42)

613. Chemical Engineering Principles II
Transport phenomenon and stage operations. The equations of change as a basis for the study of molecular and turbulent transport of momentum,
energy and mass, with emphasis upon the relation between the transport mechanism and the mathematical expression. Design principles and procedures for stagewise operations in various co-current and counter-current arrangements, based upon the ideal stage concept. Problems in both steady state and non-steady state operations. Mr. Lavine. 3 lec.; 1 lab.; 4 cr. (Formerly 51)

614. **Chemical Engineering Principles III**

Analysis of unit operations. Study of chemical engineering systems, with emphasis on the unit operations involved. Extension of previous studies of unit operations, and treatment of operations not previously considered. Mr. Zimmerman. 3 lec.; 1 lab.; 4 cr. (Formerly 52)

617. **Chemical Engineering Principles IV**

Special methods of mathematical analysis including transform methods, calculus of finite differences, and numerical techniques; and the use of analog and digital computers in the solution of chemical engineering problems. Mr. Fan. 3 lec.; 1 lab.; 4 cr. (Formerly 63)

622. **Chemical Engineering Thermodynamics**

General thermodynamic relationships and their application to power generation, refrigeration, and chemical processes; chemical equilibria and equilibrium in phase-change separations; introduction to statistical mechanics, and thermodynamics of irreversible processes. Mr. Chittenden. 3 cr. (Formerly 67)

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. Mr. Fan. 3 lec.; 1 lab.; 4 cr. (Formerly 54)

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. Mr. Zimmerman. 3 lec.; 1 lab.; 4 cr. (Formerly 68)

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. Mr. Lavine. 1 lec.; 3 lab.; 4 cr. (Formerly 66)
696. **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. Staff. 3 lab.; 3 cr. (Formerly 69)

698. **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 advisor 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**

Study of responses of physical systems and feedback principles, and their application to design and analysis of process control systems. Mr. Zimmerman. 3 lec.; 3 cr. (Formerly 81)

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**Chemistry (81)**

**Alexander R. Amell, Professor; Harold A. Iddles, Professor; Albert F. Daggett, Professor; Helmut M. Haendler, Professor; Henry G. Kuivila, Professor; Robert E. Lyle, Jr., Professor; Charles M. Wheeler, Jr., Associate Professor; Paul R. Jones, Associate Professor; Frank L. Pilar, Associate Professor; Albert K. Sawyer, Associate Professor; Gloria G. Lyle, Assistant Professor; Kenneth K. Andersen, Assistant Professor; David W. Ellis, Assistant Professor; Charles W. Owens, Assistant Professor; James H. Weber, 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. Mr. Amell and assistants. 3 lec.; 1 lab.; 4 cr. (Formerly 1-2)

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. Mr. Haendler, Mr. Wheeler, Mr. Andersen, and assistants. For students who plan to take further courses in the Department of Chemistry. 2 lec.; 1 rec.; 1 lab.; 4 cr. (Formerly 3-4)

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.; 1 rec.; 2 lab.; 6 cr. (Formerly 5-6)

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. (Formerly 17)
521. SEMIMICRO QUALITATIVE ANALYSIS
The fundamental theories of solutions as applied to the reactions of qualitative analysis. Problem work is required. The laboratory work uses the semimicro technique and provides ample experience in the analysis of simple and complex mixtures. Mr. Haendler and assistants. Prereq.: Chem. 404. 2 lec.; 2 lab.; 4 cr. (Formerly 21)

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. Mrs. Lyle. Prereq.: Chem. 404. (Elective for Medical Technology, Nursing, and Pre-Dental students and majors in Botany.) 3 lec.; 2 lab.; 5 cr. (Formerly 45)

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. 3 lec.; 2 lab.; 5 cr. (Formerly 47-48)

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. (Formerly 82)

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.: One year of General Chemistry. 3 lec.; 2 lab.; 5 cr. (Formerly 51-52)

661-662. ANALYTICAL CHEMISTRY
A thorough treatment of the theory and techniques of gravimetric and volumetric analysis followed by special methods of analysis such as those of ion exchange, chromatography, EDTA titrations and instrumental methods such as emission spectrography, flame spectrometry, spectrophotometry, gas chromatography, coulometry, potentionmetry, conductimetry, and polarography. Mr. Daggett. Prereq.: Chem. 405-406 or equivalent. 3 lec.; 2 lab.; 5 cr. (Formerly 61-62)

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES
Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radio-chemical operations. Mr. Owens. Prereq.: General Inorganic Chemistry and General Physics. 3 lec.; 2 lab.; 5 cr. (Formerly 63)
683-684. **Elementary Physical Chemistry**

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. 3 lec.; 2 lab.; 5 cr. (Formerly 83-84)

697. **Chemical Literature and Seminar**

Use of the Chemical Library; student reports on topics of interest. Mr. Lyle and Mr. Kuivila. **Prereq.:** Chem. 548 or 652 and 684. 1 lec.; 1 cr. (Formerly 87, 88)

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, 662, 684 and have a good point average. 5 lab.; 6 cr. (Formerly 87, 88)

755, 756. **Structural and Theoretical Problems of Modern Organic Chemistry**

The methods of preparation and reactions of the principal classes of organic compounds. The electron theory of organic chemistry is used to correlate these reactions. The variation in reactivity of these various classes of organic compounds is utilized as a method of characterization of organic compounds. Emphasis is on the solution of assigned problems. Mr. Lyle. **Prereq.:** One year of Organic Chemistry. 3 lec. for Chem. 755; 1 lec. and 2 labs. for Chem. 756; 3 cr. (Formerly 55-56)

775. **Inorganic Chemistry**

The relationship between chemical reactions and modern concepts of inorganic chemistry on a moderate level. The applicability and limitations of the newer ideas. Mr. Haendler. **Prereq.:** Chem. 683-684 or permission. 3 lec.; 3 cr. (Formerly 85)

776. **Advanced Physical Chemistry**

A review of selected topics in elementary physical chemistry. **Prereq.:** One year of Physical Chemistry. 3 lec.; 3 cr. (Formerly 86)

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**Civil Engineering (82)**

**J. Harold Zoller, Professor; Russell R. Skelton, Professor; Charles O. Dawson, Professor; Harold E. Langley, Jr., Associate Professor; Tung Ming Wang, Associate Professor; Robert B. McEwen, Instructor**

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. (Formerly 7)

505. **Surveying I.**

Engineering measurements, using tape, transit, level, and stadia, and the computation, adjustment, and plotting of such measurements. Mr. Dawson and Mr. McEwen. **Prereq.:** Math. 425. 1 lec.; 2 lab.; 3 cr. (Formerly 1)
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. Mr. Dawson and Mr. EcEwen. Prereq.: C.E. 505. 1 lec.; 2 lab.; 3 cr. (Formerly 2)

517. Engineering Materials

Methods of manufacture, physical properties and the application of the various materials used in civil engineering works, including timber, steel, stone, brick, cement, 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. 527 concurrently or as a prerequisite. 2 lec.; 1 lab.; 3 cr. (Formerly 17)

620. Transportation Engineering

The development, organization, administration, and inter-relation of transportation 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, methods and costs, as applied to modern transportation engineering. Mr. Skelton. Prereq.: C.E. 506. 3 lec.; 3 cr. (Formerly 50)

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. 527. 3 lec.; 1 lab.; 4 cr. (Formerly 52 and 53)

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. (Formerly 63)

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. (Formerly 64)

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. Mr. Skelton. Prereq.: C.E. 620 or permission of the instructor. 3 lec.; 1 lab.; 4 cr. (Formerly 54)

671. 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 lec.; 1 lab.; 3 cr. (Formerly 65)

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. Mr. Wang and Mr. Zoller. Prereq.: M.E. 527 as a prerequisite or concurrently. 3 lec.; 1 design period; 4 cr. (Formerly 25)

685. Theory of Structures II

Beam and truss deflections. The analysis of continuous beams and rigid frames by classical and modern methods; indeterminate trusses. Mr. Wang. Prereq.: C.E. 681. 3 lec.; 1 design period; 4 cr. (Formerly 57)

692. Steel Design

The design of members and connections; tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Mr. Wang. Prereq.: C.E. 517 and 681. 2 lec.; 1 design period; 3 cr. (Formerly 56)

693. Reinforced Concrete Design

The principles of reinforced concrete, including rectangular beams, slabs, T-beams, columns, footings, retaining walls. Mr. Wang. Prereq.: C.E. 685 as a prerequisite or concurrently. 2 lec.; 1 design period; 3 cr. (Formerly 59)

711. Community Planning

An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable community planning programs, including purpose and scope, 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 lec.; 3 cr. (Formerly 71)

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 lec.; 3 cr. (Formerly 77)

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. Mr. Skelton. Prereq.: C.E. 620. 3 lec.; 3 cr. (Formerly 67)

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. Mr. Skelton. Prereq.: C.E. 620. 3 lec.; 3 cr. (Formerly 68)

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 lec.; 1 lab.; 3 cr. (Formerly 66)

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. Mr. Wang. Prereq.: C.E. 692 and permission of the instructor. 1 lec.; 1 design period. 2 cr. (Formerly 74)

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. Mr. Wang. Prereq.: C.E. 692 and permission of the instructor. 3 lec.; 3 cr. (Formerly 78)

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. Mr. Wang. Prereq.: C.E. 685 and C.E. 693. 2 lec.; 1 design period; 3 cr. (Formerly 60)

795, (795). 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. (Formerly 49)

Dairy Science
(See Animal Sciences)

Drama
(See Speech and Drama)

Economics (72)
Carroll M. Degler, Professor; John A. Hogan, Professor; Ruth J. Woodruff, Professor; Robert F. Barlow, Professor; Sam Rosen, Professor; Kenneth J. Rothwell, Associate Professor; John A. Bergeron, Assistant Professor; Manley R. Irwin, Assistant Professor; John H. Bassett, Instructor

401-402. Principles of Economics
A study of the principles underlying the organization and operation of the economy. Staff. 3 cr. (Formerly 1-2)

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. (Formerly 3, (3) )

431-432. Business and Economic Statistics
Methods of collection, analysis, and presentation of statistical data. Statistical techniques as an aid in decision making in business and economics. 3 cr. (Formerly 31-32)
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. Mr. Rothwell. Prereq.: Econ. 402. 3 cr. (Formerly 52)

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. 3 cr. (Formerly 53)

Government Regulation of Business
A study of the role of government in economic affairs, with emphasis upon the regulation of competition and monopoly. Mr. Irwin. Prereq.: Econ. 402. 3 cr. (Formerly 57)

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. (Formerly 63)

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. Barlow. Prereq.: Econ. 402. 3 cr. (Formerly 64)

Economic Development
An analysis of the problems and available solutions confronting the underdeveloped areas of the world. (Not offered in 1964-65.) Mr. Rothwell. Prereq.: Econ. 402. 3 cr. (Formerly 66)

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. Prereq.: Econ. 402. 3 cr. Not open to students who have taken Econ. 51. (Formerly 71)

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. Not open to students who have taken Econ. 51. (Formerly 72)

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. Bergeron. Prereq.: Econ. 402. 3 cr. (Formerly 73)

675. NATIONAL INCOME ANALYSIS
  Macro-economic measurement, theory, and public policy determination. Mr. Rosen. Prereq.: Econ. 402. 3 cr. (Formerly 75)

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. Mr. Irwin. Prereq.: Econ. 402. Econ. 679 not open to students who have had Econ. 78. (Formerly 79-80)

  The courses listed below are primarily for graduate students, although seniors who have the prerequisites will be admitted.

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.

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. (Formerly 54)

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. Barlow. 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. ADVANCED NATIONAL INCOME ANALYSIS
  Emphasis on national income theory, its development and policy implications. Mr. Rosen. Prereq.: Econ. 675 and permission of the instructor. 3 cr.

774. MATHEMATICAL ECONOMICS
  Application of mathematical techniques to selected problems in economic analysis. (Not offered in 1964-65.) Mr. Bergeron. Prereq.: permission of the instructor. 3 cr. (Formerly 74)
776. Economic Fluctuations
The study of recurrent movements of prosperity and depression, with emphasis upon causes and public policy implications. Mr. Rosen. Prereq.: Econ. 402 and one additional semester course in economics or permission of the instructor. 3 cr. (Formerly 76)

778. Advanced Economic Analysis
An examination of advanced topics in microeconomics with emphasis on recent developments in such areas as general equilibrium analysis, welfare economics, demand theory, and capital theory. Mr. Bergeron. Prereq.: Econ. 673 and 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. Rothwell. Prereq.: Econ. 666 and permission of the instructor. 3 cr.

Education (48)
roland b. kimball, professor; thomas o. marshall, professor; wayne s. koch, professor; everett b. sackett, professor; carlton p. menge, associate professor; eugene c. jorgensen, assistant professor; roselmina m. indrisano, assistant professor; deborah e. stone, 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); marion e. james, associate professor (history-education); marjory a. wybourn, professor (home economics-education); paul p. chasse, instructor (language-education); richard h. balomenos, associate professor (mathematics-education); john b. whitlock, associate professor, (music-education); james w. long, professor (physical education); marion c. beckwith, professor (physical education); doris e. tyrrell, associate professor (secretarial studies-education).

Consultants in Teacher-Education
thomas p. ahearn, ronald j. clark, katherine p. flanagan, robert hughes, edmund m. keefe, paul l. o'neil, mary w. sawyer, marco w. scheer

Staff at Crotched Mountain School for the Deaf
richard e. allison, adjunct lecturer; b. gene billingslea, adjunct lecturer; frank j. calidonna, adjunct lecturer; louise e. cornell, adjunct lecturer; helen g. crathern, adjunct lecturer; ann thompson hennessey, adjunct lecturer; mary ann jernigan, adjunct instructor; robert e. kelly, adjunct assistant professor; caibre mccann, adjunct lecturer; isabelle vezina, adjunct lecturer
Cooperating Teachers


Courses in Education

481, (481). Educational Psychology

An examination of behavior in infancy, childhood, and adolescence with emphasis on the developmental effects of home and school. This course is a prerequisite to Liberal Arts undergraduate teaching preparation programs. Mr. Menge. Not open to freshmen. 3 cr. (Formerly 41)

757, (757). Principles of Learning

Psychology of learning as it operates within the classroom. Prereq.* Mr. Koch and Mr. Menge. 3 cr. (Formerly 57)

(758), 758. Principles of Teaching

Application of the theories of learning studied in Education 757, with emphasis upon the following: organization of content, specific planning, and a study of procedures essential to the evaluation of the learning processes. Prereq.* Mr. Marshall and Mr. Jorgensen. Two 2-hour lec.-labs.; 3 cr. (Formerly 58)

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.* Mr. Marshall and Mr. Kimball. 3 cr. (Formerly 59)

(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. Mr. Bardwell. 

**Prereq.:** Educ. 757 or permission of instructor. 3 cr. (Formerly 63)

### 785. UTILIZATION OF TESTING IN PUBLIC EDUCATION

Strategies for discovering and employing predictive validities of standardized tests in public school work. 3 cr. (Formerly 64)

### 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; practice teaching; and a synthesizing seminar. **Prereq.:** Miss Indrisano and Miss Stone. 16 cr. per sem. (Formerly 71-72)

#### 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. (Formerly 88)

- **Agricultural Education (Ag. Ed.) 651, 652. Methods of Teaching Agricultural Mechanics**
  
  Mr. Gilman. 1 lab.; 1 cr. (Formerly 89, 90)

- **Agricultural Education (Ag. Ed.) (792). Planning for Teaching**
  
  Mr. Annis. 4 cr. (Formerly 91)

- **Art-Education (Art-Ed) 792. Problems of Teaching Art in Elementary Schools**
  
  Mr. Thomas. 3 cr. (Formerly 91)

- **Art-Education (Art-Ed) 791. Problems of Teaching Art in Secondary Schools**
  
  Mr. Thomas. 3 cr. (Formerly 92)

- **Biology-Education (Biol-Ed) 791. Problems in the Teaching of High-School Biology**
  
  Mr. Schaefer. 3 cr. (Formerly 91)

* The prerequisite for courses in education is permission of the Department, based upon the following:

  - Ed. 481: Open to any student, sophomore or above.
  - Ed. 757: Ed. 481 with grade of C or better, cumulative average of 2.2, average of 2.5 in major.
  - Ed. 758: Same as for Ed. 757 plus a C or better in Ed. 757, a personality suitable for teaching, and a speech test.
  - Ed. 759: Ed. 757.
  - 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. 485 with grade of C or better, cumulative average of 2.2.
ENGLISH-EDUCATION (ENGL-ED) 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL ENGLISH
Mr. Goffe. 3 cr. (Formerly 91)

HISTORY-EDUCATION (Hist-Ed) 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL HISTORY AND OTHER SOCIAL STUDIES
3 cr. (Formerly 91)

HOME ECONOMICS-EDUCATION (HE-Ed) 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL HOME ECONOMICS
Miss Wybourn. 3 cr. (Formerly 91)

LANGUAGES-EDUCATION (Lang-Ed) 791. PROBLEMS IN THE TEACHING OF MODERN LANGUAGES IN THE HIGH-SCHOOL
Mr. Chasse. 3 cr. (Formerly 91)

LATIN-EDUCATION (Lat-Ed) 791. PROBLEMS IN TEACHING HIGH SCHOOL LATIN
3 cr. (Formerly 91-92)

MATHEMATICS-EDUCATION (Math-Ed) 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL MATHEMATICS
Mr. Balomenos. 3 cr. (Formerly 91)

MUSIC-EDUCATION (Mu-Ed) 792. PROBLEMS IN THE TEACHING OF ELEMENTARY SCHOOL MUSIC
Mr. Whitlock. 3 cr. (Formerly 90)

MUSIC-EDUCATION (Mu-Ed) 791. PROBLEMS IN THE TEACHING OF SECONDARY SCHOOL MUSIC
Mr. Whitlock. 3 cr. (Formerly 93)

PHYSICAL EDUCATION-EDUCATION (PE-Ed) 792. PROBLEMS OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL
3 cr. (Formerly 91)

Courses in Supervised Teaching

This work is required in the Teacher Preparation program. It is open only to students whose applications are approved by the Chairman of the Department of Education and the Coordinators of Student Teaching in the subject or subjects in which the applicant desires to do supervised teaching. Application should be filed in the office of the Department of Education on or before November 15 of the academic year in which the supervised teaching is to be done.

