

LEHIGH UNIVERSITY PUBLICATION

UNIVERSITY
CATALOG

MARCH
1957





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BETHLEHEM, PENNSYLVANIA

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LEHIGH UNIVERSITY

957/58

957/58

1957							1958							1959						
JULY							JANUARY							JULY						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	1	2	3	4	5	6	..	1	2	3	4	5	6	..	1	2	3	4	5	6
7	8	9	10	11	12	13	5	6	7	8	9	10	11	6	7	8	9	10	11	12
14	15	16	17	18	19	20	12	13	14	15	16	17	18	13	14	15	16	17	18	19
21	22	23	24	25	26	27	19	20	21	22	23	24	25	20	21	22	23	24	25	26
28	29	30	31	..	..	..	26	27	28	29	30	31	..	27	28	29	30	31	..	..
AUGUST							FEBRUARY							AUGUST						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	1	2	3	4	5	6	2	3	4	5	6	7	1	..	1	2	3	4	5	6
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11	12	13	14	15	16	17	9	10	11	12	13	14	15	10	11	12	13	14	15	16
18	19	20	21	22	23	24	16	17	18	19	20	21	22	17	18	19	20	21	22	23
25	26	27	28	29	30	31	23	24	25	26	27	28	29	24	25	26	27	28	29	30
SEPTEMBER							MARCH							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7	2	3	4	5	6	7	1	..	1	2	3	4	5	6
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22	23	24	25	26	27	28	23	24	25	26	27	28	29	21	22	23	24	25	26	27
29	30	30	28	29	30
OCTOBER							APRIL							OCTOBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	1	2	3	4	5	6	..	1	2	3	4	5	6	..	1	2	3	4	5	6
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20	21	22	23	24	25	26	20	21	22	23	24	25	26	19	20	21	22	23	24	25
27	28	29	30	31	27	28	29	30	26	27	28	29	30
NOVEMBER							MAY							NOVEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	1	2	3	4	5	6	..	1	2	3	4	5	6	..	1	2	3	4	5	6
3	4	5	6	7	8	9	4	5	6	7	8	9	10	2	3	4	5	6	7	8
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17	18	19	20	21	22	23	18	19	20	21	22	23	24	16	17	18	19	20	21	22
24	25	26	27	28	29	30	25	26	27	28	29	30	31	23	24	25	26	27	28	29
DECEMBER							JUNE							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7	1	2	3	4	5	6	7	..	1	2	3	4	5	6
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15	16	17	18	19	20	21	15	16	17	18	19	20	21	14	15	16	17	18	19	20
22	23	24	25	26	27	28	22	23	24	25	26	27	28	21	22	23	24	25	26	27
29	30	31	..	..	..	..	29	30	..	..	..	..	..	28	29	30	31	..	..	..

University Calendar

1957

1957-1958

MAY 31 1957

LIBRARY

January 3, 8:10 a.m. (Thurs.)	Christmas vacation ends
January 5 (Sat.)	Last day of classes for arts seniors taking comprehensive examinations
January 9-12 (Wed.-Sat.)	Comprehensive examinations for arts seniors
January 10 (Thurs.)	Last day for filing applications for degrees to be granted in February
January 12 (Sat.)	Last day of classes in Fall Semester
January 14 (Mon.)	Course examinations begin
January 23 (Wed.)	Course examinations end
January 28, 29 (Mon., Tues.)	Registration for Spring Semester
January 30 (Wed.)	Spring Semester instruction begins
February 9 (Sat.)	Last day on which registration for Spring courses will be permitted
March 23, 1:00 p.m. (Sat.)	Spring vacation begins Mid-Semester reports due
April 1, 8:10 a.m. (Mon.)	Spring vacation ends Preregistration begins
April 15 (Mon.)	Last day for filing applications for degrees to be conferred in June
April 20 (Sat.)	Preregistration ends
May 14 (Tues.)	Last day of classes for arts seniors taking comprehensive examinations
May 21 (Tues.)	Last day of classes in Spring Semester
May 22 (Wed.)	Course examinations begin
May 31 (Fri.)	Course examinations end
June 9 (Sun.)	Baccalaureate Sunday
June 10 (Mon.)	University Day
June 11 (Tues.)	Registration for Summer Session (1st 6 weeks, undergraduate session)
June 12 (Wed.)	Summer Session instruction begins (1st 6 weeks, undergraduate session)
July 20 (Sat.)	End of Summer Session (1st 6 weeks, undergraduate session)
July 22 (Mon.)	Registration for Summer Session (2nd 6 weeks, undergraduate session)
July 23 (Tues.)	Summer Session instruction begins (2nd 6 weeks, undergraduate session)
August 31 (Sat.)	End of Summer Session (2nd 6 weeks, undergraduate session)
September 4 (Wed.)	Freshman Week begins
September 5-7 (Thurs.-Sat.)	Make-up examinations and special examinations

LEHIGH UNIVERSITY

September 10 (Tues.) Last day for filing applications for degrees to be conferred on Founder's Day
September 9-11 (Mon.-Wed.) Registration for Fall Semester
September 12 (Thurs.) Fall Semester instruction begins
September 16 (Mon.) First Faculty Meeting
September 23 (Mon.) Last day on which registration for Fall courses will be permitted
October 13 (Sun.) Founder's Day
November 7 (Thurs.) Mid-Semester reports due
November 18 (Mon.) Preregistration begins
November 27, 10 p.m. (Wed.) ... Thanksgiving vacation begins
December 2, 8:10 a.m. (Mon.) ... Thanksgiving vacation ends
December 7 (Sat.) Preregistration ends
December 19, 10 p.m. (Thurs.) ... Christmas vacation begins

1958

January 3, 8:10 a.m. (Fri.) Christmas vacation ends
January 4 (Sat.) Last day of classes for arts seniors taking comprehensive examinations
January 8-11 (Wed.-Sat.) Comprehensive examinations for arts seniors
January 10 (Fri.) Last day for filing applications for degrees to be granted in February
January 11 (Sat.) Last day of classes in Fall Semester
January 13 (Mon.) Course examinations begin
January 22 (Wed.) Course examinations end
January 27, 28 (Mon., Tues.) Registration for Spring Semester
January 29 (Wed.) Spring Semester instruction begins
February 8 (Sat.) Last day on which registration for Spring courses will be permitted
March 22 (Sat.) Mid-Semester reports due
March 24 (Mon.) Preregistration begins
March 29, 1:00 p.m. (Sat.) Spring vacation begins
April 7, 8:10 a.m. (Mon.) Spring vacation ends
April 15 (Tues.) Last day for filing applications for degrees to be conferred in June
April 19 (Sat.) Preregistration ends
May 13 (Tues.) Last day of classes for arts seniors taking comprehensive examinations
May 20 (Tues.) Last day of classes in Spring Semester
May 21 (Wed.) Course examinations begin
May 30 (Fri.) Course examinations end
June 8 (Sun.) Baccalaureate Sunday
June 9 (Mon.) University Day

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B.S. in C.E., California, 1941; Ph.D., Lehigh, 1952.

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A.B., Rochester, 1904, Ph.D., Cornell, 1914.

ROBERT DOMINICK BILLINGER (1929, 1939).....*Associate Professor of Chemistry*
Ch.E., Lehigh, 1921; M.S., 1925; Ph.D., Cincinnati, 1929.

MATTHEW FREDSEN BORG (1955).....*Instructor in Civil Engineering*
B.C.E., City Coll. of New York, 1950; M.C.E., Catholic Univ. of America, 1953.

SAMUEL G. BOURNE (1956).....*Assistant Professor of Mathematics*
B.S., Rutgers, 1938; A.M., Johns Hopkins, 1944; Ph.D., 1949.

PHILIP JOHN BOURQUE (1955).....*Assistant Professor of Economics*
B.A., Massachusetts, 1949; M.A., Pennsylvania, 1950, Ph.D. 1956.

HARRY THOMAS BOUTSIKARIS (1950).....*Fencing Coach*
B.S., Seton Hall, 1943.

FREDERICK HINKSON BOYCE (1956).....*Graduate Assistant in Education*
A.B., Lehigh, 1956.

JOHN PETER BOYLE (1956).....*Research Assistant in Chemical Engineering*
B.S., Lehigh, 1956.

HENDERSON BAMPFIELD BRADDICK (1956).....*Assistant Professor of International Relations*
A.B., Washington, 1942; LL.B., Harvard, 1949.

FREDERICK ALDEN BRADFORD (1926, 1935).....*Professor of Economics, Head of the Department of Finance*
A.B., Michigan, 1921; M.A., 1923; Ph.D., 1926.

FRANCIS MARIO BRADY, JR. (1955).....*Instructor in Accounting*
B.S., Drexel Inst. of Tech., 1950; C.P.A., Pennsylvania, 1955.

ELMER CLARK BRATT (1929, 1941).....*Professor of Economics*
A.B., Nebraska, 1925; A.M., 1926; Ph.D., Wisconsin, 1935.

ROBERT ALLEN BREAM (1947).....*Associate Professor of Education*
B.S., Gettysburg, 1929; M.A., Columbia, 1933; Ed.D., Pennsylvania State, 1943.

CHARLES WILFRID BRENNAN (1955).....*Assistant Professor of Industrial Engineering*
B.S., Alabama, 1934; M.B.A., 1952.