Students may be enrolled for from 6 to 14 credits* of work in Supervised Teaching, usually in the second semester of the senior year. Students registered in the College of Liberal Arts may count no more than 9 semester credits in Supervised Teaching toward the fulfillment of the major requirements in Education. Prerequisites for the Ed. 794 courses are listed in the footnote.†

*Except Ed.-Ag. 794 wherein the credits are 11 and in Ed.-H.E. 794 wherein they are 7.
†The prerequisite for Ed. 794 is the same as for Ed. 758 plus a C or better in a 791 course (if offered), at least 18 semester hours in the subject to be taught, plus approval based upon selection processed by both the student’s major department and the Department of Education.
Education-Agriculture (Ed-Ag) (794). Supervised Teaching in Agriculture

Prereq.: Senior standing in Agricultural Education curriculum. (Formerly 93)

Education-Art (Ed-Art) 794. Supervised Teaching in Art

(Formerly 94)

Education-Biology (Ed-Biol) 794. Supervised Teaching in High-School Biology

(Formerly 93, 94)

Education-Commerce (Ed-Cs) 794. Supervised Teaching in High-School Commercial Subjects

(Formerly 94)

Education-Elementary (Ed-El) 793. Supervised Teaching in the Elementary School

(Formerly 94)

Education-English (Ed-Engl) 794. Supervised Teaching in High-School English

(Formerly 94)

Education-History (Ed-Hist) 794. Supervised Teaching in High-School History and Other Social Studies

(Formerly 94)

Education-Home Economics (Ed-HE) 794. Supervised Teaching in High-School Home Economics

(Formerly 94)

Education-Language (Ed-Lang) 794. Supervised Teaching in High-School Modern Foreign Language

(Formerly 94)

Education-Latin (Ed-Lat) 794. Supervised Teaching in High-School Latin

(Formerly 94)

Education-Mathematics (Ed-Math) 794. Supervised Teaching in High-School Mathematics

(Formerly 94)


(Formerly 93, 94)

Education-Physical Education (Ed-PE) 790. Directed Teaching of Physical Education

Prereq.: PE-Ed. 792 or concurrently. (Formerly 92)
501-502. Electrical Engineering

The fundamental physical laws and concepts of electrical engineering and their application to circuits, electric and magnetic fields, instrumentation, and direct-current machinery. Prereq.: Math. 523 or 426 taken concurrently and Phys. 404. E.E. 501: 1 lec.; 1 rec.; 1 lab. or conf.; 3 cr. E.E. 502: 1 lec.; 2 rec.; 1 lab.; 4 cr. (Formerly 1-2)

504. Electrical Engineering and 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.; 7 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 lec.; 3 cr. (Formerly 10)

513-514. Applied Electromagnets

Electric and magnetic circuits, vector diagrams, and equivalent circuits as applied to transformers, synchronous, and asynchronous machines. Prereq.: E.E. 502, Math. 422. Required of juniors in Electrical Engineering. 3 rec.; 3 cr. (Formerly 3-4)

515. Circuit Theory

Single phase and polyphase circuits, network theorems and wave analysis. Prereq.: E.E. 502. Required of juniors in Electrical Engineering. 3 lec.; 3 cr. (Formerly 5)

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. (Formerly 14)

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 credits. (Formerly 15, 16, 17, 18)
523, 524. Electrical Laboratory

Experimental investigations in the principles of electrical engineering as applied to direct and alternating current machines. Laboratory procedures and presentation of engineering reports. Prereq.: E.E. 502. Required of juniors in Electrical Engineering. 1 lab.; 2 cr. (Formerly 23, 24)

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. (Formerly 25, 26)

533. Fundamentals of Electrical Engineering

Direct- and alternating-current circuits, instruments and machines, and rectifiers and transformers. Prereq.: Phys. 502. Required of juniors in Chemical and Civil Engineering. 3 lec.; 1 lab.; 4 cr. (Formerly 33)

539. Electrical Engineering Fundamentals

Electric and magnetic fields and circuits. Prereq.: Phys. 502. Required of juniors in Mechanical Engineering. 3 lec.; 1 lab.; 4 cr. (Formerly 39)

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. 515 taken concurrently. Required of juniors in Electrical Engineering. 3 lec.; 3 cr. (Formerly 9)

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. (Formerly 40)

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. (Formerly 41)

645. Transmission Lines and Network

Transmission line fundamentals, T and Pi sections, filters, and symmetrical components. Prereq.: E.E. 515. Required of seniors in Electrical Engineering. 3 lec.; 3 cr. (Formerly 45)

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 lec.; 3 cr. (Formerly 46)

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. (Formerly 52)

696. 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. (Formerly 70)
706. Advanced Circuit Theory
Steady state and transient analysis, derivation of fundamental formulas and constants; application of LaPlace transforms. Prereq.: Permission of instructor. 3 lec.; 1 conf.; 4 cr.; when offered without conference period, 3 cr. (Formerly 60)

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 lec.; 3 cr. (Formerly 58)

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 lec.; 2 cr. (Formerly 62)

781. Industrial Electronics
Analysis and design of equipment for the measurement, instrumentation, and control of industrial processes; introductory theory of closed-loop systems. Prereq.: Permission of the instructor. 3 lec.; 1 lab.; 4 cr. (Formerly 78)

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 lec.; 2-3 cr. (Formerly 80)

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. (Formerly 82)

English (49)

Sylvester H. Bingham, Professor; William G. Hennessy, Professor Emeritus; Robert G. Webster, Professor; J. Howard Schultz, Professor; Dale S. Underwood, Professor; G. Harris Daggett, Associate Professor; Max S. Maynard, Associate Professor; John C. Richardson, Associate Professor; Lewis C. Goffe, Associate Professor; Edmund G. Miller, Associate Professor; Philip L. Nicoloff, Associate Professor; Eugene N. Yarrington, Assistant Professor; Donald M. Murray, Assistant Professor; Lee S. Baier, Instructor; Douglas L. Zweizig, Instructor; Diane Fortuna, Instructor; Lawson Inada, Instructor; Gordon A. Lameyer, Instructor; Hugh M. Potter, Instructor; John A. Yount, 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. (Formerly A)

302. Improvement in Reading*
Intensive drill in reading skills for six weeks. 3 rec.; no cr. (Formerly C)

* 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.
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. (Formerly 1-2)

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. Yarrington, Mr. Lameyer. Prereq.: Engl. 401-402. 3 cr. No credit toward a literature major. (Formerly 13, 14)

515, 516. A SURVEY OF AMERICAN LITERATURE
Mr. Webster, Mr. Daggett, Mr. Coffe, Mr. Nicoloff, Mrs. Fortuna, and Mr. Potter. Prereq.: Engl. 401-402. 3 cr. No credit toward a literature major. (Formerly 15, 16)

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 1964-65.) (Formerly 12)

521-522. NEWS WRITING
Mr. Murray. Prereq.: Engl. 401-402. 3 cr. No credit toward a literature major. (Formerly 21, 22)

523. WRITING OF TECHNICAL REPORTS
Required of seniors in Agriculture and in Mechanical, Electrical, and Civil Engineering. Mr. Webster and Mr. Yount. 2 cr. (Formerly 23)

625-626. ADVANCED COMPOSITION
Practice in the techniques of narration and description. Class discussions and individual conferences. Mr. Williams and Mr. Yount. Prereq.: Engl. 401-402. 3 cr. No credit toward a literature major. (Formerly 25-26)

628. ARTICLE WRITING
Mr. Murray. Prereq.: Engl. 401-402 and Engl. 521-522. 3 cr. No credit toward a literature major. (Formerly 52)

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. 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. WRITING AS AN ART
Class workshop discussions and readings of the students’ fiction, poetry, or plays. Individual conferences. Mr. Williams. Prereq.: Engl. 625 or its equivalent. 3 cr. No credit toward a literature major. (Formerly 53, 54)
705. ENGLISH GRAMMAR
Mr. Goffe. Limited to students in the teacher preparation program and graduate students working for the M.S.T. degree. 3 cr. No credit toward a literature major. (Formerly 86)

706. EXPOSITORY WRITING
Mr. Murray. Limited to students in the teacher preparation program and graduate students working for the M.S.T. degree. 3 cr. No credit toward a literature major. (Formerly 85)

709, 710, 711. CRITICAL ANALYSIS
Analysis of three forms of writing: 709, exposition; 710, fiction; 711, poetry. Mr. Bingham and Mr. Richardson. Limited to students in the teacher preparation program and graduate students working for the M.S.T. degree 3. cr. No credit toward a literature major. (Formerly 87, 88, 89)

755, 756. CHAUCER
Mr. Underwood. 3 cr. (Formerly 55, 56)

757, 758. SHAKESPEARE'S PLAYS
The major histories, comedies, and tragedies. Mr. Schultz and Mr. Yarrington. 3 cr. (Formerly 57, 58)

759. MILTON
Mr. Schultz. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 59)

760. BOSWELL'S JOHNSON
Mr. Maynard. 3 cr. (Not offered in 1964-65.) (Formerly 60)

761. WORDSWORTH
Mr. Miller. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 61)

762. BROWNING
Mr. Daggett. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 62)

763, 764. ENGLISH LITERATURE IN THE SIXTEENTH CENTURY
Mr. Schultz. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 63, 64)

765, 766. ENGLISH LITERATURE IN THE SEVENTEENTH CENTURY
Mr. Lameyer and Mr. Underwood. 3 cr. (Alternate years; 766 offered in 1964-65.) (Formerly 65, 66)

767, 768. ENGLISH LITERATURE IN THE EIGHTEENTH CENTURY
Mr. Maynard. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 67, 68)

769, 770. THE ENGLISH ROMANTIC PERIOD
Wordsworth, Coleridge, Lamb, Hazlitt, Byron, Shelley, Keats, DeQuincey. Mr. Miller. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 69, 70)

771, 772. VICTORIAN PROSE AND POETRY
Major non-fictional prose from Carlyle to Stevenson and major poetry from Tennyson to Hardy. Mr. Miller. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 71, 72)
773, 774. **British Literature of the Twentieth Century**
Mr. Richardson. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 73, 74)

775. **New England Renaissance**
Emerson, Thoreau, and other transcendentalists. Mr. Daggett. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 75)

776. **American Novel in the Nineteenth Century**
Mr. Webster. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 75)

777. **American Poetry of the Nineteenth Century**
Mr. Daggett. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 77)

779, 780. **American Literature of the Twentieth Century**
Mr. Nicoloff. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 79, 80)

781, 782. **Introduction to English Drama**
The development of English drama, exclusive of Shakespeare, from the Middle Ages to the present. Mr. Yarrington. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 81, 82)

783, 784. **The English Novel of the Eighteenth and Nineteenth Centuries**
Mr. Bingham and Mr. Miller. 3 cr. (784 offered in 1964-65.) (Formerly 83, 84)

**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. 513, 514, 516, 706, 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.* (Formerly 91)

**Entomology (29)**

*James G. Conklin, Professor; Robert L. Blickle, Professor; Walter C. O'Kane, Professor Emeritus*

(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 the field of biology-education. Each student electing the laboratory work is required to make an insect collection. Students in the College of Technology may be permitted to elect the lectures only. Mr. Conklin. 2 lec.; 1 lab.; or 2 lec.; 2-3 cr. (Formerly (2), 2)
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. (Formerly 46)

704. Medical Entomology

Insects and arachnids in relation to public health. The more important disease carriers, their biologies, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lec.; 1 lab.; 3 cr. (Formerly 54)

707, 708. Advanced Entomology

The anatomy and physiology of insects. Systematic entomology. Mr. Conklin, Mr. Blickle. Open to others than Entomology majors by permission of the Department Chairman. 2 lec.; 2 lab.; 4 cr. (Formerly 57-58)

709, 710. Advanced Economic Entomology

Problems in applied entomology and apiculture; 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. (Formerly 59, 60)

Foreign Languages and Literatures

R. Alberto Casas, Professor; Clifford S. Parker, Professor Emeritus; John S. Walsh, Professor Emeritus; Louis J. Hudon, Professor; Hermann W. Reske, Associate Professor; Samuel Stokes, Jr., Associate Professor; Alexander P. Danoff, Assistant Professor; Charles H. Leighton, Assistant Professor; Nicholas E. Alssen, Assistant Professor; George Doig, Assistant Professor; Humberto Lopez-Morales, Assistant Professor; Paul Chasse, Instructor; Christiane Musinsky, Instructor; Edna S. Hudon, Lecturer; Hilda S. Reske, Lecturer

General Language and Literature (55)

Register for the following courses as Lang. 501, etc.

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. Mr. Doig. Not open to freshmen. 3 cr. No credit toward a major. (Formerly 1, 2)

751, 752. Survey of Modern European Literature

The Renaissance, classicism, romanticism and realism studied as international movements. Stress is not upon the details of each national literature, but upon the interdependence of the literatures of the various countries. Conducted in English. 3 cr. (Formerly 51, 52)

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772. **Applied Linguistics**

Designed to acquaint teachers and others with the techniques and practical application of modern structural linguistics. Mr. Lopez-Morales. **Prereq.** Permission of the instructor. 3 cr. (Formerly 72)

773. **Introduction to Romance Philology**

The historical development of French and Spanish from Vulgar Latin. Phonology, morphology, syntax, semantics, etymology. Frequent reference is made to the spoken languages of today as well as to comparative semantics. **Prereq.** One year of Latin and familiarity with two Romance languages. 3 cr. (Offered in 1964-65.) (Formerly 73)

**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 506, Spanish 506. 3 cr. (Formerly 91)

**French (56)**

Register for the following courses as Fr. 401, etc.

New students will be assigned to French 401, French 503 or French 505 on the basis of their performance in the French placement examination.

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.** 5 rec.; 2 lab.; 5 cr. (Students who offer two or more entrance units of high school work in French, and who do not qualify for French 503, will not be permitted to register for credit for French 401. They may, however, audit the course with proper authorization and register for credit for the second half of the course, French 402.) (Formerly 1-2)

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 641 and above with the permission of the department. (Formerly 3-4)

505-506. **Introduction to French Literature and Thought**

Reading and analysis of significant works in French literature and thought. Organized around such topics as “The individual and society”, “Social criticism”, etc. 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

*No student educated in a foreign country will be permitted to register for any language course numbered 505 or below (except Greek 401-402, 503-504) in such student's native language.*

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French. Open to students who have achieved a grade of C or better in French 504 and by placement examination. (Formerly 5-6)

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.

641. Early French Literature
French literature of the Middle Ages and the Renaissance in modern French adaptation where necessary. Background readings in history and culture. Conducted in French. Prereq.: French 506: 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 41)

695, 696. Honors Work in French
For seniors writing a research paper in the Honors program in French. Prereq.: Permission of Section Supervisor. Variable credit.

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 Bruyere, Lesage, the beginning of the philosophical movement. Mr. Hudon. Conducted in French. Prereq.: French 506. 3 cr.; 4 cr. for Honors. (Offered in 1964-65.) (Formerly 59, 60)

764. Eighteenth Century French Literature and Thought
The literary and philosophical currents, including Montesquieu, Marivaux, Rousseau, Voltaire, the encyclopedists, Beaumarchais, and others. Conducted in French. Prereq.: French 506. 3 cr.; 4 cr. for Honors. (Alternate years; offered in 1964-65.) (Formerly 64)

767-768. Nineteenth Century French Literature
767: Romanticism; Mme. de Stael, Chateaubriand, Lamartine, Hugo, Vigny, Musset. 768: Late Romanticism; Realism; Stendhal, Balzac, Flaubert; Hugo, the Parnassian school. Conducted in French. Prereq.: French 506. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 67-68)

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 1964-65.) (Formerly 70)

781-782. Contemporary French Novel and Theater
781: Zola, the Concourts, Proust, Gide, Becque, Maeterlinck, and others. 782: Mauriac, Malraux, Bernanos, Sartre, Camus, Claudel, Cocteau, Pagnol, Anouilh, Giraudoux and others. Conducted in French. Prereq.: French 506. 3 cr.; 4 cr. for Honors. (Alternate years; offered in 1964-65.) (Formerly 81, 82)

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 641 and above. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 90)
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. **Pre-req.**: Permission of the Section Supervisor. Variable credit. (Formerly 73, 74, 75, 76)

**German (57)**

Register for the following courses as Ger. 401, etc.

New students will be assigned to German 401, German 402, German 503, German 504, or German 505, on the basis of their scores on the German placement examination.

401-402. **Elementary German**

For students without previous knowledge of German. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. **No credit toward a major.** 5 rec.; 2 lab.; 5 cr. (Students who offer two or more entrance units of high school work in German and who do not qualify for German 503 will not be permitted to register for credit for German 401. They may, however, audit the course with proper authorization and register for credit for the second half of the course, German 402. (Formerly 1, 2)

503-504. **Intermediate German**

Formal review of the structure of the language, further training in spoken and written German, intensive reading of selected literary texts. Outside readings in special fields of interest. 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 504 may take courses numbered 750 and above with the permission of the department. (Formerly 3, 4)

505-506. **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 504, and by placement examination. (Formerly 5, 6)

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 504 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. **Not offered for graduate credit.**

*No student educated in a foreign country will be permitted to register for any language course numbered 305 or below (except Greek 401-402, 503-504) in such student's native language.*
695, 696. Honors Work in German

For seniors writing a research paper in the Honors program in German. Prereq.: Permission of Section Supervisor. 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 and poetry with emphasis on the philosophical and social ideas of the time. Prereq.: German 505, 506. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 55)

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 505, 506. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 56)

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 506. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 57, 58)

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. 506. 3 cr.; 4 cr. for Honors. (Alternate years; offered in 1964-65.) (Formerly 59, 60)

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 506. 3 cr.; 4 cr. for Honors. (Alternate years; offered in 1964-65.) (Formerly 61, 62)

763-764. German Literature Since 1830

From Naturalism to the present. Reading, interpretation, and critical analysis of prescribed prose, drama and poetry of Hauptmann, Hofmannsthal, Rilke, Mann, Kafka. Prereq.: German 506. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65.) (Formerly 63, 64)

791-792. 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 505-506. 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) Mid-
dle 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 Section Supervisor. Variable credit. (Formerly 73, 74, 75, 76)

Greek (58)
Register for the following course as Gr. 401, etc.

401-402. Elementary Greek
Grammar, composition, translation. Mr. Doig. Prereq.: Permission of the instructor. 3 cr. No credit toward a major. (Formerly 1-2)

503-504. Intermediate Greek
Review: Plato's 'Apology'; Selections from Homer and Elegiac Poets. Prereq.: Gr. 402. 3 cr. (Formerly 3-4)

Italian (59)
Register for the following as Ital. 401, etc.

401-402. Elementary Italian*
Elements of Italian grammar, reading of simple prose, oral practice. 3 cr. No credit toward a major. Offered in Extension. (Formerly 1-2)

Latin (60)
Register for the following courses as Lat. 401, etc.

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. 3 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. They may, however, audit the course with proper authorization.) No credit toward a major. (Formerly 1-2)

503-504. Intermediate Latin
A review of Latin grammar and vocabulary, followed by readings in prose and poetry. Prereq.: Lat. 402 or the equivalent. Mr. Doig. 3 cr. (Formerly 3, 4)

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. Mr. Doig. Prereq.: Lat. 504 or equivalent. 3 cr. (Formerly 5, 6)

695, 696. Honors Work in Classics
For seniors writing a research paper in the Honors program in Classics. Prereq.: Permission of Section Supervisor. Variable cedit.

*No student educated in a foreign country will be permitted to register for any language course numbered 505 or below (except Greek 401-402, 503-504) in such student's native language.
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 1964-65.) (Formerly 51-52)

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. Mr. Doig. Prereq.: Lat. 506 or equivalent. 3 cr.; 4 cr. for Honors. (Alternate years; offered in 1964-65.) (Formerly 53, 54)

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. Mr. Doig. 3 cr.; 4 cr. for Honors. (Alternate years; not offered in 1964-65) (Formerly 55, 56)

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. (Not offered in 1964-65.) (Formerly 91-92)

Education-Latin (Ed-Lat) 794. Supervised Teaching in High School Latin

Prereq.: Permission of instructor. (Formerly 94)

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 instructor and student are: (1) Roman Comedy and Elegy, (2) The Roman Epic, (3) Roman Drama, (4) The Silver Age. Mr. Doig. Prereq.: Permission of the Section Supervisor. Variable credit. (Formerly 71, 72, 73, 74)

Russian (61)

Register for the following as Ru. 401, etc.

401-402. Elementary Russian*

Elements of Russian grammar, reading of graded prose, and oral use of the language. Mr. Alssen. 3 cr. (Students who offer two or more entrance units of high-school work in Russian will not be permitted to register for Russian 401 for credit. They may, however, audit the course with proper authorization.) No credit toward a major. (Formerly 1, 2)

503-504. Intermediate Russian*

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 Russian. Mr. Alssen. 1 lab.; 3 cr. Open by placement examination, and to students who have passed Russian 402 with a grade of C. (Formerly 3, 4)

*No student educated in a foreign country will be permitted to register for any language course numbered 505 or below (except Greek 401-402, 503-504) in such student's native language.
505-506. RUSSIAN LITERATURE AND THOUGHT

Reading and analysis of significant works in Russian literature and thought. Outside readings on the historical and cultural background of the works read. Papers and discussion in Russian. Term paper in English. Mr. Alssen. 3 cr. This course or its equivalent is prerequisite to all higher courses in Russian. Open to students who have achieved a grade of C or better in Russian 504 and by placement examination. (Formerly 5, 6)

Spanish (62)

Register for the following courses as Sp. 401, etc.

New students will be assigned to Spanish 401, Spanish 402, Spanish 503, Spanish 504, or Spanish 505, on the basis of their scores on the Spanish placement examinations.

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.; 5 cr. (Students who offer two or more entrance units of high school work in Spanish, and who do not qualify for Spanish 503 will not be permitted to register for credit for Spanish 401. They may, however, audit the course with proper authorization and register for credit for the second half of the course, Spanish 402). (Formerly 1-2)

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 examination, and to students who have passed Spanish 402 with a grade of C. Students making a grade of A in Spanish 504 may take courses numbered 750 and above with the permission of the department. (Formerly 3-4)

505-506. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT

Reading and analysis of significant works in Spanish literature and thought. Organized around such topics as “Self and society”, “God and man”, “Order and change in society”, etc. Outside readings on the historical and cultural background of the works read. Papers and discussion in Spanish. Term paper in English. Mr. Leighton. 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. (Formerly 5, 6)

631, 632. ADVANCED SPANISH CONVERSATION AND COMPOSITION

For students who wish to perfect their command of written and spoken Spanish, maintain aural-oral fluency in Spanish through intensive work in and out of the classroom, individual conferences, and laboratory sessions. Prereq.: Spanish 503 or 504 or equivalent. 3 lec.; 2 1/2 hr. lab.; 3 cr. (Formerly 31, 32)

* No student educated in a foreign country will be permitted to register for any language course numbered 505 or below (except Greek 401-402, 503-504) in such student's native language.
695, 696. HONORS WORK IN SPANISH

For seniors writing a research paper in the Honors program in Spanish. Prereq.: Permission of Section 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, La Celestina and Don Quijote, and their social and historical background. Prereq.: Sp. 505 or equivalent. 3 cr.; 4 cr. for Honors. (Formerly 51)

752. DRAMA AND POETRY OF THE SIGLO DE ORO

The social background of the baroque period. Readings of the representative plays of Lope de Vega, Calderon, Alarcon, Tirso de Molina, and the poetry of Gongora and Quevedo. Development of the prose of the period. Mr. Lopez-Morales. Prereq.: Sp. 506 or equivalent. 3 cr. 4 cr. for Honors. (Formerly 52)

755. LITERATURE OF THE NINETEENTH CENTURY

Preliminary survey of the Eighteenth century and readings and discussion of the main literary movements and writers of the Nineteenth century such as Quintana, Espronceda, Zorrilla, Larra, Duque de Rivas, Becquer, Perez Galdos, Valera, Pereda, Clarin, and Echegaray. Social and historical background of Spain in relation to Nineteenth century thought in Europe. Mr. Casas. Prereq.: Sp. 506 or equivalent. 3 cr.; 4 cr. for Honors. (Formerly 55)

756. CONTEMPORARY SPANISH LITERATURE

Starting with the generation of 1898 the readings and discussion of the work of such writers as Unamuno, Azorin, Baroja, Machado, J. R. Jimenez, Ortega y Gasset, Garcia Lorca, Perez de Ayala, Casona, Benavente, and a survey of Spanish literature and thought since 1939. Mr. Casas. Prereq.: Sp. 506 or equivalent. 3 cr.; 4 cr. for Honors. (Formerly 56)

765, 766. SPANISH-AMERICAN LITERATURE

The main themes of Spanish-American literature through the reading of the works of the most representative authors along with an historical, social and geographical background of the New World. Mr. Lopez-Morales. Prereq.: Sp. 506 or equivalent. 3 cr.; 4 cr. for Honors. (Formerly 65, 66)

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) Cervantes; (4) the literature of individual Latin-American countries. The staff. Prereq.: Permission of the Section Supervisor. Variable credit. (Formerly 73, 74, 75, 76)
Forestry (30)

PAUL E. BRUNS, Professor; CLARK L. STEVENS, Professor Emeritus; OLIVER P. WALLACE, Associate Professor; HAROLD W. HOCKER, JR., Associate Professor; JAMES P. BARRETT, Assistant Professor; ROBERT H. DONNELLY, Assistant Professor; ROGER P. SLOAN, Assistant Professor; ERNST J. SCHREINER, Adjunct Professor; FRANK S. SANTAMOUR, JR., Adjunct Professor

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 Forestry majors. 3 cr.

425. DENDROLOGY
The identification, classification and silvical characteristics of trees in the field, in autumn and in winter. The principal forest regions of North America: their location, extent, climatic conditions and flora. Forest types. Grasses important in forest and range management. Required of freshmen in Forestry. Elective for other students. 2 lec.; 1 4-hr. lab.; 4 cr.

426. WOOD IDENTIFICATION
Physical properties and identification of the commercially important woods; elementary wood anatomy. Prereq.: For. 425 or permission of the instructor. 2 lec.; 1 lab.; 3 cr. (Formerly 66)

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. 2 lec.; 1 lab.; 3 cr. (Formerly 27)

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. (Formerly 28)

538. NATURE EDUCATION
Outdoor education methods, materials, and equipment. Discussion of activity programs involving forests, soils, water, and wildlife, with the recreational and educational possibilities of each. Required for women in Physical Education Recreation Education Option. Elective for other women students. Prereq.: Junior standing and permission of the instructor. 2 lec.; 1 lab.; 3 cr. (Formerly 38)

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.: For. 528. 3 lec.; 1 lab.; 5 cr. (Formerly 43)
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. (Formerly 44)

561, 562. Investigations in Forestry
Work to be arranged according to the needs of individual students. Staff. Hours to be arranged. 2 to 4 cr. Prereq.: Permission of the instructor. (Formerly 61, 62)

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. 425; For. 527 or Bot. 742. 2 lec.; 1 lab.; 3 cr. (Formerly 29)

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. Donnelly. Prereq.: For. 528, For. 544, or equivalents 2 lec.; 1 lab.; 3 cr. (Formerly 51)

651. Forest Utilization
Methods of milling in the chief lumber-producing regions in the United States; forest products, their manufacture and markets; special problems of the lumber business. Prereq.: Permission of the instructor. 2 lec.; 1 4-hr. lab.; 4 cr. (Formerly 52)

659. 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. Prereq.: Ent. 506, Bot. 751, or equivalent. 2 lec.; 1 lab.; 3 cr. (Formerly 59)

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. Bruns. Prereq.: Senior standing in Forestry. 3 lec.; 1 lab.; 4 cr. (Formerly 69)

701. 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 covariance, 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. **Artificial Regeneration**

Forest tree improvement, production, collection and testing of forest tree seed, nursery management and out-planting of seedlings, direct seeding of forest stands, planting site surveys. Mr. Hocker. *Prereq.*: For. 527. 2 lec.; 1 lab.; 3 cr. (Formerly 30)

734. **Forest Fish and Game**

The characteristics of the more important species present in northeastern forests, together with some consideration of the management techniques applicable to each. Elective, with approval of the instructor. 2 lec.; 1 lab.; 3 cr. (Formerly 34)

742. **Forest Engineering**

Design of logging road systems with an emphasis on the economics involved. Field work in road layout, and timber sale preparation. Mr. Donnelly. *Prereq.*: Permission of the instructor. Two-week field session in June. 3 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. *Prereq.*: Permission of the instructor. 3 lec.; 1 lab.; 4 cr.

755, 756. **Forest Game Management**

Readings and discussions on the properties of game populations, and the various phases of management, including public relations. The principles of forest game management, and the preparation of a working plan for the management of forest and wildlife resources on a specified area. The student may be required to spend several week-ends working with the State Fish and Game Department, helping with investigational projects. 2 lec.; 1 4-hr. lab.; 4 cr. (Formerly 55, 56)

758. **Photogrammetry 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. (Formerly 57)

763. **Forest Recreation**

The extent, developments, and conflicts in the recreational use of wild lands of North America. Relationships to the conservation of natural resources are considered. *Prereq.*: Permission of the instructor. Mr. Wallace. 3 cr. (Formerly 63)

764. **Forest Industry Economy**

Economy in productive enterprise — logging and manufacturing of forest products; control of harvesting costs as a factor in intensifying applied forest management; planning for minimum cost operations. Mr. Wallace. *Prereq.*: Permission of the instructor. 2 lec.; 1 lab.; 3 cr. (Formerly 64)

**French**

(see Foreign Languages and Literatures)
Geology and Geography

Jerome M. Pollack, Associate Professor; T. Ralph Meyers, Professor; Donald H. Chapman, Professor; Cecil J. Schneer, Professor; Glenn W. Stewart, Associate Professor; William H. Wallace, Associate 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. Mr. Meyers, Mr. Chapman, Mr. Stewart, and Mr. Pollack. 3 lec.; 1 lab.; 4 cr. No credit toward a major. (Formerly 1-2)

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 and Agriculture. Open to Liberal Arts students by permission only. 2 lec.; 2 cr. (Not available for credit after completing Geol. 401.) No credit toward a major. (Formerly 7)

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. 401 or 407. 2 lec.; 1 lab.; 4 cr. (Formerly 28)

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. (Formerly 33)

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. Pollack. Prereq.: Geol. 402 or permission of instructor. 3 lec.; 1 lab.; 4 cr. (Formerly 55)

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. (Formerly 31)

613. Physical-Chemistry 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. (Formerly 27)

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. (Formerly 34)

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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 1964-65.) (Formerly 42)

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. (Formerly 32)

754. **Sedimentology**

The properties of sediments and sedimentary rocks, the sedimentary processes and environments, correlation procedures and stratigraphic principles. Mr. Pollack. **Prereq.:** Geol. 401 and 512 or permission of instructor. 2 lec.; 1 lab.; 3 cr. (Formerly 36)

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. (Formerly 53-54)

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 the high school science teacher who needs an introduction to the Earth Sciences. It will be offered during the 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. It will be offered during the Summer Sessions. 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. Mr. Meyers, Mr. Chapman, Mr. Stewart, Mr. Schneer, and Mr. Pollack. **Prereq.:** Permission of the instructor. 1-2 cr. This course may be repeated to a total of not more than 5 credits. (Formerly 57)

1. Areal Geology (Formerly a)
2. Geochemistry (Formerly b)
3. Geomorphology, Advanced (Formerly c)
4. Geophysics (Formerly d)
5. Glacial Geology, Advanced (Formerly e)
6. Groundwater Geology (Formerly f)
7. Historical Geology, Advanced (Formerly g)
8. Industrial Minerals (Formerly h)
9. Micropaleontology (Formerly i)
10. Mineral Fuels (Formerly j)
11. Mineralogy, Advanced (Formerly k)
12. Optical Crystallography (Formerly l)
13. Ore Deposits (Formerly m)
14. Paleontology, Advanced (Formerly n)
15. Petrology, Advanced (Formerly o)
16. Regional Geology (Formerly p)
17. Sedimentation (Formerly q)
18. Stratigraphy (Formerly r)
19. Structural Geology, Advanced (Formerly s)

797. Geology Seminar

Study of selected topics in both classical and modern geological thought. Prereq.: Senior standing and permission of the instructor. (Course not offered regularly.) (Formerly 57t)

Geography (50)

Register for the following courses as Geog. 401, etc.

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 personality of the region is studied. Mr. Wallace and Mr. LeBlanc. 3 cr. (Formerly 1, 2)

471, 472. Physical Geography

A systematic study of the earth in terms of 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 1964-65.)

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. (Formerly 21)

481. Cultural Geography

The geography of man, Differentiation of the earth in terms of population, settlement, and the basic economic activities, including agriculture, forestry, fishing, mining, manufacturing, and transportation. The interrelations of cultural phenomena and physical features in selected areas. Mr. LeBlanc. 3 cr. (Formerly 4)
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. Not open to freshmen. Prereq.: 3 hours credit in Geography or permission of instructor. 3 cr. (Alternate years; offered in 1964-65 in the second semester.) (Formerly 10)

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 permission of instructor. 3 cr. (Alternate years; not offered in 1964-65.)

532. Geography of the U.S.S.R. and Eastern Europe
A topical and regional analysis of the U.S.S.R. and its Eastern European satellites with emphasis on the former. An appraisal of the physical resource base of the U.S.S.R. and its effect on the pattern of population and location of economic activity. Mr. LeBlanc. Prereq.: Geog. 401 or permission of the instructor. 3 cr. (Alternate years; not offered in 1964-65.)