ROBERT DANIEL BRETH (1953).....*Part-time Instructor in Journalism*
B.A., Pennsylvania, 1931.

WARREN BREWER, JR. (1955).....*Graduate Assistant in History*
B.S., Lehigh, 1955.

RICHARD KOCH BRIGHT (1956).....*Graduate Assistant in Chemistry*
B.S., Albright, 1956.

WILLIAM CHARLES BROKAW (1956).....*Graduate Assistant in Economics*
A.B., Muhlenberg, 1955.

ARTHUR WELLINGTON BROWN (1956).....*Assistant in Military Science*
Sergeant, U.S.A.

GEORGE LEONARD BROWNELL (1955).....*Assistant Professor of Chemistry*
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FACULTY AND STAFF

ARTHUR WILLIAM BRUNE (1952).....*Assistant Professor of Mining Engineering*
B.S. in E.M., Missouri School of Mines, 1941; M.S. in E.M., 1946; Ph.D., Pennsylvania State, 1952.

ANTHONY JOSEPH BRYSKI (1947, 1951) *Assistant Professor of Economics*
B.S., Temple, 1940; M.A., New York, 1947.

PAUL PHILIP BUDENSTEIN (1949, 1952).....*Instructor in Physics*
B.S., Temple, 1949; M.S., Lehigh, 1951.

RAYMOND COOLEY BULL (1923, 1944).....*Director Emeritus, University Health Service*
B.S., Colorado Coll., 1904; A.B., Kansas, 1906; M.D., Jefferson Medical, 1909.

MARC GEORGES BUREAU (1956).....*Graduate Assistant in Romance Languages*
Baccalaureat, Univ. de Paris, 1950; Diplome d'Ingenieur Chimiste-Ecole Superieure de Physique et Clinic Industrielles, Paris, 1956.

EDMUND RICHARD BUTCH (1956) *Associate Professor of Military Science*
Major, U.S.A., C.E.; B.S., Missouri School of Mines, 1941.

ALLISON BUTTS (1916, 1952).....*Professor of Metallurgy*
A.B., Princeton, 1911; B.S., Massachusetts Inst. of Technology, 1913.

REYNOLD HUGH BYRNE (1956).....*Graduate Assistant in English*
B.A., Maryland, 1953.

MARGARET MARY CAFFERY (1956).....*Cataloger (Natural and Physical Sciences)*
B.S., Marywood, 1948.

FRANK JOSEPH CAIN (1956).....*Graduate Assistant in Civil Engineering*
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CLARENCE BOWEN CAMPBELL (1947, 1955)....*Coordinator of Scholarships and Self-Help*
B.A., Temple, 1937; M.A., Lehigh, 1947.

NEIL CARTHERS (1923, 1949).....*Dean Emeritus, College of Business Administration*
B.A., Arkansas, 1905; Dip. in Econ., Oxford, 1907; Ph.D., Princeton, 1916.

ROBERT CLELAND CARSON (1953, 1956).....*Assistant Professor of Mathematics*
B.S., Purdue, 1948; M.S., 1950; Ph.D., Wisconsin, 1953.

GEORGE MANNING CARTER (1955).....*Graduate Assistant in Geology*
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ALBERT JOHN CHABAI (1952).....*Research Assistant in Physics*
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HENRY BRYAN PARRY CHAPMAN (1955).....*Research Assistant in Civil Engineering*
B.A., Cambridge, 1948.

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ELLIOT WARD CHENEY (1942).....*Associate Professor of Physics*
A.B., Dartmouth, 1920; M.S., Brown, 1925; Ph.D., Princeton, 1929.

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B.S., Puget Sound, 1953; M.S., 1956.

JOHN JOSEPH CHESSICK (1948, 1952).....*Research Assistant Professor of Chemistry*
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ROBERT CHIODI (1955).....*Instructor in Physical Education, Assistant Varsity Football Coach, Freshman Basketball Coach, Freshman Baseball Coach*
B.S., Maryland, 1952.

JAY SIMON CHIVIAN (1952).....*Graduate Assistant in Physics*
B.S., Franklin and Marshall, 1952.

JUAN PUN CHONG (1956).....*Graduate Assistant in Mechanical Engineering*
B.S., California, 1953; M.S., Illinois, 1954.

GLENN JAMES CHRISTENSEN (1939, 1956).....*Professor of English, Dean of the College of Arts and Science, Director of the Curriculum in Arts and Science, Director of the Curriculum in Arts and Engineering.*
B.A., Wooster, 1935; Ph.D., Yale, 1939.

WILLIAM THOMAS CHRISTIAN (1947, 1949).....*Assistant Professor of Physical Education, Varsity Swimming Coach, Varsity Soccer Coach*
B.S. in Ed., New Jersey State Teachers (Trenton), 1939.

CURTIS WILLIAM CLUMP (1955).....*Assistant Professor of Chemical Engineering*
B.S., Bucknell, 1947; M.S., 1949; Ph.D., Carnegie Inst. of Technology, 1953.

PHILLIP RAYMOND COLLIER (1955).....*Graduate Assistant in Chemistry*
B.S., Randolph-Macon, 1955.

DOUGLAS L. COLLINS (1951, 1952).....*Research Associate in Chemistry*
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JASPER JOSEPH COLLURA (1955).....*Graduate Assistant in English*
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WRAY HOLLOWELL CONGDON (1934, 1938).....*Dean of Students, Director of Student Personnel Services*
B.A., Syracuse, 1914; M.A. (Engl.), 1915; M.A. (Ed.), Michigan, 1922; Ph.D., 1929.

MICHAEL THOMAS COOLEY (1950).....*Instructor in Physical Education, Assistant Varsity Football Coach*
B.S. in Ed., Georgia, 1948.

EUGINIA FAYE COREY (1956).....*Research Assistant in Psychology*
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FACULTY AND STAFF

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CASSIUS WILD CURTIS (1946, 1948).....*Professor of Physics*
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B.S. in Chem., Lehigh, 1902; M.S., 1908.

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ERNEST NEVIN DILWORTH (1949).....*Assistant Professor of English*
Ph.B., Kenyon, 1933; M.A., Pittsburgh, 1937; Ph.D., Columbia, 1948.

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ROGER GEORGE DITTIG (1955)....*Assistant Professor of Civil Engineering*
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AURIE NICHOLS DUNLAP (1948).....*Assistant Professor of International Relations*
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B.S., Univ. of Maryland, 1949; Captain, U.S.A.

NORMAN WILLIAM DUZEN (1956).....*Graduate Assistant in History*
B.A., Elmhurst, 1945; B.D., Yale, 1948.

ARTHUR ROY ECKARDT (1951, 1956).....*Professor of Religion, Head of the Department of Religion*
B.A., Brooklyn, 1942; B.D., Yale, 1944; Ph.D., Columbia, 1947.

ABRAM ERNEST EHRENSBERGER (1956).....*Assistant in Air Science*
Staff Sergeant, U.S.A.F.

CARL EDWIN EKBERG, JR. (1953, 1956).....*Associate Professor of Civil Engineering, Chairman, Structural Concrete Division, Fritz Engineering Laboratory*
B.C.E., Minnesota, 1943; M.S. in C.E., 1947.

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B.S. in M.E., Lehigh, 1951.

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B.A., Gettysburg, 1956.

EVERETT HARVEY EMERSON (1955)*Instructor in English*
A.B., Harvard, 1948; M.A., Duke, 1949; Ph.D., Louisiana State, 1955.

KATHERINE TERRELL EMERSON (1956)*Cataloger*
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RAYMOND JAY EMRICH (1946, 1949).....*Associate Professor of Physics*
B.S., Princeton, 1938; Ph.D., 1946.

FACULTY AND STAFF

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B.E., Johns Hopkins, 1927; M.S., Lehigh, 1938.

WAYNE EDMUND ENGLE (1956).....*Graduate Assistant in Mathematics*
B.S., Ursinus, 1956.

JAMES VANDEUSEN EPPES (1940, 1950).....*Associate Professor of Mechanical Engineering*
B.A., Virginia, 1928, M.E., Cornell, 1931; M.S. in M.E., Lehigh, 1943.

ERNEST HENRY ERN, JR. (1955).....*Graduate Assistant in Geology*
B.S., Bates, 1955.

SAMUEL JOSEPH ERRERA (1951).....*Engineer of Tests, Fritz Engineering Laboratory*
B.S. in C.E., Rutgers, 1949; M.S., Illinois, 1951.

S. BLAINE EWING (1946, 1947).....*Associate Professor of English*
A.B., Princeton, 1927; M.A., 1928; Ph.D., 1934.

WARREN WALTER EWING (1920, 1955).....*Professor Emeritus of Physical Chemistry*
B.S., Parsons, 1912; M.S., Chicago, 1918; Ph.D., 1920.

GEORGE DORMER FARNE (1934, 1945).....*Assistant Professor of Romance Languages*
A.B., Columbia, 1926; M.A., 1927.

DOUGLAS DAVID FEAVER (1956).....*Assistant Professor of Classical Languages*
B.A., Toronto, 1948; M.A., Johns Hopkins, 1949; Ph.D., 1951.

JACQUELINE MARIE FETSKO (1949, 1954).....*Research Associate in Chemistry*
B.A., Pennsylvania, 1946; M.S., Lehigh, 1953.

VELMER BERNEL FISH (1948, 1954).....*Associate Professor of Chemistry*
B.S., Iowa State, 1936; Ph.D., 1942.

JOHN WILLIAM FISHER (1956).....*Research Assistant in Civil Engineering*
B.S.C.E., Washington (Mo.), 1956.

ANNE STROWD FLANNERY (1947, 1948).....*Assistant Librarian (Technical Processes)*
A.B., Duke, 1934; A.B. in L.S., Emory, 1942; M.A., Duke, 1945.

EDWARD LEO FOLEY (1955).....*Graduate Assistant in Physics*
B.S., Engr. Phys., Montana State, 1954.

ERNEST GUNTER FONTHEIM (1950).....*Graduate Assistant in Physics*
A.B. and B.S., Southwest Missouri State, 1950; M.S., Lehigh, 1952.

ADELBERT FORD (1931, 1955).....*Professor Emeritus of Psychology*
A.B., Michigan, 1920; A.M., 1923; Ph.D., 1926.

WILLIAM PAUL FORDYCE (1955).....*Assistant in Air Science*
Staff Sergeant, U.S.A.F.

ALAN SHIVERS FOUST (1952).....*Professor of Chemical Engineering, Head of the Department of Chemical Engineering, Director of the Curriculum in Chemical Engineering*
B.S. in Ch.E., Texas, 1928; M.S. in Ch.E., 1930; Ph.D., Michigan, 1938.

JAMES LEONARD FOZARD (1956).....*Graduate Assistant in Psychology*
A.B., California, 1954; M.A., San Diego State, 1956.

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PAUL JUSTUS FRANZ, JR. (1944, 1949).....*Assistant to the President*
B.S. in Bus. Adm., Lehigh, 1944; M.A., 1955.

H. BRUCE FREDRICKS (1954).....*Assistant Professor of Air Science*
B.B.A., Georgia, 1950; Captain, U.S.A.F.

AUGUSTUS HENRY FRETZ (1918, 1948).....*Associate Professor Emeritus*
Ph.B., Lafayette, 1903; C.E., 1906; M.S., 1924. *of Geology*

HELEN ELIZABETH FRY (1951).....*Assistant Director of Placement*
B.A., Baldwin-Wallace, 1945.

RAYMOND EUGENE FUESSLE (1953).....*Chaplain of the University,*
B.A., New York, 1930; B.D., Virginia Episcopal Theological Seminary, 1933. *Associate Professor of Religion*

YUZURU FUJITA (1954).....*Research Assistant in Civil Engineering*
B.S., Tokyo, 1946; M.S., 1948; Ph.D., Lehigh, 1956.

MERTON OTIS FULLER (1912, 1955).....*Associate Professor Emeritus of*
C.E., Syracuse, 1910; M.S., Lehigh, 1934. *Civil Engineering*

EUGENE T. GADOL (1956).....*Instructor in Philosophy*
B.A., Oklahoma, 1943.

THEODORE VICTOR GALAMBOS (1956).....*Research Assistant in Civil*
B.S., North Dakota, 1953; M.S., 1954. *Engineering*

ROBERT TAYLOR GALLAGHER (1942, 1951).....*Professor of Mining*
Engineering, Head of the Department of Mining Engineering, Director of the Curriculum in Mining Engineering
B.S., Pennsylvania State, 1927; M.A., Missouri, 1938; D.E.M., Colorado School of Mines, 1941.

EDWARD EUGENE GARDNER (1955).....*Assistant Professor of Electrical*
B.S., Massachusetts Inst. of Technology, 1948; M.A., Minnesota, 1950; Ph.D., Engineering
Catholic Univ. of America, 1955.

HUGH RICHARD GAULT (1946, 1952).....*Professor of Geology*
A.B., DePauw, 1936; M.A., Missouri, 1938; Ph.D., Johns Hopkins, 1942.

DANIEL GAVALES (1955).....*Teaching Assistant in Psychology*
B.A., Queens (New York), 1955.

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B.S., Delaware, 1956. *Engineering*

LEANOR RUTH GILBERT (1930, 1943).....*Recorder*

LAWRENCE HENRY GIPSON (1924, 1952).....*Research Professor Emeritus*
of History
A.B., Idaho, 1903; B.A., Oxford, 1907; M.A., 1951; Ph.D., Yale, 1918; Litt.D., Temple, 1947; L.H.D., Lehigh, 1951; LL.D., Idaho, 1953, L.H.D., Yale, 1955.

WILLIAM VALENTINE GLEBE (1956).....*Instructor in German*
B.A., Toronto, 1949; M.A., Alberta, 1950.

DONALD JOSEPH GLENN (1955).....*Associate Professor of Air Science*
B.A., Ohio State, 1947; Major, U.S.A.F.

ELMER WILLIAM GLICK (1949, 1952).....*Treasurer*
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B.S., City College of New York, 1953.

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ARTHUR FREEMAN GOULD (1947, 1953).....*Professor of Industrial Engineering, Head of the Department of Industrial Engineering, Director of Curriculum in Industrial Engineering*
S.B., Massachusetts Inst. of Technology, 1938; M.S., Lehigh, 1949.

JAMES LARMOUR GRAHAM (1930, 1954)....*Associate Professor Emeritus of Psychology*
B.A., Muskingum, 1911; B.D., Union Theological Seminary, 1922; M.A., Columbia, 1922; Ph.D., Peabody Inst., 1927.

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B.A., Lehigh, 1936; M.S., 1938; Ph.D., 1946.

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HERBERT FRANK GRETZ, JR. (1956).....*University Physician, Part-time*
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B.S., Muhlenberg, 1955.

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B.S., Lafayette, 1953.

HOWARD DIETRICH GRUBER (1914, 1948) ... *Associate Professor Emeritus of Electrical Engineering*
E.E., Lehigh, 1909; M.S., 1923.

MARY ELIZABETH GRUBER (1953).....*Serials Librarian*
B.A., Pennsylvania State, 1952; M.S. in L.S., Drexel Inst. of Technology, 1953.

ADOLF GRÜNBAUM (1950, 1955).....*William Wilson Selfridge Professor of Pure Philosophy*
B.A., Wesleyan, 1943; M.S. (Physics), Yale, 1948; Ph.D., 1950.

SAMUEL LINIAL GULDEN (1953).....*Instructor in Mathematics and*
B.S., City College of New York, 1949; M.A., Princeton, 1950. *Astronomy*

ALBERT L. GUNDRUM (1956).....*Lecture Assistant in Physics*
F.A.G.O.

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E.M., Lehigh, 1927. *Association*

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EMIL A. HAVACH (1941, 1949) *Head Trainer*

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HERBERT EUGENE ISAR (1949, 1956).....*Assistant Professor of Spanish*
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LEMUEL ROY JOHNSTON (1945).....*Part-time Instructor in Education*
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B.S., Norwich, 1928; Colonel, U.S.A.

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B.S. in Bus. Adm., Lehigh, 1957.

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B.S., Albright, 1937.

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B.A., Lehigh, 1910; M.A., Harvard, 1913.

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B.A., Lehigh, 1941; M.S., Tennessee, 1942; Ph.D., Lehigh, 1952. *in Chemistry*

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A.B., Randolph-Macon, 1918; M.A., Princeton, 1920; Ph.D., 1921; LL.D.,
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C.E., Vanderbilt, 1892. *Mathematics and Astronomy*

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B.S., Michigan, 1920; M.A., 1921; Ph.D., 1927.

FACULTY AND STAFF

ELI SCHWARTZ (1954).....*Assistant Professor of Finance*
B.S., Denver, 1943; M.A., Connecticut, 1948; Ph.D., Brown, 1952.

RAMON CARLFRED SCOTT (1954).....*Research Assistant in Mathematics*
B.A., American International, 1953; M.A., Massachusetts, 1954.

WALTER JAMES SCOTT, JR. (1952).....*Research Assistant in Physics*
B.A., Swarthmore, 1941.

CHARLES AUGUSTUS SEIDLE (1948, 1952).....*Director of Admission*
B.A., Pittsburgh, 1931; M.A., Columbia, 1936; Ed.D., 1948.

EDITH AMANDA SEIFERT (1923, 1956).....*Assistant Bursar*

ROBERT EUGENE SENTZ (1955).....*Instructor in Electrical Engineering*
B.S. in E.E., Lehigh, 1948.

EARL JAMES SERFASS (1936, 1952)....*Professor of Chemistry, Head of the Department of Chemistry, Director of the Curriculum in Chemistry*
B.S. in Ch.E., Lehigh, 1933; M.S., 1935; Ph.D., 1938.

WILSON NATHANIEL SERFASS, JR. (1956).....*Instructor in Accounting*
B.S., Albright, 1952; M.B.A., Indiana, 1956.

JOSEPH CARMINE SERPICO (1956).....*Graduate Assistant in Civil Engineering*
B.S., Pennsylvania, 1956.

JONATHAN BURKE SEVERS (1927, 1951).....*Professor of English, Head of the Department of English*
A.B., Rutgers, 1925; A.M., Princeton, 1927; Ph.D., Yale, 1935.

ARCHIBALD NORBERT SHERBOURNE (1954, 1956).....*Instructor in Civil Engineering*
B.Bc., London, 1953.

WILLIAM SHERIDAN (1911, 1954).....*Assistant Professor Emeritus of Physical Education*

YING-JER SHIEH (1956).....*Research Assistant in Civil Engineering*
B.S., Illinois, 1956.