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 1964-65.) (Formerly 22)

795. Meteorological of 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. (Formerly 57)

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.
Physical Science  (44)
Register for these courses as Ph. Sci. 401, etc.

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. (Formerly 1-2)
(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.)

German
(see Foreign Languages and Literatures)

Government  (52)

John T. Holden, Professor; Robert B. Dishman, Professor; Erwin A. Jaffe, Associate Professor; S. Kenneth Howard, Assistant Professor; Frederick Wurzburg, Assistant Professor; Joseph P. Ford, Instructor; Raymond E. Matheson, Instructor

All students majoring in Government must complete Government 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. (Formerly 5)

(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 on the constitutional and political framework within which they operate. Staff. Open to all students. 3 cr. (Formerly 6)

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. (Formerly 8)

513.  LOCAL GOVERNMENT AND POLITICS
An examination of the institutions of local government in the United States, their historical background, and the social, economic, and political
environments in which they operate. Particular emphasis is placed on the urban political process and power structures. Examination of municipal planning and some of its devices, i.e., zoning, building codes, and urban renewal are included. Mr. Howard. 3 cr. (Formerly 14)

514. **State Government and Politics**

A comparative, historical and theoretical examination of the role played by the states and their governmental subdivisions in the American federal system. The relation between structure and politics in state government, and the effect of this relationship on the executive, legislative, and judicial powers. The special areas of intergovernmental relations, regional cooperation, metropolitan growth, state reorganization, fiscal management taxation, and the theories of cooperative federalism and state's rights. Mr. Howard. Prereq.: Gov. 406. 3 cr. (Formerly 13)

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.: Gov. 405 or permission of instructor. 3 cr. (Formerly 11)

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.: Gov. 405 or permission of instructor. 3 cr. (Formerly 12)

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.: Gov. 406. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 15)

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.: Gov. 405, 406 or introductory American history course. Mr. Jaffe. 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.: Gov. 406. 3 cr. (Alternate years; offered in 1964-65.) (Formerly 54)
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. Mr. Howard. Prereq.: Gov. 406 or Soc. 400. 3 cr. (Formerly 57)

741. Administration of Justice
The nature, sources and problems of the law as distinguished from other forms of social control. The course is analytical and critical, tracing the origin and development of legal institutions from primitive times to the present and evaluating the modern role of judge, jury, and counsel in the administration of justice. The law in action i.e., law as it is applied by courts and practiced by lawyers rather than as it is formulated by the legislative and executive branches. Mr. Dishman. 3 cr. (Formerly 51)

742. The Supreme Court and the American Constitution
Stresses the basic constitutional principles on which the American political system is founded and their application to present-day social, political, and economic problems. The powers of Congress, the President, and the federal courts and the constitutional limitations by which their respective powers are checked. Mr. Dishman. Prereq.: Gov. 406. 3 cr. (Formerly 52)

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. (Formerly 55)

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. (Not offered in 1964-65.) (Formerly 56)

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. (Alternate years; not offered in 1964-65.) (Formerly 69)

752. Governments 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.: Gov. 405 or permission of instructor. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 90)

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.: Gov.
405 or permission of instructor. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 92)

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. (Formerly 63)

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. (Formerly 64)

765. CONTEMPORARY POLITICAL THEORY

A survey and analysis of contemporary political theories. The crisis in democratic thought, totalitarian ideology, the search for scientific political theory. Prereq.: Gov. 763, 764, or permission of instructor. Mr. Jaffe. 3 cr. (Not offered in 1964-65.)

771, (771). RESEARCH IN GOVERNMENT PROBLEMS

An individual research project in one of the fields of government, e.g., local or state administration, comparative government, international relations, international organizations, political theory, politics, or public law to be prepared under the direction of the instructor. Emphasis on the methods and sources of research in government. Open to senior majors in Government. Mr. Dishman. 3 cr. (Formerly 65)

776. NATURAL RESOURCES POLICY AND ADMINISTRATION

The development and administration of public policy on land, water, and mineral resources. The historical development of governmental action in each of these areas, political conflicts on policy goals, and the administrative structure for carrying out current policies. Prereq.: Gov. 406. 3 cr. (Not offered in 1964-65.) (Formerly 58)

779. PUBLIC POLICY AND REGIONALISM

3 cr. (Not offered in 1964-65.) (Formerly 67)

797, 798. SEMINAR IN GOVERNMENT

A selected current topic from government, political philosophy and history, political behavior, public law, public administration, or international 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. Permission of the instructor is required. Mr. Holden, Mr. Dishman, Mr. Ford, Mr. Jaffe, Mr. Howard. 3 cr. (Formerly 97)

Greek

(See Foreign Languages and Literatures)
History (53)

Marion E. James, Associate Professor; Philip M. Marston, Professor; William Yale, Professor Emeritus; David Long, Professor; Gibson R. Johnson, Associate Professor Emeritus; Allan B. Partridge, Associate Professor; Hans Heilbronner, Associate Professor; Robert C. Gilmore, Associate Professor; William Greenleaf, Associate Professor; Charles A. Jellison, Jr., Associate Professor; William R. Jones, Assistant Professor; Allen B. Linden, Instructor.

In these courses an important place is given to historical reading carried on in the reference room. Often a considerable part of the work is written. The statements in regard to prerequisites are for Liberal Arts students. Agriculture and Technology students should consult the Department Chairman.

Basic Course

The following is a basic course which is required of all students.

401, 402. Introduction to Contemporary Civilization

A background of appreciation of the significance of man's environment, the nature of man, the cultural heritage from the past, recognition of historical allusions in literature and conversation, and knowledge of the general sequence of historic events. Prehistoric and historic social evolution. The historic explanation of modern life and an appreciation of the problems of contemporary society. Mr. Gilmore, Mr. Heilbronner, Miss James, Mr. Jellison, Mr. Jones, Mr. Linden, Mr. Long, and Mr. Partridge. 3 cr. No credit toward a major. (Formerly 1, 2)

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. (Formerly 7, 8)

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. (Formerly 51, 52)

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. (Formerly 87, 88)

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. (Not offered in 1964-65.) (Formerly 85, 86)
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. (Formerly 83, 84)

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. (Formerly 19, 20)

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. (Formerly 21, 22)

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. (Formerly 65, 66)

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. (Formerly 67)

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. (Formerly 69)

756. Twentieth-Century Europe

European history 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. (Formerly 70)

763, 764. History of Russia

The development of the Russian state from its foundation to its present state and cultural system. Mr. Heilbronner. 3 cr. (Formerly 70) present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. Mr. Heilbronner. 3 cr. (Formerly 71, 72)
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. (Formerly 9, 10)

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. (Not offered in 1964-65.) (Formerly 11)

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. (Not offered in 1964-65.) (Formerly 12)

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. (Formerly 31, 32)

781. History of Modern China, 1850-1950

The struggles of a great Asian nation to modernize. Political, social, and cultural developments, the internal and external factors in the decline of the Chinese Empire, efforts to transplant western political institutions to China, the westernization of China's intellectuals, the growth of the Kuomintang and of the Chinese Communist Party, and the impact of World War II. Mr. Linden. 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 requirements 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 in-
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. (Formerly 97)

(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.: Permission 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 curriculum, past and present; aims and objectives in the social studies; selection and organization of teaching material; teaching and testing techniques. Special emphasis on teaching American history and the problems of American democracy. Open to students who have satisfactorily completed 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 58. 3 cr. This course may not be used to satisfy major requirements. (Formerly 91)

**Home Economics (31)**

Marjory A. Wybourn, Professor; Elizabeth Rand, Associate Professor; Earle Goodman, Jr., Associate Professor; Ruth Pearce, Assistant Professor

407. **Home Economics Professional Seminar**

A course designed to help the student define and clarify professional and educational objectives, to acquaint the student with the philosophy of Home Economics, educational experiences in college and professional opportunities in the field. Trips will be planned to meet Home Economists in various positions. 1 cr. (Formerly 7)

(548), 548. **Field Work**

A supervised experience which provides an opportunity for home economics students to explore various professional fields. Prereq.: Permission of adviser. 2-6 cr. (Formerly 48)

**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. 3 cr. (Formerly 15)

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. 3 cr. (Formerly 25-26)

783. FAMILY RELATIONSHIPS
A study of husband-wife, parent-child and sibling interactions throughout the family life cycle. 3 cr. (Formerly 83)

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. 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. Maximum of 6 cr. (Formerly 81, 82)

Clothing and Textiles

404. TEXTILES
The textile fibers and their characteristics, natural and man-made as related to their selection, care, and ultimate use. Includes laboratory. 3 cr. (Formerly 4)

405, (405). CLOTHING CONSTRUCTION
Planning, purchasing, and using patterns and fabrics for clothing. Basic principles of garment construction. Includes laboratory. 3 cr. (Formerly 5)

531, (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. Prereq.: Arts 23. 3 cr. (Formerly 31)

560. FLAT PATTERN
Application of the principles of flat pattern designing to the development of design ideas for apparel. Garment construction. Prereq.: H. E. 405. Includes laboratory. 3 cr. (Formerly 40)

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. Includes laboratory. 3 cr. (Formerly 43)

563. TAILORING
The appreciation and application of tailoring principles to making and buying tailored garments. Prereq.: H. E. 560 or 561. Includes laboratory. 3 cr. (Formerly 61)

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. (Not offered in 1964-65.) (Formerly 65)
Fundamentals of Fashion
Economic, psychological, and sociological problems inherent in the field of fashion. The development of the fashion industry. 2 cr. (Formerly 67)

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. (Formerly 69)

Foods and Nutrition
(418), 418. Principles of Food Selection and Preparation
The scientific principles involved in selection, preparation, and preservation of food, includes laboratory. 3 cr. (Formerly 18)

419, (419). Menu Planning and Service
Meal management; the planning, marketing, preparation and service of meals for the family. Prereq.: H. E. 418. Includes laboratory. 3 cr. (Formerly 19)

771, (771). Experimental Foods
Application of the experimental method of study to problems in foods. Methods of evaluating food quality. Prereq.: H. E. 418 and permission of instructor. Includes laboratory. 3 cr.

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. 3 cr. (Formerly 73)

674. Nutrition in Health and Disease
Dietary modification and management and the metabolic bases for nutritional therapy in the treatment of disease. Prereq.: H. E. 573. 3 cr. (Formerly 74)

797. Nutrition Seminar
Critical review of literature in the field of nutrition with emphasis on experimental data on which principles of human nutrition are based. Prereq.: Permission of instructor. 3 cr. (Formerly 76)

778. Food Trends and Developments
Investigation and evaluation of developments in food production, preparation, and preservation. Instructional field trips constitute a major portion of class time. 3 cr. (Formerly 86)

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. 3 cr.

794. Supervised Teaching in Home Economics
Eight weeks of supervised teaching in a school. Prereq.: Educ. 757, 758 and H. E. 791. 7 cr. (Formerly 94)

196
(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. (Formerly 96)

Home Management

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. 3 cr. (Formerly 87)

658. Home Management Residence
Management principles in the operation of the home. Permission of instructor. 2-4 cr. (Formerly 88)

796, (796). 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: (a) family finance, (b) consumer education, (c) management processes, (d) current research. 1-3 cr. each semester. Maximum of 6 cr.

Institutional Administration

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. 3 cr. (Formerly 21-22)

653. Organization and Management of Institutional Food Service
Study of supervision, personnel policies, menu planning, food production and merchandising, cost control, budgeting, plant planning, maintenance, and sanitation as related to institutional food service. Prereq.: H. E. 418. 3 cr. (Formerly 53)

Horticulture
(See Plant Science)

Hotel Administration (54)
Richard H. Pew, Associate Professor

401. Introduction to Hotel Management
The scope of the hotel-motel business, both resort and transient. History of hospitality. 1 cr. Required of freshmen in Hotel Administration. (Formerly 1)

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. ½ cr. for each course. (Formerly 40, 42, 44, 46)

197
555. Hotel Operation
The organization, personnel, and work of the departments; front office procedure; housekeeping. B.A. 509 should precede or accompany this course. 3 cr. (Formerly 55)

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. 3 cr. (Formerly 56)

666. Hotel Promotion and Sales
The principles and practices used internally and externally for stimulating hotel and restaurant sales. 2 cr. (Formerly 66)

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. 3 cr. (Formerly 67)

669. Hotel Honors Seminar
A research and problems course concerned with advancing knowledge in the lodging and feeding fields. 3 cr. (Formerly 69)

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. 2 cr.

Humanities (43)
Register for this course as Hu. 501-502.

501-502. Humanities
A course in general education involving the departments of English, Foreign Languages and Literatures, 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 a historical survey. Weekly lectures or demonstrations, readings, slides, films, recordings, class recitations, and discussion. There will be at least one museum trip each semester. Mr. Casas, Mr. Daggett, Mr. Fasanelli, Mr. Maynard, and guest lecturers. Not open to freshmen. 3 cr. (Formerly 1-2)

Italian
(See Foreign Languages and Literatures)

Languages
(See Foreign Languages and Literatures)
Latin
(See Foreign Languages and Literatures)

Liberal Arts (40)
The following courses are non-departmental.
Register for them as L.A. 651, etc.

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, Mr. Nicoloff. Prereq.: Senior standing. 3 cr. Open to all Colleges. (Formerly 51)

695, 696. Independent Study
See description of the plan on page 67. Not less than 6 cr. nor more than 12 cr. for a year. (Formerly 97)

Mathematics (84)
M. Evans Munroe, Professor; Marvin R. Solt, Professor Emeritus; William L. Kichline, Professor; Robert J. Silverman, Professor; A. Robb Jacoby, Professor; Shan S. Kuo, Professor of Applied Mathematics; Shepley L. Ross, Associate Professor; Edward H. Batho, Associate Professor; Donald M. Perkins, Assistant Professor; Robert O. Kimball, Assistant Professor; Frederick J. Robinson, Assistant Professor; David M. Burton, Assistant Professor; Richard H. Balomenos, Assistant Professor; William E. Bonnice, Assistant Professor; William G. Witthoft, Assistant Professor; Eric Nordgren, Assistant Professor

301. Digital Computer Programming
The elements of the FORTRAN language; basic instruction in the use of the IBM 1620 computer. 0 cr.

302. Intermediate Algebra
0 cr. (Offered through the Extension Service only.) (Formerly 2)

303. Trigonometry
0 cr. (Offered through the Extension Service only.) (Formerly 3)

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. (Formerly 5)
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. (Formerly 7-8)

421. CALCULUS B1

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. (Formerly 21)

422. CALCULUS B2

Continuation of differential and integral calculus with analytic geometry. Prereq.: Math. 421. 3 cr. Does not count for major credit in Mathematics. (Formerly 22)

425. CALCULUS A1

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, ½ year of trigonometry. 4 cr. Does not count for major credit in Mathematics. (Formerly 25)

426. CALCULUS A2

Conclusion of introductory course in calculus of functions of one argument. Prereq.: Math. 425. 4 cr. (Formerly 26)

523. CALCULUS B3

Conclusion of introductory course in calculus of functions of one argument. Prereq.: Math. 422. 3 cr. (Formerly 23)

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. (Formerly 24)

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. (Formerly 27)

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. 4 cr. (Formerly 31)
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. (Formerly 41)

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. (Formerly 71-72)

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.