CLARENCE ALBERT SHOOK (1930, 1946).....*Professor of Mathematics*
A.B., Western Reserve, 1916; A.M., Harvard, 1918; Ph.D., Johns Hopkins, 1923.

PAUL EDWARD SHORT (1938, 1946).....*Assistant Professor of Physical Education, Assistant Director and Business Manager of Athletics*
B.S. in Bus. Adm., Lehigh, 1934.

JAMES RIDGEWAY SHREVE (1956).....*Assistant Varsity Football Coach*
A.B., Syracuse, 1951.

WESLEY JARRELL SIMMONS (1955).....*Associate Professor of Military Science*
A.B., Western Maryland, 1938; Lt.Col., U.S.A.

ARTHUR ROBERT SIMPSON (1954).....*Assistant Professor of Military Science*
B.S., Colorado A. & M., 1943; Captain, U.S.A.

JOHN DAVID SKEWIS (1954).....*Research Assistant in Chemistry*
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CLIFFORD WILSON SLOYER (1956).....*Graduate Assistant in Mathematics*
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LEHIGH UNIVERSITY

ROGER GEORGE SLUTTER (1956) *Research Instructor in Civil Engineering*
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ARNOLD MCCOLLUM SMALL (1954) *Assistant Professor of Psychology*
A.B., San Diego State, 1951; M.S., Wisconsin, 1953; Ph.D., 1954.

EARL KENNETH SMILEY (1934, 1945) *Vice-President, Secretary of the Board of Trustees*
A.B., Bowdoin, 1921; M.A., Lehigh, 1935; L.H.D., Moravian, 1947; LL.D., Waynesburg, 1952.

STANLEY FRED SMITH (1952) *Graduate Assistant in Physics*
B.S., St. Lawrence, 1952.

WILLIAM ADAMS SMITH, JR. (1955) *Instructor in Industrial Engineering*
B.S., U.S. Naval Academy, 1951.

JUDSON GRAY SMULL (1919, 1950) *Associate Professor Emeritus of Chemistry*
B.S. in Chem., Lehigh, 1906; M.S., 1921.

MAX DONALD SNIDER (1946) *Assistant Professor of Marketing*
B.S., Illinois, 1936; M.S., 1937; M.B.A., Stanford, 1941.

RAYMOND HORNING SNYDER (1950, 1952) *Associate Professor of Sanitary Engineering; Chairman, Sanitary Engineering Division, Fritz Engineering Laboratory*
B.S. in C.E., Lehigh, 1938.

RAFAEL ARCHANGEL SOTO (1935, 1954) *Associate Professor Emeritus of Romance Languages*
B.S., Illinois, 1912; B.A., 1915; M.A., 1917.

WILBER DEVILLA BERNHART SPATZ (1946, 1954) *Associate Professor of Physics*
B.S., Lafayette, 1930; M.S., Purdue, 1934; Ph.D., New York, 1943.

JAMES RUSSEL STAMM (1956) *Instructor in Romance Languages*
B.S., Columbia, 1949; M.A., Mexico City, 1950.

JOHN STOHLER STECKBECK (1955) *Assistant Professor of Physical Education, Varsity Cross Country Coach, Assistant Director of Physical Education*
B.Sc., West Chester State Teachers, 1936; M.Sc., Pennsylvania, 1951.

EDWARD CHARLES PEREIRA STEWART (1956) *Assistant Professor of Psychology*
B.A., Maryland, 1950.

BRADLEY STOUGHTON (1923, 1944) *Professor Emeritus of Metallurgy*
Ph.B., Yale, 1893; B.S., Massachusetts Inst. of Technology, 1896; Eng.D., Lehigh, 1944.

ROBERT DANIEL STOUT (1939, 1956) *Professor of Metallurgical Engineering, Head of the Department of Metallurgical Engineering, Director of Curriculum in Metallurgical Engineering*
B.S., Pennsylvania State, 1935; M.S., Lehigh, 1941; Ph.D., 1944.

CARL FERDINAND STRAUCH (1938, 1953) *Professor of English*
A.B., Muhlenberg, 1930; M.A., Lehigh, 1934; Ph.D., Yale, 1946.

MILTON CALEB STUART (1926, 1952) *Professor Emeritus of Mechanical Engineering*
B.S. in M.E., Pennsylvania, 1909; M.E., 1924.

FACULTY AND STAFF

ROBERT LAMB STUBBINGS (1949, 1953).....*Research Assistant Professor of Chemistry*
B.S., Lehigh, 1941; M.S., 1946; Ph.D., 1949.

CHARLES EDWIN STUHLMAN (1955).....*Research Assistant in Civil Engineering*
B.S.C.E., Washington (Missouri), 1953.

JAMES EDWARD STURM (1956).....*Assistant Professor of Chemistry*
B.A., St. John's (Minnesota), 1951; Ph.D., Notre Dame, 1957.

LEONARD PETER SUFFREDINI (1956).....*Research Assistant in Chemistry*
B.S., Pennsylvania State, 1952.

HARRY SUPRINICK (1956).....*Instructor in Metallurgy*
B.S., Michigan Coll. of Mining & Technology, 1951; M.S., 1952.

EDWARD SUSSNA (1956).....*Assistant Professor of Economics*
B.A., Brooklyn, 1950; M.A., Illinois, 1952; Ph.D., 1954.

HALE SUTHERLAND (1930, 1952) *Professor Emeritus of Civil Engineering*
A.B., Harvard, 1906; S.B., Massachusetts Inst. of Technology, 1911.

MORRIS LEO SWEET (1955).....*Instructor in Marketing*
B.S., Rutgers, 1949; M.B.A., New York, 1950.

ROBERT SWENSON (1956).....*Teaching Assistant in Physics*
B.S., Montana State, 1956.

WILLIAM SWIDER, JR. (1955).....*Graduate Assistant in Physics*
B.S., Lehigh, 1955.

JOHN SWINDELEHURST (1955).....*Graduate Assistant in Civil Engineering*
B.S.C.E., Rutgers, 1953.

DONALD GEORGE TAILBY (1956).....*Instructor in Economics*
B.A., Rutgers, 1950; M.A., 1956.

ALEXANDER TAKACS (1955).....*Instructor in Electrical Engineering*
B.Eng., McGill (Canada), 1955.

LAMBERT TALL (1955).....*Research Assistant in Civil Engineering*
B.E., Sydney (Australia), 1954.

FIRMAN TAMBUNAN (1956).....*Graduate Assistant in Electrical Engineering*
B.S., India, 1951; M.S., Lehigh, 1952.

PAUL EUGENE TAX (1956).....*Heat Exchange Institute Assistant in Chemical Engineering*
B.S., New York, 1956.

IVAN JACKSON TAYLOR (1953).....*Instruments Associate in Civil Engineering*

JAMES HOWARD TAYLOR, JR. (1953).....*Research Assistant in Chemistry*
B.S., Virginia Polytechnic Inst., 1950; M.S., Lehigh, 1952.

*ROBERT SAXTON TAYLOR (1950).....*Assistant Librarian*
A.B., Cornell, 1940.

ROBERT SAYRE TAYLOR, JR. (1950).....*Legal Counsel*
B.A., Lehigh, 1925; LL.B., Pennsylvania, 1928.

*On leave 1956-57.

LEHIGH UNIVERSITY

EVERETT ANDERSON TEAL (1945).....*Director of Placement and Counseling*
B.S., Ball State Teachers, 1932; M.A., Columbia, 1941.

JOSEPH TENO (1952, 1955).....*Assistant Professor of Electrical*
B.S. in E.E., Lehigh, 1951; M.S. in E.E., 1952. *Engineering*

GEORGE ALLEN TERRELL (1953).....*Assistant in Military Science*
Master Sergeant, U.S.A.

THEODORE ALFRED TERRY (1955)....*Instructor in Mechanical Engineering*
B.S., Drexel Inst. of Technology, 1950; M.S., Lehigh, 1951.

EARLE GORDON THOMAS III (1954).....*Instructor in Air Science*
First Lieutenant, U.S.A.F.

HAROLD PRESCOTT THOMAS (1932).....*Professor of Education, Head*
of the Department of Education, Director of the General College
Division, Director of the Summer Session, Director of the Adult
Education Program
B.S., Colgate, 1920; Ed.M., Harvard, 1925; Ed.D., 1932.

STANLEY JUDSON THOMAS (1923, 1956).....*Professor Emeritus of*
Bacteriology
B.S., Lafayette, 1912; M.S., Lehigh, 1913; M.A., 1915; Ph.D., Pennsylvania, 1928.

LOUIS FELSINGER THOMPSON (1950, 1951).....*Instructor in English*
A.B., Columbia, 1948; M.A., Lehigh, 1952.

WILLIAM PAUL THOMPSON, JR. (1955).....*Graduate Assistant in Physics*
B.S., Yale, 1955.

BRUNO THURLIMANN (1952, 1955).....*Associate Professor of Civil*
Engineering
Dipl., Swiss Federal Inst. of Technology, 1946; Ph.D., Lehigh, 1951.

FRANCIS JOHN TREMBLEY (1928, 1949).....*Professor of Ecology*
B.S., Hobart, 1928; M.S., Lehigh, 1931; Ph.D., Pennsylvania, 1934.

JOHN SCHRADER TREMPER (1939, 1952)....*Associate Professor of German,*
Head of the Department of German, Secretary of the Faculty
A.B., Colgate, 1928; M.A., Cornell, 1932; Ph.D., 1938.

ROCCO JOHN TRESOLINI (1949, 1953).....*Associate Professor of Political*
A.B., Hartwick, 1942; M.A., Syracuse, 1947; Ph.D., 1949. *Science*

KENNETH MANGOLD TRUMBORE (1946).....*Assistant Manager of*
B.A., Moravian, 1940. *Supply Bureau*

WILLIAM ELLIOTT TYLER III (1956).....*Graduate Assistant in Chemistry*
B.S., Randolph-Macon, 1956.

JOHN HENRY URBAN (1954).....*Assistant Professor of Economics*
B.S., Purdue, 1948; M.S., 1949; Ph.D., 1951.

RALPH NEWCOMB VANARNAM (1928, 1942).....*Assistant Professor of*
E.E., Cornell, 1926; M.S., 1927. *Mathematics and Astronomy*

EUGENE VASILEW (1956).....*Assistant Professor of Speech*
B.A., New York, 1942; M.A., State Univ. of Iowa, 1947; Ph.D., Ohio State, 1955.

FACULTY AND STAFF

JAMES HAROLD WAGNER (1949, 1951).....*Registrar*
B.A., Gettysburg, 1947; M.A., Pennsylvania, 1950.

ROBERT ELMER WALCK (1955).....*Research Assistant in Chemistry*
B.S., Muhlenberg, 1949; M.S., Northeastern, 1951.

WILLIAM EDWARD WALL (1955).....*Graduate Assistant in Mechanical*
B.S., Lehigh, 1954. *Engineering*

CARL KELLEY WALTERS, JR. (1953).....*Assistant in Military Science*
Master Sergeant, U.S.A.

SHERWOOD GEORGE WALTERS (1950, 1954).....*Assistant Professor of*
Marketing
A.B., Western Maryland, 1949; M.S., Columbia, 1950; M.B.A., 1953.

RENE EMIL WALTHER (1955).....*Research Associate in Civil Engineering*
Dipl. Ing. E.T.H., Swiss Federal Inst. of Technology, 1952.

FRANK RUEBEN WEAVER (1956).....*Assistant Superintendent of*
Buildings and Grounds

CARL ORVILLE WEBB (1956).....*Assistant in Military Science*
Master Sergeant, U.S.A.

HOWARD RODNEY WEBBER (1956).....*Graduate Assistant in English*
A.B., Dartmouth, 1956.

SOLOMON WEINSTOCK (1956).....*Assistant Professor of Psychology*
B.S., City College of New York, 1944; Ph.D., Indiana, 1954.

MARY EMELINE WEIR (1950).....*Research Assistant in Chemistry*
B.S., Pennsylvania State, 1938.

ULRICH WERNER WEISSTEIN (1954).....*Instructor in German*
M.A. in Letters, Indiana, 1953; Ph.D., 1954.

LEONARD ANDREW WENZEL (1951, 1956).....*Associate Professor of*
Chemical Engineering
B.S., Pennsylvania State, 1943; M.S., Michigan, 1948; Ph.D., 1949.

KARL LEROY WERKHEISER (1950).....*Assistant Accountant*
B.S., Rider, 1950.

JAMES EDWARD WERT (1954).....*Assistant Professor of Accounting*
B.S., Lebanon Valley, 1948; M.B.A., Pennsylvania, 1951; Ph.D., Ohio State, 1954.

CLARENCE RICHARD WESTFALL (1955).....*Assistant Professor of Military*
B.S., U.S. Military Academy, 1943; Major, U.S.A. *Science*

ROBERT CARL WESTGREN (1956).....*Research Assistant in Metallurgy*
B.S., Lehigh University, 1956.

DONALD BINGHAM WHEELER, JR. (1947)....*Assistant Professor of Physics*
B.S. in Eng. Phys., Lehigh, 1938; Ph.D., California Inst. of Technology, 1947.

MARTIN DEWEY WHITAKER (1946).....*President*
B.A., Wake Forest, 1927; M.A., North Carolina, 1930; Ph.D., New York, 1935;
LL.D., Lafayette, 1946; Sc.D., Moravian, 1947; Sc.D., Wake Forest, 1947; LL.D.,
Rutgers, 1948.

LEHIGH UNIVERSITY

LAWRENCE WHITCOMB (1930, 1939).....*Associate Professor of Geology*
Ph.B., Brown, 1922; A.M., Princeton, 1928; Ph.D., 1930.

JAMES JOSEPH WHITE (1953).....*Assistant in Military Science*
Master Sergeant, U.S.A.

JAMES PINCKNEY WIGHTMAN (1955).....*Graduate Assistant in Chemistry*
B.S., Randolph-Macon, 1955.

ALBERT WILANSKY (1948, 1952).....*Associate Professor of Mathematics*
B.A., Dalhousie (Canada), 1941; B.S., 1942; Ph.D., Brown, 1947.

BRADFORD WILLARD (1939).....*Professor of Geology, Head of the Department of Geology*
B.A., Lehigh, 1921; A.M., Harvard, 1922; Ph.D., 1923.

SAMUEL STERLING WILLEY (1954).....*Assistant Professor of Air Science*
B.A., Marshall, 1949; Captain, U.S.A.F.

JOHN GRIFFITH WILLIAMS (1947).....*Operator, Photocopy Laboratory*

CHARLES RICHARD WILSON (1956).....*Graduate Assistant in Mechanics*
B.C.E., Manhattan, 1955.

HAROLD ARTHUR WOLF (1955).....*Instructor in Economics*
B.A., Oregon, 1951; M.A., Michigan, 1952.

MILTON WILLIAM WOOD (1951).....*Caterer, Dining Service*

PHILIP B. WOODROOFE (1951, 1953).....*Director of Residence Halls*

HORACE WETHERILL WRIGHT (1921, 1950)....*Professor Emeritus of Latin*
A.B., Wisconsin, 1908; Ph.D., Pennsylvania, 1917.

EDWARD ROBERT WYZCALEC (1956).....*Graduate Assistant in Metallurgical Engineering*
B.S., Lehigh, 1954.

FRANK OLIVER WYSE (1955).....*Instructor in Mathematics*
A.B., Harvard, 1952; M.A., Princeton, 1955.

WILLARD ROSS YATES (1955).....*Assistant Professor of Political Science*
B.A., Oregon, 1948; M.A., 1949.

MICHAEL ANDREW YATSKO (1955) ..*Instructor in Mechanical Engineering*
B.S., Lehigh, 1950.

YUNG-FANG YU (1952).....*Research Assistant in Chemistry*
B.S., National Chekieng (China), 1948; M.S., Lehigh, 1954; Ph.D., 1956.

ALBERT CHARLES ZETTLEMOYER (1941, 1950).....*Professor of Chemistry, Director National Printing Ink Research Institute*
B.S. in Ch.E., Lehigh, 1936; M.S., 1938; Ph.D., Massachusetts Inst. of Technology, 1940.

HOWARD J. B. ZIEGLER (1947, 1953).....*Clara H. Stewardson Professor of Philosophy, Head of the Department of Philosophy*
B.A., Franklin and Marshall, 1930; B.D., Theological Seminary of the Reformed Church in U.S., 1933; S.T.M., Lutheran Theological Seminary at Philadelphia, 1941; Ph.D., Columbia, 1950.

FELLOWS AND SCHOLARS

ROBERT JEROME ADLER.....*Socony Mobil Fellow in Chemical Engineering*
B.S., Lehigh, 1954.

VIRGILIO BELTRAN-LOPEZ.....*Baldwin Fellow in Physics Ing. Civil*
Maestro-en-Ciencias-Fisicas; Universidad de Puebla (Mexico), 1955.

IAN W. BROWN.....*Packard Fellow in History*
B.A., McGill, 1953; M.A., 1956.

HAO KWONG CHU.....*Squibb Fellow in Chemistry*
B.Sc., National Sun Yat-sen University, 1943.

GUSTAVO CONSTANTE-ANDA.....*Byllesby Fellow in Civil Engineering*
Ing. Civil, Universidad Central (Ecuador), 1953.

SAMUEL COZZENS.....*Howard Flint Fellow in Chemistry*
B.S., Muhlenberg, 1954.

WILLIAM H. CRAWFORD.....*University Scholar in Psychology*
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ROBERT C. CUNNINGHAM.....*Hood Fellow in English*
B.A., Delaware, 1955.

BENOY KRISHNA DEB.....*Gotshall Scholar in Electrical Engineering*
B.E., Bengal Engineering College, 1951.

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B.A., St. Joseph's (Pennsylvania), 1953.

ROBERT THOMAS FOLK.....*National Science Foundation Fellow in Physics*
B.S. (E.E.), Lehigh, 1953; B.S. (Eng. Phys.), 1954; M.S., 1955.

GENGIS, ALI GOKKENT.....*Hoppes Fellow in Civil Engineering*
B.S., Robert College (Istanbul), 1955.

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B.S., Colorado A. and M., 1951.

AARON L. HEIMOWITZ.....*University Scholar in Business Administration*
B.S., Yeshiva, 1954.

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B.S., LeMoyne, 1956.