629. 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. (Formerly 51)

630. 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. (Formerly 52)

653-654. 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 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. (Formerly 53-54)

698. Senior Seminar

Individual study on special topics. Preparation and presentation of reports on topics assigned. Prereq.: Senior standing in mathematics. 3 cr. (Formerly 98)

699. 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. (Formerly 99)
741. **Mathematical Statistics I**
Sampling theory; estimation of parameters; the multivariate normal distribution. *Prereq.:* Math. 542. 4 cr. (Formerly 73)

742. **Mathematical Statistics II**
Testing statistical hypotheses, confidence intervals, regression and correlation, non-parametric methods, and other topics. *Prereq.:* Math. 741. 4 cr. (Formerly 74)

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. 4 cr. (Formerly 55)

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. 4 cr. (Formerly 56)

761. **Higher Algebra I**
The integers; the rational and complex number systems; congruences; polynomials; groups; rings; integral domains; fields. *Prereq.:* Math. 531. 4 cr. (Formerly 61)

762. **Higher Algebra II**
Vector spaces and transformations matrices and determinants. *Prereq.:* Math. 761. 4 cr. (Formerly 62)

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. 4 cr. (Formerly 67)

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. 4 cr. (Formerly 68)

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. 4 cr. (Formerly 75)

781. **Theory of Approximation**
The theorems of Weierstrass on approximation of continuous functions; the Tschebycheff approximation problem; Tschebycheff polynomials; trigonometric polynomials of best approximation; interpolation; the formulas of Lagrange and Newton; trigonometric interpolation. *Prereq.:* Math. 527. 4 cr. (Formerly 81)
782. Non-Linear Differential Equations
Phase plane analysis of lineal systems and non-linear conservative systems; stability theorems; limit cycles and periodic solutions; the Van der Pol equation; the method of Kryloff and Bogoliouboff. Prereq.: Math. 527. 4 cr. (Formerly 82)

783. Introduction to Differential Geometry
A first course in the metric differential Geometry of curves and surfaces in Euclidean space. Prereq.: Math. 527. 4 cr. (Formerly 83)

784. Introduction to Topology
Elementary point-set topology in metric and topological spaces, in particular the real line and plane. Prereq.: Math. 761. 4 cr. (Formerly 84)

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. 4 cr. (Formerly 88)

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 the secondary schools. (Formerly 91)

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. 4 cr. (Formerly 96)

Mechanical Engineering (85)

Robert W. Corell, Associate Professor; 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; Peter M. Forsbergh, Associate Professor; William E. Clark, Assistant Professor; William Mosberg, Assistant Professor; Frederick G. Hochgraf, Assistant Professor; Wei Tsang Yang, Assistant Professor; Harvard B. Emery, Instructor; John A. Wilson, Instructor; Frank A. Lewis, Lecturer; Paul A. Williams, Lecturer; Lyman J. Batchelder, Instructor Emeritus; Elias M. O'Connell, Instructor Emeritus

405. Engineering Drawing
Representation of engineering information by multiview drawings, pictorial views, sketches, and graphs. The fundamentals of descriptive geometry. 2 lab.; 3 cr. (Formerly 13, 14)
413-414. Engineering Drawing

Representation of engineering information by multiview drawings, pictorial views, sketches, and graphs. The fundamentals of descriptive geometry. 1 lab.; 1 cr. (Formerly 13, 14)

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 manufactured parts. Prereq.: M.E. 405. 3 labs.; 3 cr. (Formerly 17)

511. Machine Shop Practice

Advanced work in machine tools and their use, production methods, inspection, and control. Prereq.: M.E. 510. 2 lab.; 2 cr. (Formerly 32)

520. Heating and Air Conditioning

Present methods of heating and air conditioning buildings. Prereq.: Phys. 402. 3 cr. (Formerly 40)

522. Materials I

An introduction to the structure and properties of metals, plastics, and ceramics with a special emphasis on the influence of atomic structure on physical properties. Solidification, equilibrium multiphase relations, deformation models, elastic energy as a driving force. Prereq.: Phys. 404. 3 cr. (Formerly 22)

525. Statics

Force, moment and couple; resultants and equilibrium of force systems by vector and scalar methods. Properties of areas and solids. Prereq.: Math. 426. 2 cr. (Formerly 25)

526. Dynamics

Particle and rigid body motion; relation between force, mass and acceleration; work and energy; impulse and momentum. Prereq.: M.E. 525. 3 cr. (Formerly 26)

527. Strength of Materials

Direct tension, compression and shear; strain; deflection in beams; combined stresses; strain energy; columns. Prereq.: M.E. 525. 3 cr. (Formerly 35)

533. Thermodynamics

The fundamental laws of thermodynamics and their relation to working substances. Prereq. or concurrent: Phys. 502. 3 cr. (Formerly 33)

534. Thermodynamics

A more comprehensive study of thermodynamic properties of media; thermodynamics of combustion; heat transfer. Prereq.: M.E. 533. 3 cr. (Formerly 34)

536. Fluid Dynamics

Fundamentals and phenomena of compressible and incompressible fluid flow and its relation to thermodynamics, including fluid properties, energy transfer and momentum principles. Specifically considered are adiabatic flow with and without friction, diabatic flow, dimensional analysis and flow measurement. Prereq.: M.E. 526, 533. 3 cr. (Formerly 36)
537. Mechanical Laboratory
Study and instrumentation of mechanical engineering equipment; preparation of engineering reports. Prereq. or concurrent: M.E. 533. 1 lab.; 1 cr. (Formerly 37)

538. Mechanical Laboratory
Investigation of the operating characteristics of mechanical equipment and heat exchangers; experimental stress analysis. Prereq.: M.E. 527, 537. Prereq. or concurrent: M.E. 534, 536. 2 lab.; 2 cr. (Formerly 38)

643. Machine Design and Analysis
Analysis and design of mechanical elements and systems, utilizing and developing further the fundamentals of strength of materials and dynamics. Prereq.: M.E. 526, 527, Math. 527. 3 cr. (Formerly 43)

644. Mechanical Vibrations
Analysis of vibration motion for discrete mechanical systems. Prereq.: M.E. 526, Math. 527. 3 cr. (Formerly 44)

654. Heat Transfer

657-658. Heat and Power Systems
The analysis of problems relating to heat and power systems and to energy transfer and transmissions in general. The principles of thermodynamics, fluid flow, combustion, heat transfer, and other engineering sciences shall be utilized and developed further. Prereq.: M.E. 534, 536, 538. 3 cr. (Formerly 57-58)

663. Materials II
Behavior of metals, plastics, and ceramics in engineering environments. Non-equilibrium multiphase relations, diffusion, nucleation of phases, dislocation models of creep and relaxation, ductile and brittle modes of failure, thermal stresses, modification of bulk and surface properties through deformation and heat treating. Laboratory work includes observation of properties by classical mechanical methods. Prereq.: M.E. 522. 2 lec.; 1 lab.; 3 cr. (Formerly 63)

664. X-ray Metallography
Theoretical and experimental studies of X-ray diffraction and micro-radiography. Production of X-rays; directions and intensities of diffracted beams; Laue and Debye-Scherrer photographs, size, perfection, and orientation of grains; phase diagram determinations; stress measurement. Prereq.: M.E. 522 or permission of instructor. 3 cr. (Formerly 67)

671. Naval Architecture I
Introduction to ships — nomenclature and types. Geometry and hull form delineation. Hydrostatic characteristics of freely floating, partially waterborne, and damaged ships. Hydrostatic characteristics of submerged bodies. Introduction to ship strength. Computer application to problems. Prereq.: M.E. 525, 527 (may be taken concurrently). 3 cr. (Formerly 71)
691. Engineering Economy
The principles which form the basis of engineering procedures for obtaining the highest ratio of utility to cost. Prereq.: Senior standing. 3 cr. (Formerly 65)

692. Industrial Management
Principles and methods of industrial management, designed to give students a working knowledge of modern industrial practice, with particular emphasis on the engineering viewpoint. Prereq.: Senior standing. 3 cr. (Formerly 66)

695-696. Mechanical Engineering Project
A special study involving investigation of problems or areas germane to mechanical engineering. Prereq.: Permission of department. 1-3 cr. (Formerly 51-52)

697-698. Mechanical Engineering Seminar
Student reports and discussions of recent developments in mechanical engineering. Prereq.: Senior standing. 1 cr. (Formerly 41-42)

699. Undergraduate Thesis
An investigation or research of some mechanical engineering problem. Elective for seniors in Mechanical Engineering. Prereq.: Permission of the Department. 2 cr. (Formerly 49)

701. Advanced Thermodynamics

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. 527, Math. 629. 3 cr. (Formerly 105)

729. Kinematics
The classical vector equations of relative motion are used to analyze mechanisms of varying complexity. By the use of descriptive geometry the vector equations are applied to three dimensional motion and graphical solutions in three dimensions are obtained. Analytical methods are also used and space linkages analyzed. Prereq.: M. E. 526. 1 lec.; 2 labs.; 3 cr.

751. Gas Dynamics

755. Internal Combustion Engines
Thermodynamics applied to spark ignition and compression ignition engines. Fuels, carburetion, fuel injection, lubrication, performance. Prereq.: M. E. 533. 2 lec.; 1 lab.; 3 cr. (Formerly 55)
756. TURBOMACHINERY
Thermodynamics and fluid flow principles applied to rotating machinery. Prereq.: M. E. 534, 536. 2 lec.; 1 lab.; 3 cr. (Formerly 56)

772. NAVAL ARCHITECTURE II
Hydrodynamic resistances-surface ships and submerged bodies. Model testing theory. Powering and propellers. Use of "Standard Series" tests. Introduction to ship motion and control steering and rudders. Concepts of ship design. Computer application to problems. Prereq.: Consent of instructor. 3 cr. (Formerly 72)

Microbiology (47)

Lawrence W. Slanetz, Professor; Theodore G. Metcalf, Professor; William Chesbro, Associate Professor; George J. Hageage, Jr., Assistant Professor

501. Public Health and Sanitation
The nature and types of microbes causing infectious diseases; the prevalence, transmission, and control of these diseases. Sanitation of water, sewage, food, and air. Community hygiene and public health administration. Mr. Slanetz. Prereq.: Biol. 401-402 or consent of instructor. 3 lec. or demonstrations; 3 cr. (Formerly 5)

503. General Microbiology
Principles of microbiology; morphology, physiology, and classification of bacteria and other microorganisms, and their relationship to agriculture, industry, sanitation, and infectious diseases. Mr. Slanetz, Mr. Metcalf, and Mr. Chesbro. Prereq.: Chem. 401-402 or equivalent. 2 lec.; 2 lab.; 4 cr. (Formerly 1)

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. (Formerly 2)

700. Soil Microbiology
The nature and types of bacteria and other microorganisms present in soil and their activities in carrying out decomposition of plant and animal matter; their role in the nitrogen, carbon, and sulfur cycle in soil; their relationship to other soil inhabitants; and their contribution to soil fertility. Mr. Chesbro. Prereq.: Microb. 503. 2 lec.; 2 lab.; 4 cr. (Alternate years) (Formerly 6)

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.: Micro. 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.: Micro. 503. 2 lec.; 2 lab.; 4 cr. (Formerly 8 and 108)

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.: Micro. 702. 2 lec.; 2 lab.; 4 cr. (Formerly 53)

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.: Micro. 702. 1 lec.; 3 lab.; 4 cr. (Formerly 60)

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. (Formerly Biol. 61-62)

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. (Formerly 55, 56)

797, 798. Microbiology Seminar

Reports and discussions on current literature and recent developments in microbiology. Mr. Slanetz and staff. Prereq.: Microb. 600 or 702 and consent of the instructor. 1 2-hr. period; 1 cr. (Formerly 57, 58)

Music

Karl H. Bratton, Professor; Robert W. Manton, Professor; Donald E. Steele, Professor; John B. Whitlock, Associate Professor; Andrew J. Galos, Associate Professor; Irving D. Bartley, Assistant Professor; John W. Wicks, Assistant Professor; Raymond A. Hoffman, Assistant Professor; Donald A. Mattran, Assistant Professor; John J. Zei, Assistant Professor; Paul F. Verrette, 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 Curriculum. 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

Open to all students on the basis of individual audition. The Marching Band presents precision performances at home and away football games, pep rallies, and parades. The Symphonic Band studies and performs the finest in band literature and gives concerts on campus and throughout the New England area. Mr. Matran. Prereq.: Permission of instructor. 2 lab.; 1 cr. (Formerly 1)

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 members of the surrounding communities. Mr. Galos. Prereq.: Permission of instructor. 2 lab.; 1 cr. (Formerly 2)

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. (Formerly 3)

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. Zei. Prereq.: Permission of the instructor. 2 lab.; 1 cr. (Formerly 4)

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. (Formerly 5)

446, (446). Ensemble — Techniques and Literature

1) Brass; 2) Strings; 3) Tudor Singers; 4) Woodwind. 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. (Formerly 7)

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. (Formerly 8)
Lessons in Applied Music are based on 1/2-hour private instruction per week. One semester hour of credit may be earned with one lesson per week; two semester hours of credit may be earned with two lessons per week. 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 for one lesson a week, and $50 for two lessons a week. These fees include the use of a practice room for the required preparations.

 Majors in Applied Music 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. All Applied Music courses may be repeated.

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. Zei. 2 cr. (Formerly 19, 20)

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 the Music Education Curriculum. Enrollment limited to 8. Permission of instructor. 2 cr. (Not offered in 1964-65). (Formerly 21, 22)

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: pre-Bach, J. S. Bach, C. P. E. Bach, Scarlatti, Haydn, Mozart, Beethoven, the romantic composers, the post-romantic, and present-day composers. Mr. Manton, Mr. Steele, Mr. Bartley, and Mr. Wicks. 1 or 2 lessons; 1 or 2 cr. (Formerly 23)

571. **Organ**

A thorough foundation in pedal and manual technique, including hymn playing, followed in subsequent semesters by the standard works of Bach, Cesar, Franck, Widor, and contemporary composers. Students should be proficient in piano before enrolling for organ. Permission of the instructor is required. Mr. Bartley and Mr. Wicks. 1 or 2 lessons; 1 or 2 cr. (Formerly 24)
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 is 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. 1 or 2 lessons; 1 or 2 cr. (Formerly 25)

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. Zei. 1 or 2 lessons; 1 or 2 cr. (Formerly 26)

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. 1 or 2 lessons; 1 or 2 cr. (Formerly 27)

575. **WOODWIND**

The technique and literature of clarinet, flute, oboe, bassoon, and saxophone, or any woodwind instrument. Mr. Mattran and Mr. Whitlock. 1 or 2 lessons; 1 to 2 cr. (Formerly 28)

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 and Mr. Mattran. 1 or 2 lessons; 1 or 2 cr. (Formerly 29)

577. **PERCUSSION**

Snare drum rudiments. The technique, tuning and sticking of the pedal and hand 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. 1 or 2 lessons; 1 or 2 cr. (Formerly 30)

**Theory and Composition (63)**

421-422. **SIGHTSINGING, EAR TRAINING, DICTATION I**

Intensive training in the acquisition of the basic essentials of music. Development of rhythmical sense, the identification and singing of intervals, accurate response to melodic, harmonic, and rhythmical dictation, the basic laws of musical notation, knowledge of scales, and terminology. Mr. Hoffman. 3 labs. 0 cr. (Formerly 9, 10)

*Mus. 421-422 is normally prerequisite to Mus. 423-424, but the two may be taken simultaneously with the approval of the instructor in Mus. 423-424. Qualified students are exempted from Mus. 421-422 when proper notification is furnished the College Dean's Office and the University Registrar.*
423-424. **Harmony I**

Basic techniques in harmonization in four parts of basses (figured and unfigured) and soprano melodies using triads and their inversions, non-harmonic tones, the dominant seventh and its inversions, and secondary dominants. Attention will also be given to harmonic rhythm and modulation. Harmonic analysis of Bach chorales will be an integral part of this course. Keyboard harmony will also be stressed. Mr. Wicks. **Prereq.**: Music 421, 422. However, if the student has sufficient familiarity with the keyboard to be able to read simple pianoforte music, he should take Music 423, 424 in his freshman year along with Music 421, 422. In this case, permission of the instructor is required. Mr. Wicks. 2 cr. (Formerly 11, 12)

521-522. **Sightsinging, Ear Training, Dictation II**

An extension of Music 421, 422. 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. (Formerly 13, 14)

523-524. **Harmony II**

Continuation of harmonization techniques developed in **Harmony 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 submedian; the Neapolitan sixth; the four augmented 6th chords; and other chromatically altered 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. 423, 424. 2 cr. (Formerly 15, 16)

525-526. **Conducting Methods — Instrumental and Choral**

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 choral and instrumental conducting techniques, problems of choral organization, psychology of rehearsal. Mr. Galos, Mr. Bratton and Mr. Mattran. 1 cr. (Formerly 41, 42)

719-720. **Counterpoint**

First semester: Sixteenth century polyphony based on the sacred choral style of Palestrina, Vittoria, Lassus, and others of this period. Second semester: free instrumental counterpoint based on the styles of Bach, Handel, and other classic masters. Twentieth century counterpoint will be discussed in the closing classes of the course. Mr. Manton. **Prereq.**: Mus. 523-524 or permission of instructor. 2 cr. (Formerly 53, 54)

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 canonic 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. Mr. Manton. **Prereq.**: Mus. 719-720 or permission of instructor. 2 cr. (Formerly 59, 60)

723-724. **Composition**

The various smaller harmonic forms, the variation, the rondo, and the sonata forms will serve as models for composition. Mr. Manton. **Prereq.**: Permission of the instructor. 2 cr. (Formerly 71, 72)
History, Literature, and Appreciation  (63)

401. Music Appreciation

Intelligent listening through formal analysis of the irreductible minimum of great musical masterpieces. A selection of the most important works of Beethoven, Schubert, Mendelssohn, Chopin, Liszt, Brahms, Franck, Tchaikowsky, d'Indy, and many others analyzed by the students and the instructor and played several times in the classroom. 2 cr. (Formerly 97, 98)

402. Music Appreciation

Continuation of Music 401. 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.) (Not offered in 1964-65.) (Formerly 35)

403-404. Introduction to Music Literature

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. Mr. Wicks and Mr. Hoffman. 3 cr. (Formerly 37-38)

405-406. Music History and Literature

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. Wicks. 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.) (Offered in 1964.) (Formerly 40)

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. Mr. Manton. 2 cr. (Alternate years; not offered in 1964-65.) (Formerly 43)

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. (Alternate years; offered in 1964-65.) (Formerly 61)

702. MUSIC OF THE EIGHTEENTH CENTURY
The lives and outstanding works of Bach, Handel, Haydn, and Mozart. Mr. Wicks. 2 cr. (Alternate years; offered in 1964-65.) (Formerly 62)

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. (Alternate years; not offered in 1964-65.) (Formerly 63)

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. (Alternate years; not offered in 1964-65.) (Formerly 64)

705. THE LIFE AND WORKS OF BEETHOVEN
The piano sonatas, symphonic works, and the string quartets. Lectures, analysis, reports, required readings, and listening. Mr. Manton. 2 cr. (Alternate years; not offered in 1964-65.) (Formerly 83)

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. Zei. 2 cr. (Alternate years; offered in 1964-65.) (Formerly 87-88)

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. (Alternate years; offered in 1964-65.) (Formerly 47, 48)

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. (Formerly 95)

552. TECHNIQUES AND METHODS IN WOODWIND INSTRUMENTS
Correct tone production and technique of woodwind instruments. Materials and procedures for class and individual instruction. The school band as a concert organization. Mr. Mattran. 3 cr. (Formerly 96)

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. (Formerly 97)
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 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 would substitute it for two of the instrumental 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. Emphasis 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 1964-65.) (Formerly 57)

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. (Summer Session course.) (Formerly 98)

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 relationship of the teacher to school and community. Observation of music programs in secondary schools. Mr. Whitlock. Prereq.: Educ. 758. 3 lec.; 1 lab.; 3 cr. (Formerly 93)

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. (Formerly 90)

793, 794. EDUCATION-MUSIC (Ed-Mu). SUPERVISED TEACHING IN ELEMENTARY AND SECONDARY SCHOOL MUSIC

Prereq.: Mu-Ed. 792, 791. (Formerly 93, 94)

796. MUSIC EDUCATION SEMINAR

Problems of organizing and administering school orchestras, bands, glee clubs, choruses and small ensembles, such as objectives, motivation, schedule, discipline, equipment, programs, finances, rehearsal techniques, contests and festivals, materials, personnel selection and grades. Mr. Whitlock. 3 cr. (Special Summer Session course; offered in 1964-65.) (Formerly 94)
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 instrumental classes, as well as the development of music organizations. This seminar is especially designed for classroom music teachers and supervisors of considerable experience. Opportunity will be given the class members 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; offered in 1964-65.) (Formerly 99)

Occupational Therapy (65)
Marguerite Abbott, Associate Professor; 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; Gerhard Nothmann, m.d., Community Psychiatry; Anna Philbrook, 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.