CARL S. HOLZINGER.....*Curtiss-Wright Fellow in Engineering*
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EMMETT SMITH JACOBS.....*Socony Mobil Fellow in Chemistry*
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GEORGE CHAOCHI LEE.....*Byllesby Fellow in Civil Engineering*
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JOHN F. MAHONEY.....*Texas Company Fellow in Chemical Engineering*
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ALAIN R. R. MOREL.....*Gotshall Scholar in Civil Engineering*
Dipl. d'Ing., Ecole Nationale des Ponts et Chaussees (Paris), 1956.

RICHARD D. MORRISON.....*Hornor Fellow in Metallurgy*
B.S., South Dakota School of Mines, 1956.

PAUL BENTON MYERS, JR.....*New Jersey Zinc Research Fellow in Geology*
B.A., Colgate, 1955.

AKIRA NITTA.....*Brink Fellow in Civil Engineering*
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RAMON R. OJEDA.....*Gotshall Scholar in Mechanical Engineering*
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ALFRED H. PALMER.....*Gotshall Scholar in Civil Engineering*
B.S., Cooper Union, 1954.

KEITH A. R. PERKINS.....*King George VI Memorial Fellow in Mechanical Engineering*
Higher National Certificate, Coventry Technical College (England), 1951.

WILLIAM GEORGE RAUPP.....*Thorne Research Fellow in Biology*
B.A., Muhlenberg, 1953.

ROGER HARRY RICHMAN.....*Allegheny-Ludlum Fellow in Metallurgy*
B.S., New Mexico Institute of Mining and Technology, 1950.

EUGENE H. SIEGEL, JR.....*Gotshall Scholar in Electrical Engineering*
B.S., Lehigh, 1956.

ALBERT MILLER STOCK.....*Armstrong Cork Fellow in Chemistry*
B.A., Gettysburg, 1953.

RICHARD C. STONE, JR.....*Federal Telecommunication Laboratory Fellow in Communications*
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JOSHUA WILSON STOUT, III.....*Weirton Steel Fellow in Chemical Engineering*
B.S., Lehigh, 1954; M.S., 1956.

HOWARD C. TROY.....*University Scholar in History*
B.S., Lehigh 1952.

BRUNO VINCENT VISCOMI.....*Westinghouse Fellow in Mechanical Engineering*
B.S., Drexel Institute of Technology, 1956.

CLARENCE MARVIN WAYMAN.....*Linde Air Products Fellow in Metallurgy*
B.S., Purdue, 1952; M.S., 1955.

SANDRA LILLIAN WHALEN.....*New Jersey Zinc Research Fellow in Geology*
B.A., Brown (Pembroke), 1954.

EDWIN LEWIS WOISARD.....*Esso Education Foundation Fellow in Physics*
B.A., Drew, 1950; M.S., Lehigh, 1952.

S U M M E R S E S S I O N S

S U M M E R S E S S I O N S

(In addition to members of the regular staff)

E. CARLTON ABBOTT.....	<i>Superintendent of Schools, Lansdowne, Pennsylvania</i>
ROSS L. ALLEN.....	<i>Director of Education, Division of Health, Physical Education and Recreation, State Uni- versity Teachers College, Cortland, New York</i>
NELSON F. BEELER.....	<i>Professor of Science, State University Teachers College, Potsdam, New York</i>
CHARLES H. BOEHM.....	<i>Superintendent of Public Instruction, Department of Public Instruction, Harrisburg, Pennsylvania</i>
ANNA DE PLANTER BOWES	<i>Chief, Nutrition Division, Pennsylvania Department of Health, Harrisburg, Pennsylvania</i>
WALTER H. BRACKIN	<i>Department of Psychology, Muhlenberg College, Allentown, Pennsylvania</i>
JOHN S. CARTWRIGHT.....	<i>Superintendent of Schools, Allentown, Pennsylvania</i>
CHARLES E. CHAFFEE.....	<i>Superintendent of Schools, Bethlehem, Pennsylvania</i>
RUTH FEDDER.....	<i>Psychologist, Bucks County Schools, Doylestown, Pennsylvania</i>
JOHN B. GEISSINGER.....	<i>Superintendent of Schools, Somerville, New Jersey</i>
HARVEY A. HEINTZELMAN.....	<i>Chief, Occupational Information and Guidance, Pennsylvania Department of Public Instruction, Harrisburg, Pennsylvania</i>
LEON C. HOOD.....	<i>Administrative Assistant, Clifford J. Scott High School, East Orange, New Jersey</i>
JOHN HUGHES.....	<i>Consultant, California Test Bureau; formerly State Director of Guidance, Maine</i>
EDWIN B. KEIM.....	<i>Principal, Cheltenham Township High School, Elkins Park, Pennsylvania</i>
SLAVA MALEC.....	<i>Nutrition Consultant, Pennsylvania Department of Health, Bethlehem, Pennsylvania</i>
ORRIELLE MURPHY.....	<i>Dean of Women, Towson State Teachers College, Maryland</i>
JAMES NANCARROW.....	<i>Principal, Upper Darby Township Senior High School, Upper Darby, Pennsylvania</i>
WILLIAM W. OSWALT.....	<i>Director, Special Education, Lehigh County Schools, Allentown, Pennsylvania</i>
ELWOOD L. PRESTWOOD.....	<i>Assistant to the Superintendent, Lower Merion Township School District, Ardmore, Pennsylvania</i>
BURT C. SHEEHAN.....	<i>Executive Director, Northampton County Tuber- culosis and Health Society, Bethlehem, Pennsylvania</i>
ANNE SNIPES.....	<i>Public Health Educator, Bucks County Health Department, Doylestown, Pennsylvania</i>

LEHIGH UNIVERSITY

HELEN F. STOCHEN.....*Psychiatrist, Student Health Office, Temple University; Faculty, Department of Psychiatry, Temple University School of Medicine, Philadelphia, Pennsylvania*
DENO G. THEVAOS.....*Assistant Professor of Psychology, The Pennsylvania State University, University Park, Pennsylvania*
THOMAS W. WATKINS.....*Supervising Principal, Southern Lehigh School District, Coopersburg, Pennsylvania*
ALEXANDER G. WESMAN.....*Associate Director, Test Division, The Psychological Corporation, New York City*
PHILIP WEXLER.....*Department of Health Education, State Teachers College, Cortland, New York*

SUPERVISORS OF STUDENT TEACHING IN
COOPERATING HIGH SCHOOLS

EARL BAUMAN.....*Social Studies, Fountain Hill High School, Bethlehem*
JOSEPH BELLETTI.....*Mathematics, Northeast Junior High School, Bethlehem*
EARL EVANS.....*Social Studies, Liberty High School, Bethlehem*
CHARLES GRIDER, JR.....*History, Southern Lehigh School District, Coopersburg*
DORIS HARRISON.....*Social Studies, Liberty High School, Bethlehem*
WILBUR JACKSON.....*Mathematics, Liberty High School, Bethlehem*
PAUL MILLER.....*Mathematics, Fountain Hill High School, Bethlehem*
HOWARD SCHEETZ.....*Mathematics, Broughal Junior High School, Bethlehem*

STANDING COMMITTEES OF THE FACULTY

(In each case the chairman is named first. The term of each elected member expires in June of the year given in parentheses after his name. The President and Vice Presidents are *ex officiis* members of all committees.)

ADMISSIONS: C. A. Seidle, W. H. Congdon, J. H. Wagner (*ex officiis*), T. C. Kubelius (1957), C. M. Criswell (1958), B. B. Owen (1959), R. D. Billinger (1960), J. V. D. Eppes (1961), H. R. Gault (1962), R. L. Armstrong (1963).

ADVANCED STANDINGS: J. H. Wagner, C. A. Seidle (*ex officiis*), H. J. B. Ziegler (1957), T. H. Grainger (1958), F. Kreith (1959), J. A. Maurer (1960).

DISCIPLINE: W. H. Congdon (*ex officio*), E. D. Amstutz (1958), J. M. Haight (1959), and two student members.

EDUCATIONAL POLICY: H. R. Gault (1958), A. E. Pitcher (1957), C. W. Curtis (1959), F. B. Jensen (1960), A. S. Foust (1961); C. E. Allen, L. V. Bewley, G. J. Christensen, W. H. Congdon, F. E. Myers (*ex officiis*); J. H. Wagner, Secretary (*ex officio*).

FELLOWSHIPS AND GRADUATE SCHOLARSHIPS: H. A. Neville, F. E. Myers, R. J. Tresolini.

GRADUATE FACULTY, EXECUTIVE COMMITTEE OF: F. E. Myers, H. A. Neville (*ex officiis*), H. M. Diamond (1957), R. D. Stout (1958), B. W. Parker (1959), J. J. Karakash (1960), C. F. Strauch (1961).

HONORARY DEGREES: H. M. Diamond (1957), E. C. Bratt (1958), A. J. Barthold (1959), A. C. Zettlemoyer (1960), J. E. Jacobi (1961), B. Willard (1962).

INSPECTION TRIPS: A. F. Gould (1957), J. V. D. Eppes (1958), C. B. Joynt (1959), G. R. Jenkins (1960), E. R. Johnston (1961).

PETITIONS: J. H. Wagner (*ex officio*), T. H. Grainger (1957), T. C. Kubelius (1957), R. E. Heiland (1958), C. B. Joynt (1958), J. Teno (1959), J. H. Urban (1959).

PUBLICATIONS, BOARD OF: P. Parr, J. B. McFadden, C. J. Moravec (*ex officiis*), T. Hailperin (1957), and four student members.

ROSTER: J. H. Wagner (*ex officio*), C. W. Curtis (1957), J. J. Karakash (1958), E. H. Cutler (1959), T. M. Haynes (1960).

STANDING OF STUDENTS: W. H. Congdon, C. E. Allen, L. V. Bewley, G. J. Christensen, W. J. Eney, A. S. Foust, R. T. Gallagher, A. F. Gould, J. B. Hartman, J. J. Karakash, F. E. Myers, C. A. Seidle, E. J. Serfass, R. D. Stout, H. P. Thomas, J. H. Wagner (all members *ex officiis*).

STUDENT ACTIVITIES: P. Parr (*ex officio*), T. E. Jackson (1957), J. D. Mack (1958), and three student members.

STUDENT CLUB FINANCES: P. Parr (*ex officio*), F. G. Armstrong (1957), A. R. Miller (1958), and three student members.

SUMMER SESSION: H. P. Thomas, C. A. Seidle, J. H. Wagner (*ex officiis*), H. V. Anderson (1957), R. D. Stout (1958), A. R. Eckardt (1959), C. F. Strauch (1960), G. P. Conard (1961).

SPECIAL STANDING COMMITTEES OF THE FACULTY

ART EXHIBITIONS: F. J. Quirk, G. J. Christensen, C. M. Criswell, R. N. VanArnam.

ATHLETIC ELIGIBILITY: P. L. Sadler (*ex officio*), J. D. Leith, G. W. Kyte (1957), C. D. Jensen (1958), A. F. Gould (1959), R. D. Stout (1960).

CATALOG: C. E. Allen, L. V. Bewley, G. J. Christensen, W. H. Congdon.

CHAPEL: R. E. Fuessle, W. H. Congdon (*ex officiis*), R. J. Emrich (1957), H. M. Diamond (1958), C. B. Joynt (1959), three members to be named by the Alumni Association, and three student members.

DEAN'S AWARD: W. H. Congdon, C. E. Allen, L. V. Bewley, G. J. Christensen, J. D. Leith, P. Parr.

FORMAL UNIVERSITY EXERCISES: P. L. Sadler, E. J. Berryhill, J. D. Leith, A. C. Molter.

FRESHMAN WEEK: J. D. Leith, R. E. Fuessle, W. L. Jenkins, G. W. McCoy, E. H. Riley, C. A. Seidle, E. A. Teal.

FULBRIGHT: W. R. Congdon (*ex officio*) F. P. Beer, F. B. Jensen, C. B. Joynt.

HOUSE COMMITTEE, DROWN MEMORIAL HALL: P. Parr (*ex officio*), and two student members.

INSTITUTE OF RESEARCH: H. A. Neville (*ex officio*), G. D. Harmon (1957), A. C. Zettlemoyer (1957), A. F. Gould (1958), F. B. Jensen (1958), G. J. Christensen (1959), R. J. Emrich (1959).

LIBRARY: J. D. Mack (*ex officio*), A. Grunbaum (1957), J. J. Karakash (1958), C. B. Joynt (1959), R. B. Sawyer (1960), E. Schwartz (1961).

MUSIC: W. H. Schempf, J. J. Karakash, C. A. Shook.

NOMINATIONS: H. P. Thomas (1956), J. B. Hartman (1957), F. B. Jensen (1958).

PLACEMENT: W. H. Congdon, E. A. Teal (*ex officiis*), A. S. Foust (1957).

"BOSEY" REITER CUP: W. H. Congdon, P. J. Franz, R. E. Fuessle.

RESIDENCE HALLS: P. B. Woodrooffe (*ex officio*), S. B. Ewing (1957), P. Parr (1958), J. W. Maxwell (1959), J. D. Ryan (1960), J. B. McFadden (1961).

ALFRED NOBLE ROBINSON AWARD: E. W. Glick, C. E. Allen, L. V. Bewley, G. J. Christensen, J. D. Mack, F. E. Myers, H. A. Neville, E. K. Smiley, M. D. Whitaker.

SAFETY AND PREVENTIVE MAINTENANCE: T. E. Jackson, R. E. Heiland, G. W. McCoy, L. A. Wenzel.

SCHOLARSHIPS AND LOANS: W. H. Congdon, P. J. Franz, F. J. Trembley.

STUDENT APPRAISAL OF INSTRUCTORS AND COURSES: H. R. Gault (1957), J. E. Jacobi (1958), J. V. D. Eppes (1959), T. M. Haynes (1960), R. B. Sawyer (1961), and three student members to be appointed by Arcadia.

STUDENT CONCERT-LECTURES: C. J. Moravec, W. H. Schempf, C. A. Shook, and three student members.

WILLIAMS SENIOR PRIZES: J. B. Severs, F. A. Bradford, H. B. Davis, G. D. Harmon, W. L. Jenkins, H. J. B. Ziegler.

Lehigh University

Lehigh University is a non-denominational, private institution comprising the College of Arts and Science, the College of Business Administration, the College of Engineering, the Graduate School, and the Institute of Research. Its offering of the baccalaureate degree is limited to men, although men and women are admitted to the Graduate School, the Summer Session, and the Adult Education Program.

Its buildings are located on a 180 acre campus on South Mountain above the City of Bethlehem, Pennsylvania, a site situated approximately halfway between New York City and Harrisburg. A field house, gymnasium, and playing field on the north side of the city are included among the University's athletic and recreation facilities.

Supplementing the formal academic program is an extensive program of extra-curricular activities, in all of which students have the assistance of competent faculty advisers.

Lehigh is distinctly a university with a purpose. This purpose is a heritage from its founder, the Honorable Asa Packer, industrialist and philanthropist.

Beginning life as a poor farm boy in Connecticut Asa Packer moved to Pennsylvania as a youth and became one of America's pioneer captains of industry. He recognized and developed the great natural resources of that richly endowed section of Pennsylvania known as the Lehigh Valley.

Looking back from the peak of his career Mr. Packer saw clearly how much easier his tasks would have been and how much fuller the fruits of his labor if he had been fortified in youth with a background of training in the arts and natural sciences. Looking forward with penetrating vision he foresaw the great industrial development that was then just beginning. He realized that the training he lacked was to become more and more essential in the years to come.

Originally the founder had in mind a school primarily technical, catering to the youth of the Lehigh Valley. However, as the details of the project were worked out by Judge Packer and his educational advisers, the scope of the educational services contemplated were greatly broadened. They foresaw the complex

social, economic, and technical problems which the future would bring and the need for service and leadership in these areas.

Thus it was that in 1865 Lehigh University was founded to provide young men with a sound basis for successful living, in the fullest sense of the phrase, and to insure leadership for the complex business and industrial civilization of the future.

During his lifetime and by bequest Judge Packer gave Lehigh over three million dollars including land, buildings and endowment. The generosity of the Packer family and other friends of Lehigh, the distinguished faculty originally assembled, and the prominence of early alumni firmly established the reputation of Lehigh in college education, and the young university took its place proudly among older and larger institutions.

The new institution, which opened its doors to young men from the country at large in 1886, was given the character of a small university. From the very beginning Lehigh combined in a unique fashion the traditional American college of liberal arts, the continental university, and the new technical institute of university rank.

The endowment fund of the University now exceeds thirteen million dollars. The value of equipment, buildings, and grounds is over seventeen million dollars.

Lehigh continues to base its program on the premise that an education for successful living must combine the acquisition of knowledge and skills fundamental in the professions with courses designed to broaden the vision and to enrich the personal life of the individual. Therefore at Lehigh requirements for graduation include studies preparatory to a career, a generous number of courses to acquaint the student with the nature and problems of the world in which he lives, and opportunities to develop himself as an individual.

The organization of Lehigh as a small university contributes to the goal of meeting individual needs by enabling students enrolled in one college to pursue in other undergraduate divisions those studies for which they are qualified and from which they can best profit.

It is also important to note that students may move from one curriculum to another. For instance, a freshman may discover that

his first choice was ill-founded. After consultation and investigation he is permitted to transfer to a curriculum more suited to his interests and abilities.

A comprehensive student advisory system assures that a student will seek and obtain advice in planning for his future career. The services of the officers and departments concerned with advising students are provided on a compulsory and voluntary basis so that when help is needed, it is available.

Lehigh students have ample opportunity to discuss with qualified and sympathetic advisers problems related to courses of study and problems of a personal nature. (See "Placement and Counseling Services").

Lehigh University is located in Bethlehem, Pennsylvania, approximately 60 miles north of Philadelphia and 90 miles west of New York City, in the center of the cultural East and in the heart of the industrial production of the Middle Atlantic states.

It was no mere chance that Lehigh was placed on the slope of Old South Mountain. When Judge Packer selected a large tract of land near the banks of the Lehigh River, he knew he was establishing a new university at the very doors of the mighty industries and the historical institutions of the Atlantic seaboard. Bethlehem was at the gateway to westward expansion by railroad and highway. It was (and is) a city, which could serve admirably as a "college town" — providing a bustling industrial community and historic cultural background as laboratories for students.

Settled in 1740 by Moravians, Bethlehem is rich in historic traditions with picturesque homes and well-kept gardens. Numbered among its historic places of interest is the Bell House erected in 1745. The bell served the settlers as a call to worship as well as warning them of fire or Indians. Colonial Hall, erected in 1748, was used during the Revolutionary War as a hospital for wounded soldiers of the Continental Army.