411. Survey of 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. (Formerly 41)

412. Therapeutic Crafts
Therapeutic crafts and skills in selected handicrafts, such as stenciling, copper tooling, bookbinding, fly tying, basketry, cord knotting, papier-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 $3.00-$5.00. Miss Bell. 2 lab.; 3 cr. (Formerly 1)

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 $10.00-$15.00. Miss Bell. 2 lab.; 3 cr. (Formerly 2)

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. 2 cr. (Formerly 42)
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 minimal anxiety and maximum support) by utilizing individual and group activity programs. Miss Bell. 2 cr. (Formerly 44)

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 Abott. *Prereq.: O. T. 522, 681, 682. 2 cr. (Formerly 46)*

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. 3 cr. (Formerly 49)

682. **ORTHOPEDIC MEDICAL LECTURES**

Etiology, pathology, symptoms, and treatment of orthopedic conditions. Films. Dr. Arthur DiMambro. 2 cr. (Formerly 50)

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. Anna Philbrook. 2 cr. (Formerly 51)

698. **ADVANCED READING SEMINAR**

A conference-seminar to assist the senior O.T. student to integrate the knowledge and skills he has acquired. Administration, including floor plans, purchasing, and inventory, will be studied. 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 are integrated by experts in the humanities and medicine, by way of the seminar conference method. This will be followed by a plan of integrated independent study in a specific field of study, of one and not more than two fields of the student's major O.T. interest. A final thesis will be required. Miss Abbott. 2 cr. ( Formerly 56)

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. 2 cr. (Formerly 48)
711. Clinical Affiliation in General Medicine, Surgery, and Pediatrics
   Full time — three months. No credit. (Formerly 92)

712. Clinical Affiliation in Psychiatry
   Full time — three months. No credit. (Formerly 93)

713. Clinical Affiliation in Physical Disabilities
   Full time — three months. No credit. (Formerly 94)

All occupational therapy affiliation fees must be paid prior to entering any affiliation, starting either in the summer following the junior year or after the senior year.

Philosophy (66)

Robert P. Sylvester, Assistant Professor; Donald C. Babcock, Professor Emeritus; Asher Moore, Professor; Paul Brockelman, 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. Mr. Sylvester. Open to all students. 3 cr. (Formerly 3)

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. Mr. Moore. Open to all students. 3 cr. (Formerly 5)

411. Philosophy of Human Nature
   A study of representative views of the nature of man, such as the alternatives proposed by theism, naturalism, and existentialism, and with particular attention to some of the fundamental problems of ethics, such as duty and happiness, freedom and responsibility, individualism and authority. Readings from traditional and contemporary philosophical literature and from the literature of the social sciences. Mr. Brockelman. Open to all students. 3 cr. (Formerly (8))

420. Philosophies in the Contemporary World
   A discussion of philosophies which are shaping the present. These philosophies are considered both abstractly and in their concrete expressions in artistic and social forms, and account is taken of their relations with science and technology. Mr. Moore. Open to all students. 4 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. 3 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. (Formerly 21, 22)

502. Mediaeval Philosophy

The philosophic thought of the Middle Ages from Augustine to Scotus but with particular emphasis upon the writings of St. Augustine and St. Thomas Aquinas. Prereq.: Phil. 500 or permission of the instructor. (Not open to freshmen.) 3 cr. (Alternate years) (Formerly 24)

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.) 3 cr. (Formerly 25)

520. Aesthetics

An examination of representative theories concerning the nature of art and aesthetic experience. (Not open to freshmen.) 3 cr. (Alternate years) (Formerly 26)

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.) 3 cr. (Formerly 27)

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.) 3 cr. (Formerly 28)

600. Philosophy through Literature

A study of the philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. Mr. Moore. 3 cr. (Alternate years) (Formerly 52)

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. Mr. Sylvester. Prereq.: Phil. 500-501. 3 cr. (Alternate years) (Formerly 55)

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. Mr. Brockelman. Prereq.: Phil. 500-501. 3 cr. (Alternate years) (Formerly 56)
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 experimental design, theory construction, operationism, the nature of mathematics and its application in science, the place of speculation in science, the unity of science, special problems of the biological and social sciences. The relation of science to ethics, the humanities, and everyday life. Mr. Sylvester. 3 cr. (Alternate years) (Formerly 58)

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. 3 cr. Barring duplication of subject this course may be repeated for credit. **Subjects for 1964-65. Fall Semester:** Aristotle. Mr. Brockelman. Spring Semester: *Plato.* Mr. Sylvester. (Formerly 89)

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. 3 cr. Barring duplication of subject this course may be repeated for credit. (Formerly 90)

795, 796. **Individual Study**

Students who are adequately prepared to do independent work involving extensive reading and writing may do advanced work on an individual basis. Before registering for this course the student must formulate a project and secure the consent of a member of the department who will supervise his work. Conferences and/or written work as required by the supervisor. Credits to be arranged. (Formerly 99)

**Physical Education for Men (90)**

**James W. Long, Professor and Director, Division of Physical Education and Athletics; Carl J. Lundholm, Professor; Paul C. Sweet, Professor; Clarence E. Boston, Associate Professor; Andrew Mooradian, Associate Professor; E. William Olson, Associate Professor; E. J. Blood, Assistant Professor; Theodore W. Conner, Instructor; F. William Haubrich, Instructor; Donald R. Cochren, 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.

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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.

Physical Education Activity Courses

431-432. Basic Activity Courses
First quarter: lectures and laboratory experience. Second, third, and fourth quarters: required activities will be based upon the results of testing in the basic course and the student's needs and interests. Required activities will include badminton, bowling, golf, gymnastics and tumbling, handball, beginners skating, figure skating, beginners skiing, social dance, squash rackets, riding, beginners swimming, advanced swimming, weight-training and conditioning, tennis and wrestling. 2 hrs.; 1/2 cr. (Formerly 31, 32)

433, 434. Elective Activity Courses
Additional elective activity courses may be elected by sophomore, 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.; 1/2 cr.

Teacher Preparation Courses

441-442-443-444. Physical Education Activity Courses
Opportunity for students to become acquainted with basic skills in a variety of physical activities taught in the secondary school. Required of students in the Physical Education Curricula in lieu of P.E. 431-432. 3 periods; 1 cr.

453. Principles of Physical Education
The aims, objectives and principles of physical education and the historical factors which have influenced the physical life of nations. 3 cr. (Formerly 23)

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. Prereq.: Zool. 507. 2 cr.

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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. 1 lec.; 2 lab.; 2 cr. (Formerly 48)

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. 1 lec.; 2 lab.; 2 cr. (Formerly 45)

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. 1 lec.; 2 lab.; 2 cr. (Formerly 46)

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. 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. 2 lec.; 1 lab.; 2 cr.

527. **Theory of Teaching Aquatics***

Theory, teaching methods, and skills in swimming, diving and water safety. 2 lec.; 1 lab.; 2 cr.

528. **Problems of Coaching Track and Field***

Instruction and practical demonstrations 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. 1 lec.; 2 lab.; 2 cr. (Formerly 47)

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. 1 lec.; 2 lab.; 2 cr.

533. **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. 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. 3 cr. Prereq.: Biol. 401-402.

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*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.
622. **First Aid-Safety; Athletic Training**

Nature and causes of injuries incident to physical activities. The common hazards of play, and preventative measures for children and athletes are discussed. First aid principles are presented. 2 cr. **Prereq.:** Zoo. 507. (Formerly 63)

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. 3 cr. **Prereq.:** Zoo. 507.

756. **Problems of Health Education**

A course designed to acquaint the student with methods, materials and principles of developing a broad school health program. 3 cr. **Prereq.:** P. E. 582. (Formerly 56)

765. **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. 3 cr. (Formerly 65)

768. **Measurement Procedures in Physical Education**

The study of procedures used in the selection, administration, instruction, and use of motor skill, knowledge tests, and evaluation methods in the field of physical education. 2 cr. (Formerly 68)

P.E.-Ed. 792. **Problems of Teaching Physical Education in the Elementary School**

Methods, materials and organization of a comprehensive program of activities for use of primarily in the elementary school. 3 cr. (Formerly 91)

Ed.-P.E. 790. **Directed Teaching of Physical Education**

Opportunity for teaching physical education activities under direction in the elementary or secondary school. **Prereq.:** P. E. 791 or concurrently. 1 lec.; 2-5 hr. lab.; 6 cr. (Formerly 92)

### Physical Education for Women (91)

Marion C. Beckwith, Director and Professor of Physical Education for Women; Evelyn Browne, Associate Professor; Caroline S. Wooster, Associate Professor; Barbara K. Newman, Associate Professor; Joan T. Stone, Assistant Professor; Janet Atwood, Assistant Professor; Marilyn D. Tavares, Assistant Professor; Ruth E. Murray, Assistant Professor; Nancy B. Gilbert, Instructor; Elizabeth E. Knowlton, 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-curricular competition 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, 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 freshman 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 the fall that they enter the University.

Special gymnasium uniforms consist of 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 and ability of the less skilled, the Department includes in its program numerous club and other activities in which advanced instruction is given by a member of the teaching staff. Membership is open to any University student. Qualifications are club standards or membership requirements of the group. The clubs and their instructors follows:

Dance Club — Miss Tavares; Rifle Club — Miss Browne; Durham Reelers — Mrs. Jean Tufts; Skating Club — Mrs. Judith Jones; Ski Club — Miss Newman; W.R.A. — Mrs. Gilbert 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 dancing, recreation workshop, volleyball, hockey, basketball, and American country dancing.

Basic Instructional Program

401, 402, 403, 404. Physical Education Activity Courses

Required of all freshmen and sophomore women (except prospective freshman majors, elect 411 and 421.) Select from list below. Freshmen must take Movement Fundamentals the first semester. 3 hrs.; 1 cr. (Formerly 1, 2, 3, 4)

405, 406. Physical Education Activity Courses

Elective for juniors and seniors plus freshman 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, movement fundamentals, golf (elem. + inter.), modern dance, hockey, individual gym, riding (elem. + inter. + adv. + colt training), speed ball, swimming (majors), tennis (elem. + inter.).

**Second Quarter**

Basketball, badminton (elem. + inter.), elementary games (majors), fencing, folk dance, movement fundamentals, gymnastics, modern dance (elem. + inter.), individual gym, riding (beg. + elem. + inter. + adv. + colt training), riflery, figure skating (elem. + inter.), skiing (beg.), recreation workshop, stunts and tumbling.

**Third Quarter**

American square dance, badminton (elem. + inter.), dance composition, elementary games, fencing, folk dance, gymnastics, individual gym, modern dance (elem. + inter.), riding (elem. + inter. + adv. + colt training), riflery (elem. + inter.), figure skating (elem. + inter.), skiing (beg. + elem. + inter. + adv.), recreation workshop, stunts and tumbling, volleyball.

**Fourth Quarter**

Archery (elem. + inter.), outdoor education, dance composition (elem. + inter.), individual gym, lacrosse, modern dance, riding (elem. + inter. + adv. + colt training), softball, swimming (majors), tennis, (elem. + inter.).

**Theory Courses**

453. **Principles of Physical Education**

The aims, objectives, and principles of physical education and the historical factors which have influenced the physical life of nations. Miss Browne and Mr. Conners. 3 cr. (Formerly 23)

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. Elective for sophomores, juniors, and seniors (by permission of instructor). 3 cr. (Formerly 24)
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. Mrs. Gilbert. Elective for sophomores, juniors, and seniors. 3 cr. (Formerly 36)

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. 2 cr. Prereq.: Zool. 507.

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 Tavares. Open to Physical Education majors or by permission of instructor. 2 lec.; 1 lab.; 2 cr. (Formerly 53, 54)

563, 564. The Theory of Teaching Team Sports for Women

The methods involved in the teaching of team sports and lead-up games with emphasis on coaching methods 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. (Formerly 63, 64)

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. (Formerly 73, 74)

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. Prereq.: Biol. 401-402. 3 cr.

755. 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. (Formerly 55)

756. Problems of Health Education

Methods, materials, and principles of teaching school health. Open to Physical Education majors and others by permission of instructor. Prereq.: P. E. 582. 3 cr. (Formerly 56)

765. 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, facili-
ties, equipment, selection of staff, and public relations. Miss Browne. 3 cr. (Formerly 66)

768. Measurement Procedures in Physical Education

Procedures used in the selection, administration, construction, and use of motor skill, knowledge tests, and evaluation methods in the field of physical education. 2 cr. (Formerly 68)

788. Recreation Field Work

Opportunity for participation in the planning and operation of a variety of recreation programs, under supervision, in nearby clubs and community centers. Prereq.: P.E.-Ed. 792 or concurrently. Mrs. Gilbert. 1 lec.; 2-5 hr. lab.; 6 cr. (Formerly 96)

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. (Formerly 92)

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. (Formerly 91)

Physics (86)

John A. Lockwood, Professor; Harry H. Hall, Professor; Horace L. Howes, Professor Emeritus; David G. Clark, Associate Professor; Edward L. Chupp, Associate Professor; John E. Mulhern, Jr., Associate Professor; Lyman Mower, Associate Professor; Robert E. Houston, Jr., Associate Professor; Laurence J. Cahill, Jr., Associate Professor; Robert H. Lambert, Assistant Professor; Richard L. Kaufman, Assistant Professor; George H. Mullen, Assistant Professor; Robert E. Simpson, Assistant Professor

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.) 4 cr. (Formerly 1-2)

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. (Formerly 9)

404. General Physics I

Fundamental concepts of physics. This is Part I of a three-part sequence, of which Parts II and III are selected topics chosen for deeper and more
rigorous treatment. 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. (Formerly 18)

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. (Formerly Math. 30)

501-502. GENERAL PHYSICS II, III

Selected topics from kinematics and dynamics, kinetic theory, electrostatics, electromagnetism, wave motion, 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. (Formerly 23-24)

503. MODERN PHYSICS

An introduction to twentieth century physics, including the structure of atoms and nuclei, basic ideas of quantum mechanics and solid state theory. Prereq.: Phys. 501, 502, Math. 523, 527. 3 lec.; 3 cr. (Formerly 37)

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.; 4 cr. (Formerly 31-32)

605-606. EXPERIMENTAL PHYSICS I AND II


607. PHYSICAL OPTICS

Starting with Maxwell’s Equations and covering the nature of light, interference, diffraction, polarization, and related phenomena. Prereq.: Phys. 703-704 taken concurrently. Math. 527. 3 lec.; 3 cr. (Formerly 81)

608. THERMODYNAMICS

An introduction to thermodynamics and kinetic theory. 3 cr. (Formerly 82)

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.; 4 cr. (Formerly 95-96)

* See description of Liberal Arts Physics major, page 82.
611-612. **Physical Colloquium**

Participation in departmental colloquium reading, and study. *Prereq.*: Senior standing in Physics. 1 cr. May be taken more than once. (Formerly 97-98)

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. (Formerly 99)

615-616. **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. 4 cr. (Formerly 91)

702. **Atomic and Nuclear Physics**

Natural radioactivity, nuclear reactions, nuclear scattering, models of the nucleus, high energy nuclear physics, cosmic rays. *Prereq.*: Phys. 701 4 cr. (Formerly 92)

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. 4 cr. (Formerly 83-84)

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**Plant Science (32)**

**Horticulture and Crops**

Lincoln C. Peirce, Professor; 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; James R. Mitchell, Assistant Professor; Owen M. Rogers, Assistant Professor; Radcliffe B. Pike, Extension Specialist

401. **Introductory Crop Production**

The production, distribution, cultural practices, improvement, and uses of field crops, such as forage, grain and tuber crops. Mr. Higgins. 2 lec.; 1 lab.; 3 cr. (Formerly 1)

406. **Plant Propagation**

Discussion and practice including soil, sand, and peat media; seed treatments, seeding, watering, light, feeding, and temperatures; leafy, softwood, and hardwood cuttings; hormone treatment; budding, root, top and bridge-grafting; seedbed nursery practice. Mr. Rogers. 2 cr. (Formerly 2)
408. **General Horticulture**

The principles and practices of horticulture, including fruits, vegetables, and ornamentals, as they apply to both commercial production and the growing of plants in and around the home. Staff. 2 lec.; 1 lab.; 3 cr. (Formerly 4)

413. **Horticultural Products and Judging**

Selection of fruits, vegetables, and flowers for exhibition, marketing, and domestic use. The management and judging of small fairs and exhibitions. A wide range of plants and varieties, both fresh and frozen, are used as class material. Required of all Horticulture majors and recommended for others who are training for such positions as county agricultural agents, home demonstration agents, club leaders, or Smith-Hughes teachers. 2 lab.; 2 cr. (Formerly 13)

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. (Formerly 27)

437. **Floral Arrangement**

Floral design and the use of flowers in the home; practice in floral arrangement. A laboratory fee of $5.00 is charged. Mr. Rogers. Prereq.: Permission of the instructor. 1 lab.; 1 cr. (Formerly 37)

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. 1 and permission of instructor. 1 lab.; 1 cr. (Formerly 25)

604. **Production of Row and Other Annual Crops**

The characteristics and fundamentals of production of row and drilled crops, with emphasis on corn, potatoes, and other cereal crops. Mr. Higgins. 2 lec.; 1 lab.; 3 cr. (Formerly 26)

654. **Small Fruits**

The culture and economic uses of the strawberry, raspberry, blackberry, blueberry, cranberry, and grape. Each fruit is considered with relation to its history, propagation, planting, pruning, harvesting, marketing, insects and diseases, and domestic uses. Mr. Eggert. 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 54)

659. **Greenhouse Management**

Modern methods of greenhouse management including soils, watering, costs of production and marketing, and fundamentals of plant behavior under glass. Mr. Rogers. 2 lec.; 1 lab.; 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 59)

666. **Nursery Management**

The development of the nursery business. Factors that influence the location of a nursery, layout of the plant, soil and site, types of plants, pest control, inspection, digging, grading, storage, packing, shipping, and sales. Mr. Eggert. Prereq.: Plant Propagation. 1 lec.; 1 lab.; 2 cr. (Alternate years; not offered in 1964-65.) (Formerly 66)
670. Problems in Crop Production
Principles and practices in crop production, including the management of soils and the use and response of lime and fertilizers. For personnel in agricultural education and other students with the permission of their advisers. Staff. Summer session only — not offered in 1965. Two hours daily, lec. and lab.; 2 cr. (Formerly 70)

678. Commercial Greenhouse Crops
A survey of the principal greenhouse crops and an intensive study of their individual culture. Mr. Rogers. Prereq.: Greenhouse Management. 2 rec.; 1 lab.; 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 78)

705. (705). Pasture-Hay Crops and Turf Management
The grasses and legumes used as hay, pasture, and silage, and the methods used in the production of high quality forage. Consideration also will be given to turf grasses and management of lawns and turfs. Mr. Higgins. Prereq.: Permission of instructor. 3 lec.; 1 lab.; 4 cr. (Formerly 51)

706. Breeding of Field Crops
Principles and methods of breeding of grasses, legumes, and cereal crops. The genetic basis of breeding will be emphasized. Laboratory will consist of genetic problems, crossing and inheritance studies in the greenhouse, and statistical analysis of experimental plot designs. Mr. Dunn. 2 lec.; 1 lab.; 3 cr. (Alternate years; not offered in 1964-65.) (Formerly 62)

753. Orchard Fruits
Examination of fundamental principles and experimental data and their application to orchard problems, including the establishment of orchards, soil management, water and fertilizer requirements, mineral deficiencies, training and pruning, fruit bud formation, pollination and fruit setting, thinning and winter injury. Mr. Eggert. 3 cr. (Formerly 53)

763. The Development of the Vegetable Industry
Similarities and differences in management of vegetable production for fresh market, processing, seed, roadside sales, and home use. The significance of the plant processes of photosynthesis, respiration, and translocation to the vegetable grower. Environmental factors of soil, temperature, and moisture as they affect vegetable production. The management and role of plant growing structures, seed testing, variety selection, nutrition, weed control, and irrigation in the home garden and commercial plantings. 2 lec.; 1 lab.; 3 cr. (Formerly 63)

764. The Commercial Production, Storage, and Marketing of Several Different Vegetable Crops
The management methods of culture, weed control, insect and disease control, nutrition, irrigation, and marketing of different types of vegetables and in different soils. The use and limitations of specialized equipment and chemicals together with a review of recent experimental work in vegetable production. 2 lec.; 1 lab.; 3 cr. (Formerly 64)

794. Plant Breeding
Application of the principles of genetics to practical plant breeding. Hybridization, chemical treatments, and selection as means of producing and improving varieties. Mr. Rogers. Prereq.: Zoology 61. 2 lec.; 1 lab.; 3 cr. (Formerly 94)
795, 796. Investigations in Plant Science

1. Fruits — Mr. Eggert. 2. Flowers — Mr. Rogers. 3. Vegetables — Mr. Eggert. 4. Ornamentals — Mr. Rogers. 5. Plant Breeding — Mr. Dunn and Mr. Rogers. 6. Field Crop Production — Mr. Higgins. Hours to be arranged. 1 to 4 cr. (Formerly 95, 96)

797, 798. Plant Science Seminar

Library and reference work on special phases of horticultural and field crop problems. Practice in consulting literature and in preparation and presentation of reports and abstracts. Required each semester of seniors and graduate students majoring in Plant Science; elective for other qualified students. Staff. 1 cr. (Formerly 91-92)

Poultry Science

(See Animal Sciences)

Psychology (67)

Eugene S. Mills, Professor; Herbert A. Carroll, Professor Emeritus; George M. Haslerud, Professor; Brian R. Kay, Associate Professor; Raymond L. Erickson, Associate Professor; Frederick M. Jervis, Associate Professor; Walter R. Duryea, Assistant Professor; Vincent J. Tempone, Assistant Professor; Robert G. Condon, Assistant Professor; William W. Lothrop, Assistant Professor; Ruth M. Pollack, Lecturer

401-402. General Psychology

An introduction to psychology as a behavioral science with emphasis on both its theoretical and applied aspects. A systematic study is made of the basic determinants of behavior and the nature of psychological inquiry. In the first semester, such topics as the history of psychology, scientific method, perception, conditioning, motivation, and frustration and conflict are considered. In the second semester, complex learning and problem solving, psychological testing, personality, social behavior, and psychopathology are among the areas studied. Staff. Not open to seniors in the College of Liberal Arts. 3 cr. Both semesters are prerequisites for all other courses in the department, except with permission of the instructor. This course cannot be counted for major credit. (Not open to students who have taken Psych. 1) (Formerly 1; 47)

437. Developmental Psychology

Man’s behavioral and psychological development and their relation to physical growth. Phylogenetic and ontogenetic development is 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. Not open to freshmen. Mr. Duryea. Prereq.: Psych. 402 or permission of instructor. 3 cr. (Formerly 37)

532. Industrial Psychology

A survey of the applications of psychology to business and industry. Communication and human relations, accident prevention, conditions of
work, human engineering, motivation of workers, and an introduction to recruitment, selection and training of personnel. Mr. Kay. Prereq.: Psych. 402 or the permission of the instructor. Not open to freshmen. 3 cr. (Formerly 32)

544. Psychology of Personality
A survey of the major theories of personality with an examination of clinical and research literature as it is related to the nature and development of personality. Prereq.: Psych. 402. Not open to freshmen. 3 cr. (Formerly 44)

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 the thwarting of these needs. Ways of recognizing these conflicts by their manifestations and of helping students to resolve them. The mental hazards of the teaching profession. Mr. Jervis. 3 cr. Prereq.: Psych. 402. (Formerly 89)

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 are considered in detail. Mr. Erickson and Mr. Tempone. Prereq.: Psych. 402. 3 cr. (Formerly 54)

663. The Exceptional Child
The gifted, the retarded, the physically handicapped, and emotionally disturbed, as compared on basic psychological variables such as intellectual functioning, personality dynamics, and adjustment problems. Mr. Lothrop. Prereq.: Psych. 402. 3 cr. (Formerly 63)

667. Statistics in Psychology
The problems and methods involved in the statistical treatment of quantitative data in psychology. The computation and interpretation of elementary statistical measures such as mean, median, standard deviation and the various methods of correlation. Prereq.: Psych. 402. 3 cr. (Formerly 67)

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 will be made by members of the seminar as the basis for discussion. Prereq.: 15 semester credits in Psychology. 3 cr. (Formerly 98)

697. The Integrating of Psychology
By lectures, discussions and papers senior majors recall and reassess their previous psychology courses, 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. (Formerly 95)
Discussion of theory and practices in applying experimented methods to
a variety of psychological phenomena. Each student in the class will be
responsible for an individual experimental project. Mr. Haslerud, Mr. Dur-
yea, Mr. Erickson. Prereq.: Psych. 402. 2 lec.; 1 lab.; 3 cr. (Formerly 57)

The experimental support for contemporary theories of learning and their
practical implications. Mr. Haslerud. Prereq.: Psych. 402. 3 cr. (Formerly
58)

The drives and motives which underlie normal human behavior and the
forms of adjustment which arise when motives conflict or encounter ex-
ternal frustration. Mr. Mills. Prereq.: Psych. 402. 3 cr. (Formerly 60)

Similarities and differences in behavior of infra-human organisms at
different phylogenetic levels as aids to understanding how behavior evolved
and to the clarification of behavior principles. The historical and biological
foundations of such special topics as instinct, consciousness, abnormal be-
havior, social influence, reasoning and judgment are surveyed by use of
the comparative method. Mr. Duryea. Prereq.: Psych. 402. 3 cr. (Formerly
77)

The relation between behavior and the structure of the organism. Special
attention to the sensory, nervous, and glandular functions as the organic
base for motivation, emotion, learning, etc. Mr. Haslerud. Prereq.: Psych.
402. 3 cr. (Formerly 78)

The exploration of social structure and function of industrial organiza-
tions. Leadership, role and organization theories, and a critical evaluation
of their supporting experimental evidence. Mr. Kay. Prereq.: Psych. 402.
3 cr. (Formerly 82)

The complex expansion of contemporary psychology as seen in historical
perspective. Some of the major antecedents in philosophy, theology, and
the physical sciences. The subsequent extensive development of psychology
in the United States in the form of complementary schools and systems of
thought and research. Mr. Mills. Prereq.: Psych. 402. 3 cr. (Formerly 83)

Taught by a different instructor each year. The course will present ad-
vanced material in an area in which the instructor has developed special-
ized knowledge through research and special study. Students may repeat
the course but they may not duplicate areas. Instruction may be given
in any one of the following: (1) Clinical, (2) Developmental, (3) Differ-
tential, (4) Experimental, (5) Industrial, (6) Learning and Perception,
(7) Personality, (8) Physiological, (9) Psychological Evaluation, (10)
credits in Psychology and permission of instructor. 3 cr. (Formerly 93)
Reserve Officers Training Corps
Department of Military Science (98)

Lieutenant Colonel Carol H. Mullins, Infantry, Professor; Major Paul D. Tomlinson, Infantry, Assistant Professor; Captain Robert D. LaTour, Artillery, Assistant Professor; Captain Robert H. Nourse, Infantry, Assistant Professor; Captain Martin P. Sorensen, Artillery, Assistant Professor; Staff Sergeant Gilbert Phillips, Assistant; Staff Sergeant Norman D. Tufts, Assistant; Sergeant Lance E. Fuller, 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.

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. (Formerly 13)

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 developments 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. (Formerly 14)

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. (Formerly 23)
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. (Formerly 24)

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. (Formerly 33)

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. Minimum of five hours of instruction per week. 3 cr. (Formerly 34)

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. (Formerly 43)

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 pay 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. (Formerly 44)

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. 2 labs.; 1/2 cr. per year. (Formerly 66)

**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. Success-
ful 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 Air Science (99)

Colonel John F. Britton, USAF, Professor; Lieutenant Colonel William J. Luckey, USAF, Assistant Professor; Lieutenant Colonel William B. Canning, USAF, Assistant Professor; Captain Malcolm B. Robertson, USAF, Assistant Professor; Captain Donald P. Uhl, USAF, Assistant Professor; Captain Denis J. Driscoll, USAF, Assistant Professor; Master Sergeant Jefferson T. Joyner, USAF, Assistant; Technical Sergeant Charles E. Mooers, USAF, Assistant; Staff Sergeant John B. MacDonald, USAF, Assistant; Airman First Class James H. Allen, USAF, Assistant; Airman First Class Alfred Seppy, USAF, Assistant

Entrance requirements for basic Air Force ROTC are lenient, while those for advanced are quite strict. Completion of the basic Air Force ROTC course during the freshman and sophomore years entitles the student to six hours of academic credit while acquiring training in leadership skills and an understanding of the role of the military services in relation to national and international issues. Selection for advanced in both the flying and non-flying categories is based on character, attitude, academic record, and leadership ability. Each cadet selected for advanced Air Force ROTC must be a student in good standing with the University and Air Force ROTC, must successfully complete a battery of officer qualification tests, and be physically qualified for an Air Force commission.

About one-third of those admitted into advanced are physically qualified for, and desire, flight training as pilots 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. As there is a special need for Air Force officers with engineering backgrounds, students taking such courses are urged to apply for the advanced phase. In addition to uniforms provided to all cadets enrolled in AFROTC, advanced cadets receive a subsistence allowance during the junior and senior years, including summer periods. Successful completion of the advanced course and the award of a baccalaureate degree by the University qualifies the student for a commission as an officer in the United States Air Force Reserve.

413. Air Leadership

Leadership training of one hour each week. Course is required for all Air Science freshmen. In addition, the student must successfully complete a University course of at least two credits during the semester. Normally English I will complete this requirement. In addition, the following courses will satisfy the substitute course requirement: English 401, 402, 513 or 514; History 401 or 402; Biology 401, 402; Chemistry 401, 402, 403, 404, or 405; Geology 401 or 402; Physics 1, 2, or 18; Mathematics 2, 3, 7, 8, 21, or 22; Sociology 411; Botany 411. The student must designate one of the courses listed above as a substitute for the academic portion of A.S. 413. Variations from these courses will be made through the Department of Air Science. Credit. (Formerly 13)
416. Foundations of Aerospace Power

An introductory examination of the factors of aerospace power, major ideological conflicts, requirements for military forces in being, responsibilities of citizenship, development and traditions of the military profession, role and attributes of the professional officer in American democracy, organization of the armed forces as a factor in the preservation of national security, and the United States Air Force as a major factor in the security of the free world. Three hours of classroom instruction plus one hour of leadership laboratory. 3 cr. (Formerly 16)

525. World Military Systems

A comparative study of world military forces to include free world land and naval forces, free world air forces, communist military systems and trends in the development and employment of military power. Three class hours per week and one hour of Leadership Training. 3 cr. (Formerly 25)

528. Air Leadership

Air leadership laboratory of one hour each week. Course is required for all Air Science sophomores. In addition, the student must successfully complete a University course of at least two credits during the semester. Normally one of the following will complete this requirement: English 513, 514, 516; Humanities 1 or 2; Foreign Language; Biology 401, 402; Chemistry 401, 402, 403 or 404; Geology 401 or 402; Physics 1, 2, 9, 18, 23 or 24; Mathematics 2, 3, 7, 8, 21, 22, 23 or 24. The student must designate a substitute course during registration for that semester to the Department of Air Science. Variations from these courses will be made through the Department of Air Science. Credit. (Formerly 28)

635. The United States Air Force

A study devoted to the nature of military conflict and the development of aerospace power into a prime security element. Considers 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. Three classroom hours per week, one hour of supervised research and one hour of Leadership Laboratory. 3 cr. (Formerly 35)

636. Astronautics and Space Operations

A study of the development and the importance of the national space effort, the characteristics of the solar system that affect space exploration and operations and current and planned capabilities for space operations. Includes training in the development of leadership skills. Three classroom hours per week, one hour of supervised research and one hour of Leadership Laboratory. 3 cr. (Formerly 36)

745. International Relations

A study of international relations with emphasis on those factors of special interest to the Air Force officer. Considers the various determinants of a nation's power, the bases for power alignments in the world, efforts to alleviate major sources of tension among nations and current attempts to maintain world peace through international organizations. Flight instruction, training in weather and air navigation and an opportunity to qualify for a private pilot's license is offered to selected cadets. Three hours of classroom instruction, one hour of supervised research, plus one hour of Leadership Laboratory. 3 cr. (Formerly 45)

238
746. Military Aspects of World Political Geography; and the Air Force Officer

Course is devoted to study of the concepts of the military aspects of political geography, maps and charts, factors of power and the geographic influences upon political problems with a geographical analysis of the strategic areas. A study is also made of materials to help the cadet make a rapid, effective adjustment to active duty as an officer in the Air Force. Three hours of classroom instruction, one hour of supervised research, plus one hour of Leadership Laboratory. 3 cr. (Formerly 46)

Resource Economics (21)
(Agricultural Economics)

William F. Henry, Professor; James R. Bowring; Professor; Harold C. Grinnell, Professor; William H. Drew, Professor; Richard A. Andrews, Associate Professor; Silas B. Weeks, Associate Professor; George E. Frick, Adjunct Professor

402. Economics of Agriculture
A survey of economics as related to the agricultural industry. Includes the nature of farming costs and farm prices, the economics of marketing, the economic bases of consumer decision making, and agricultural policy. Mr. Henry. 3 cr. (Formerly 12)

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. Grinnell. 3 cr. (Formerly 51)

505. Agricultural Marketing
Food processing and distribution comprise one of the world’s most important industries. This course examines 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. Consideration is given to market development, plant location, prices, grades, and specification buying as related to the demand for food by institutional buyers, processors, and retailers. Emphasis is given to 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. (Formerly 55)

507. Economics of Consumption
The significance of consumer decisions about spending and saving to the economy. Budgeting and decision making in the major categories of consumer purchases. Factors influencing consumer choice, including prices, grades, and standards. Changing food needs and their relation to production and marketing problems. Problems of maximizing consumer satisfaction. Mr. Henry. 3 cr. (Formerly 34)

604. Farm Management Analysis
Principles of managing farms for maximum income, including methods of making management decisions; enterprise selection and resource combination; adjustment to prices; management of land, labor, and equipment;
obtaining capital; farm planning; records and analysis of performance. The principles are applied to several kinds of farms through examples, laboratory problems, and farm visits. Mr. Andrews. 3 lec.; 1 lab.; 4 cr. (Formerly 14)

697-698. Seminar in Resource Economics

Presentation and discussion of reports on economic theory and current economic topics with departmental staff. Prereq.: Junior standing. May be repeated. 1 cr. (Formerly 63-64)

706. Economics of Resource Development

This course will offer as background some of 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 will be discussed. 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. (Formerly 66)

708. Research Methods in Social Sciences

Designed to teach the scientific method of research to advanced students. Emphasis will be placed on the meaning of logic and the scientific method and on the application of research techniques to identifying and solving problems. Prereq.: 3 hours of statistics. Mr. Drew. 3 cr. (Formerly 72)

711. Public Policy for Agriculture

The study of problems which are the basis for government and private policies in the production and marketing of agricultural products. Prices, production controls, marketing agreements, conservation, and farm credit are appraised relative to the objectives of agriculture and the concept of general welfare. Mr. Drew. 3 cr. (Formerly 61)

715. Linear Programming

The course covers 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. 7 or permission of instructor. Mr. Andrews. 3 cr. (Formerly 75)

795-796. Investigations in Resource Economics

Special assignments in readings and problems to satisfy students' needs. Mr. Andrews, Mr. Bowring, Mr. Drew, Mr. Grinnell, Mr. Henry. 1-3 cr. (Formerly 67-68)

Russian

(See Foreign Languages and Literatures)

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. SecI. 407-408 must be taken in conjunction with
this course or precede it. Miss Tyrrell. Prereq.: Permission of instructor. 3 cr. (Formerly 1-2)

405, (405). PERSONAL USE TYPWRITING

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. (Formerly 5)

407-408. TYPWRITING

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 Secl. 427). (Formerly 7-8)

427. TYPWRITING

Practice in acquiring correct typewriting techniques, and in arranging letters, tabulations, and simple manuscripts. This course, which begins on November 9, 1964, is to be taken instead of Secl. 407 by Secretarial students who have had Secl. 405 or the equivalent. Prereq.: Secl. 405 or equivalent and permission of instructor. Miss Davis. 5 lab.; 1 cr. (Formerly 27)

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.: Secl. 402 or equivalent and permission of instructor. 3 cr. (Formerly 3-4)

509-510. ADVANCED TYPWRITING

Practice in tabulating and in writing business letters, legal papers, and various business forms. Miss Davis. Prereq.: Secl. 408 or the equivalent and permission of the instructor. 5 lab.; 2 cr. (Formerly 9-10)

511. FILING

Various alphabetic, numeric, geographic, and subject-matter systems of correspondence filing; cross reference; follow-up methods; filing supplies and equipment. Miss Davis. Prereq.: Secl. 407 and permission of instructor. 2 cr. (Formerly 11)

(513). OFFICE MACHINES

Duplicating methods, practice in typing master copies and stencils, and in operating an electric typewriter, a mimeograph, a mimeoscope, and a liquid process duplicator; practice in machine transcription; and an introduction to adding and calculating machines. Miss Davis. Prereq.: Secl. 408 and permission of instructor. 5 lab.; 2 cr. (Formerly 13)

517. SECRETARIAL OFFICE PROCEDURE

Discussion of secretarial duties and traits; problems in the discharge of various duties; problems in office management. Miss Tyrrell. Prereq.: Secl. 503 and 509, or these courses taken in conjunction with Secl. 517, and permission of instructor. 3 cr. (Formerly 17)

518. SECRETARIAL OFFICE PRACTICE

Practice secretarial work in business offices. Miss Tyrrell. Prereq.: Secl. 504 and 510, or these courses taken in conjunction with Secl. 518, and permission of instructor, 10 hours a week; 3 cr. (This course is open only to students who entered before the fall of 1963.) (Formerly 18)
523-524. BUSINESS WRITING

Review of grammar, word usage, punctuation, and sentence construction. Practice in writing various types of business letters and reports; proof-reading; editing. Prereq.: One semester of typewriting preceding this course or taken in conjunction with it. Miss Tyrrell. 3 cr. (Formerly 23-24)

622. ADVANCED DICTATION

Speed building in dictation and transcription. Miss Tyrrell. Prereq.: Secl. 504 and permission of instructor. 3 cr. (Formerly 22)

Social Science (45)

This course is given under the auspices of the Division of Social Science of the Faculty 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 Government, History, 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. (Formerly 81)

Sociology (68)

Richard Dewey, Professor; Charles W. Coulter, Professor Emeritus; Melville Nielson, Associate Professor; Stuart H. Palmer, Associate Professor; Melvin T. Bobick, Associate Professor; Maurice Richter, Jr., Assistant Professor; Richard E. Downs, Assistant Professor; Pauline Soukaris, Instructor; Owen B. Durgin, Registrar

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. (Formerly 33)

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. (Formerly 42)
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.) (Formerly 73, 74)

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. (Formerly 97)

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. (Formerly 1)

(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. (Formerly 44)

(520), 520. The Family

An anthropological and institutional approach comparing customs and organizations in several societies. Not open to freshmen. 3 cr. (Formerly 27)

(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. (Formerly 58)

(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. (Formerly 18)

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. (Formerly 48)

560, (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. (Formerly 45)

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. (Formerly 49)

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. 6 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. (Formerly 92)

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. (Formerly 75)

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. (Formerly 76)

703, (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. (Formerly 71)

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. Students not majoring in sociology may be admitted by permission of the instructor. 3 cr. (Formerly 85, 86)
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. (Formerly 54)

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 to the relationships between social movements and social change. *Prereq.:* Soc. 400. 3 cr. (Not offered in 1964-65.) (Formerly 62)

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. (Formerly 57)

760. **Crime Control**

The theory and practice of preventing crime and delinquency and of rehaboritating the criminal and the delinquent. There will be a number of lectures by, and discussions with, various penologists. A seminar course limited to 15 students. *Prereq.:* Soc. 703. Permission of instructor. 3 cr. (Formerly 88)

795, 796. **Reading and Research in Sociology and Anthropology**


**Soil and Water Science (23)**

Allan B. Prince, Professor; Gordon L. Byers, Associate Professor; Nobel K. Peterson, Associate Professor; Paul A. Gilman, Associate Professor of Agricultural Engineering Technology, Thompson School of Agriculture

**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. (Formerly Agron. 11)

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. (Formerly Agron. 14)
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 1964-65.)

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 1964-65.) (Formerly Agron. 57)

703. 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. (Formerly Agron. 71, 72)

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 1964-65.) (Formerly Agron. 58)

705. FIELD MACHINERY

The design of the engineering elements of farm machinery; capacity and power requirements of farm implements. Prereq. or concurrently: M.E. 26. 2 lec.; 1 lab.; 3 cr. (Alternate years; offered in 1964-65.) (Formerly Ag. Eng. 33)

706. AGRICULTURAL STRUCTURES

The functional planning and the analysis used in farm building design; problems arising from the physiological processes of animals and crops. Mr. Byers. Prereq. or concurrently: M.E. 35. 2 lec.; 1 lab.; 3 cr. (Alternate years; not offered in 1964-65.) (Formerly Ag. Eng. 34)
707. Electric Power and Processing
The utilization of electrical energy on farms for power, illumination, and temperature control, including the study of equipment used in crop processing, water systems, materials handling, and the analysis of farmstead wiring problems. Prereq. or concurrently: E. E. 39. 2 lec.; 1 lab.; 3 cr. (Alternate years; not offered in 1964-65.) (Formerly Ag. Eng. 35)

708. Farm Tractors
The design and operation of farm tractors, tractor power units, chassis mechanics, tractor tests and performances. Prereq. or concurrently: M. E. 26; M. E. 33. 2 lec.; 1 lab.; 3 cr. (Alternate years; offered in 1964-65.) (Formerly Ag. Eng. 32)

Mechanized Agriculture

402. Residence Planning
The considerations involved in building or buying a house to fit one's needs. Problems in selecting and applying typical materials to residence construction. 1 lec.; 1 lab.; 2 cr. (Formerly Ag. Eng. 2)

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 labs.; 3 cr. (Formerly Ag. Eng. 18)

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. 2 lec.; 1 lab.; 3 cr. (Alternate years; offered in 1964-65.) (Formerly Ag. Eng. 21)

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 1964-65.) (Formerly Ag. Eng. 22)

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 1964-65.) (Formerly Ag. Eng. 23)

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, sewage 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. 2 lec.; 1 lab.; 3 cr. (Alternate years; offered in 1964-65.) (Formerly Ag. Eng. 24)
Hydrology

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.

Spanish

(See Foreign Languages and Literatures)

Speech and Drama (69)

Joseph D. Batcheller, Associate Professor; Edmund A. Cortez Professor; John C. Edwards, Associate Professor; Phyllis D. Williamson, Instructor; Gilbert B. Davenport, Instructor; Judith K. Davenport, Lecturer, Mari-anne H. Jaffe, Lecturer

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. (Formerly B)

401, (401). Basic Speech

A beginning course in the social, psychological, physiological, and phonetic bases of speech. Projects in informal public speaking, oral interpretation, discussion, and elementary phonetic transcription are used: (1) to illustrate the bases and (2) for the improvement of the individual student. This course is 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. (Formerly 5)

411. 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. Mrs. Williamson. 3 cr. (Formerly 25)

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 produccion. Mr. Batcheller. 2 lec.; 1 lab.; 3 cr. (Formerly 21)
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. 1 lab.; 3 cr. (Formerly 24)

457. Oral Interpretation of Literature
The analysis of literature as a basis for performance; demonstrate and experiment 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. (Formerly 31)

459, (459). Stagecraft
An introduction to stage and television scenery, costumes, properties, lighting, sound, and back-stage organization. Practical application in University Theater productions. Mr. Davenport. 1 lec.; 2 lab.; 3 cr. (Formerly 37)

501, (501). Public Speaking
The basic speaker, materials, presentation, occasion, and audience relationships. An introduction to extemporaneous and impromptu speaking for the purposes of informing and convincing. Practice in speaking with evaluation and constructive comment by the instructor and audience. Cannot be counted for major credit. Mr. Cortez and staff. 3 cr. (Formerly 15)

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. Mrs. Williamson. 3 cr. (Formerly 28)

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. Mr. Cortez. 3 cr. (Formerly 64)

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. 3 cr. (Formerly 53)

551. Acting
The relation of the actor to other theater workers in producing a play. Analysis of the role, creation of images, rehearsal and performance problems of legitimate theater and television. Prereq.: 6 credits in Speech and Drama or approval of the instructor. Mr. Edwards. 1 lec.; 2 lab.; 3 cr. (Formerly 43)

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. Batcheller. 1 lec.; 2 lab.; 3 cr. (Formerly 49)

601. (601). Speech Practice

Application of the theory of specific speech areas, other than theater, i.e. Discussion, Debate, Speech Correction, in individual or group projects. May be repeated to 4 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. Staff. 1 cr. (Formerly 29)

605. Bases of Theater Arts

An exploration of 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. (Formerly S-51)

611. Rhetoric in the Western World

A study of 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, government, 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. Mrs. Williamson. 3 cr. (Alternate years). (Formerly 52)

617. Oral Interpretation of Literature

An analysis of 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. (Formerly S-57)

622. Theater for Children

An introduction to 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. As part of the course of study, 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. Mrs. Jaffe. 1 lec.; 2 lab.; 3 cr. (Alternate years) (Formerly 56)

641. Theater Practicum

The study of 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. (Formerly S-61)

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. (Formerly S-99)

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. (Formerly S-97)

647. **Play Production in High Schools**

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. (Formerly S-71)

649. **Principles and Methods of Drama**

The philosophy of educational theater. Courses of study and extra-curricular programs. The problems of dramatic activities. Practical solutions applied in laboratory and public performance sessions. (Summer Session only) 3 cr. (Formerly S-74)

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. (Formerly 40)

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 major credit. **Prereq.**: the basic courses in which the practice credit is taken and approval of the instructor. Mr. Batcheller. 1 cr. (Formerly 45)

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. (Formerly 62)

**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 con-
sidered 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; lectures on various phases of engineering and related fields are also given by other engineering faculty members. Primarily for 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.

Zoology (70)

PAUL A. WRIGHT, Professor; C. FLOYD JACKSON, Professor Emeritus; GEORGE M. MOORE, Professor; LORUS J. MILNE, Professor; EDYTHE T. RICHARDSON, Professor; WILBUR L. BULLOCK, Professor; EMERY F. SWAN, Associate Professor; PAUL E. SCHAEPER, Associate Professor; PHILIP J. SAWYER, Associate Professor; MARCEL E. LAVOIE, Associate Professor; ARTHUR C. BORROR, Assistant Professor; ALAN G. LEWIS, Assistant Professor; BURTON C. STaugaard, Instructor; WENDELL W. LEAVITT, Instructor

412. PRINCIPLES OF ZOOLOGY

Concepts of animal biology, including ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Prereq.: Bot. 411. 3 lec.; 1 lab.; 4 cr. Not open to students who have credit for Biol. 402 and 404. (Formerly 48)

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. (Formerly 17, 18)

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. (Formerly 36)

530. ZOOLOGICAL TECHNIQUES

Covers such topics as elementary microtechnique, biological photography, photomicrography, enbalming and injecting of circulatory systems. Course content may vary depending on the needs of students enrolled. Mr. Staugaard. Prereq.: Zool. 508 or equivalent. 1 lec.; 2 lab.; 3 cr.

601. KINESIOLOGY

Bodily movements. The relation of skeleton, muscles, and joints in movements. Designed primarily for Occupational Therapy majors and for students in the Physical Education Teacher Preparation curriculum. Mrs. Richardson. Prereq.: Zool. 508. 2 lec.; 1 lab.; 3 cr. (Formerly 19)

606. NEUROLOGY

Practical study of morphology, physiology, and histology of the human nervous system. Mrs. Richardson. Prereq.: Biol. 402 and one year of Zoology. 3 lec.; 1 lab.; 4 cr. (Formerly 64)
701, (701). **Principles of Ecology**

The interrelationships of plants and animals with both their living and non-living environments. Energy relationships, limiting factors, community organization, succession, and biogeography. Staff. **Prereq.: Zool. 412 or equivalent. 3 cr. (Formerly 71)**

704. **Comparative Endocrinology**

The various endocrine organs, vertebrate and invertebrate, with particular emphasis on endocrines which relate to physiology of reproduction. Mr. Wright. **Prereq.: Permission. 3 cr. (Formerly 112e)**

(706), 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. Mrs. Richardson. **Prereq.: Zool. 412 or equivalent. 3 lec.; 1 lab.; 4 cr. (Formerly 61)**

711, 712. **Natural History and Taxonomy of the Vertebrates**

The various classes of vertebrates; their habits, habitats, and life histories, with special reference to those occurring in eastern North America. Zoology 711 will include the fishes, amphibia, and reptiles. Zoology 712 will cover the mammals and birds. Mr. Sawyer. **Prereq.: General Zoology and Zool. 508. 2 rec.; 2 lab.; 4 cr. (Formerly 77, 78)**

(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. Mr. Moore. **Prereq.: General Zoology. 1 lec.; 3 labs.; 4 cr. (Also offered in Summer Session.) (Formerly 68)**

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. (Formerly 51)**

725. **General Physiology**

The fundamental physiological properties of excitability, contractility, conductivity, metabolism, growth, and reproduction. Mrs. Lambert. **Prereq.: One year of Zoology, and Organic Chemistry. 3 lec.; 1 lab.; 4 cr. (Formerly 59)**

729. **Vertebrate Morphogenesis**

A comparative study of the organ systems of the vertebrate body and their embryonic development. Mr. Staugaard. **Prereq.: Zool. 507-508 or equivalent or permission. 3 lec.; 2 lab.; 5 cr. (Formerly 65)**

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. (Formerly 66)**
736. Advanced Genetics

The recent advances in genetics and cytogenetics. Staff. Prereq.: Zool. 706. 2 lec.; 2 lab.; 4 cr. (Formerly 62)

795, 796. Special Problems in Zoology

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