Each spring Bethlehem is the mecca for thousands of music-lovers from far and near, who come to hear the famous Bach Choir in Packer Memorial Church on the Lehigh Campus.

With a population of about 70,000 Bethlehem is a city of modern commercial and industrial importance. But the 180-acre campus of Lehigh on a hillside of the south side of the Lehigh river ensures the residential character of the University.

Admission Requirements

The enrollment of Lehigh University is strictly limited by action of its board of trustees, with a resulting limitation in the number of candidates who can be admitted each year to the several divisions of the University.

In the selective procedure necessitated by this limitation, the University, through its Office of Admission, takes into account a number of criteria which are believed to have some individual validity and in combination a high degree of validity in predicting probable success in college work.

(1) HIGH SCHOOL UNITS

The sixteen courses required as entrance credit represent the quantitative equivalent of the usual four-year secondary school program and include certain prescribed subjects and sufficient electives to make up the following totals:

For the College of Arts and Science—

English	4
Foreign Language	2
Elementary and Intermediate Algebra.....	1½
Plane Geometry	1
Electives	<u>7½</u>
	16

For the College of Business Administration—

English	4
Elementary and Intermediate Algebra.....	1½
Plane Geometry	1
Electives*	<u>9½</u>
	16

For the College of Engineering—

English	4
Elementary and Intermediate Algebra.....	1½
Plane Geometry	1
Plane Trigonometry and Logarithms.....	<u>½</u>

(Recommended but not required)

Advanced Algebra or Solid Geometry.....	1½
Electives	<u>8½</u>
	16

The electives may be offered in any subjects studied under standard conditions in an accredited secondary school. However, it is recommended that in addition to the above minimum subject matter requirements all candidates include as many courses in science, history, mathematics, and language as their programs and schools will permit.

*See pg. 90 for language requirements in the College of Business Administration.

(2) QUALITY OF WORK

The quality of the candidate's work will be judged by such factors as his rank or relative average grade in his class; the extent to which he has made grades distinctly higher than the minimum passing grade; to evidence of improvement or deterioration in quality of record as he has progressed through secondary school; to his relative success or failure in the particular subjects which he proposes to continue in college; and to the comments and recommendations of his principal or headmaster.

(3) ENTRANCE EXAMINATIONS

All candidates for admission to the freshman class at Lehigh University are required to write entrance tests prepared and administered by the *College Entrance Examination Board*.

Each candidate is required to write a full series of tests: *Morning Program*: Scholastic Aptitude Test; *Afternoon Program*: English Composition Achievement Test and two additional tests.

Candidates for the College of Arts and Science and for the College of Business Administration are requested to write a language, science, mathematics, or social studies tests for the additional afternoon tests.

Candidates for the College of Engineering and for the combined Arts-Engineering Program are requested to write the advanced mathematics test and a science test for the additional afternoon tests.

Lehigh recommends that the candidate write the Scholastic Aptitude Test in January or February and the three afternoon achievement tests in March.

Information and application forms for the tests should be secured from the *College Entrance Examination Board* at one of the following addresses (whichever is closer to the candidate's home or school): *P. O. Box 592, Princeton, New Jersey*, or *P. O. Box 9896 Los Feliz Station, Los Angeles 27, California*.

The candidate is responsible for requesting that his test scores be sent to Lehigh—either by indicating Lehigh on his College Board application blank or, if he failed to do this, by special request to the College Board office. In addition to requesting College Board scores, the candidate must submit an application for admission to the freshman class at Lehigh.

(4) OTHER CRITERIA AND INTERVIEWS

Information about other qualifications of candidates is obtained from principals, headmasters, and counselors. Such information relates to the candidate's health, emotional stability, intellectual motivation, social adjustment, participation in school activities, and established habits of industry and dependability.

Normally the officers of admission conduct personal interviews with all candidates at the University or at the candidate's secondary school. Where distance makes this impossible, interviews are arranged with Lehigh alumni or other qualified persons in the candidate's community. The University reserves the right to require any candidate for admission to present himself for an interview and to base the selection of candidates in part upon the appraisals obtained through such interviews.

Each candidate is urged to visit Lehigh whenever possible so that he may see the University and talk personally with an officer of admission. An appointment should be made in advance of the visit.

Interviews may be scheduled on weekdays between 9:30 and 11:30 a.m. and from 1:30 to 4:00 p.m. and on Saturday mornings from 9:00 to noon. The Office of Admission is closed Sundays, national holidays, Saturday afternoons during the school year, and all day Saturday during the summer months.

A particularly good time for a candidate and his parents to visit Lehigh is during the summer between the junior and senior years in secondary school. If an applicant has not visited Lehigh prior to his senior year, he should make every effort to schedule an interview in the fall so that he will have an opportunity to see the University and to make serious plans for his college education before he becomes too pre-occupied with activities of the senior year.

Bethlehem is easily reached by automobile, train, bus, or plane. It is served by the Lehigh Valley Railroad (New York to Buffalo) and the Reading System from Philadelphia.

Admission Procedure

ADMISSION TO THE FRESHMAN CLASS

A candidate for admission to the freshman class should secure from the Office of Admission an application blank and should

submit this early in his last year of preparation for College. First consideration is given to applications received prior to *March 1*.

On the application for admission the candidate is asked to indicate his proposed major field of study at Lehigh. Each candidate is urged to read this Catalog or the *Undergraduate Announcement* thoroughly and carefully so that he will be familiar with the programs and opportunities at Lehigh before he indicates his proposed field of study.

He should arrange with his school adviser to register for morning and afternoon tests administered by the College Entrance Examination Board. (See p. 47).

Whenever practicable the candidate should also arrange for a personal interview.

Most important of all he should maintain a good academic record—particularly during his last year of preparation for college. He should work hard to develop good study habits which will assure a good record in secondary school and will give him a good start in his freshman year in college.

ADVANCED STANDING FROM SECONDARY SCHOOLS

A few private and public secondary schools now offer truly advanced courses for limited numbers of selected students. If a candidate has completed, or expects to complete, such a course in an approved secondary school, he may establish advanced standing by taking an anticipatory examination in the particular subject.

This privilege is granted only on written request to the Director of Admission not later than June of the year the student plans to enter college.

The examinations are given at the University at times scheduled by the University. A fee of \$5 is charged for each such examination.

Exceptions to this method of establishing advanced standing from secondary schools are made only when a particular school and Lehigh University have agreed to accept well recommended students with advanced standing for specified courses. The school is expected to take the initiative in approaching the University for such an understanding.

ADVANCED STANDING FROM ANOTHER COLLEGE

Candidates for admission by transfer from other institutions may be admitted with advanced standing subject to the enrollment limitations of the several divisions of the University. Such candidates must have met the entrance requirements (other than examinations) prescribed for undergraduates at Lehigh.

A candidate who has studied at another college prior to applying for admission to Lehigh will be considered on the basis of the quality of his record at that college. *A candidate who has been dropped from another college for disciplinary reasons or for poor scholarship or who is not in good standing at his former college is not eligible for admission to Lehigh University.*

A student who is planning to transfer to Lehigh University should so arrange his work in college that he will cover as many as possible of the subjects of the freshman and sophomore years of the curriculum he selects.

A student who desires to transfer to Lehigh University from another university, college, or junior college must submit an application for admission (on a special transfer form) and an official transcript of his academic record at each college he has attended. Such a transcript must include a complete list of all courses taken, a list of entrance credits accepted for admission, and a statement of honorable dismissal. A copy of the catalog of each college previously attended should be sent to the Office of Admission at the time the transcript is forwarded.

A candidate who has attended more than one university, college, or junior college must present a record from each institution. Failure to submit a complete record of former academic experience will result in cancellation of admission or registration.

ACCEPTANCE OF ADMISSION AND DEPOSIT

When a candidate's preliminary credentials are complete and he has been offered formal admission to Lehigh University, he will be asked to notify the Director of Admission of his acceptance of the offer of admission by making a deposit of \$50 to hold a place for him in the limited enrollment. This deposit is not an additional fee but is applied toward tuition charges for the first semester. However, the deposit is forfeited in case of failure to enroll for the specified semester.

Early offers of admission for the freshman class entering in September are sent in March following receipt of January College Board scores and preliminary secondary school records through the first semester of the senior year. Normally, acceptable candidates who write both morning and afternoon tests in March may expect to be notified after the middle of April.

Lehigh does not admit a freshman class in February. A transfer student will not be admitted until he has completed at least two semesters of study at an accredited institution of higher learning.

VACCINATION REQUIREMENTS

In accordance with state and University regulations all new and transfer students are required either to show evidence of vaccination against smallpox within three years or to be vaccinated prior to the beginning of classes. These vaccinations will be performed at the Health Center when required.

In addition immunization with Tetanus toxins and the Salk Vaccine is strongly recommended before coming to Lehigh.

Undergraduate Fees

The tuition for undergraduates is \$450.00 per semester in the College of Engineering, the College of Arts and Science, the College of Business Administration, and the General College Division. Undergraduates enrolled in the College of Engineering will pay, in addition to tuition, a fee of \$50.00 per semester. A student regularly enrolled in any of the undergraduate divisions of the University who registers for fewer than the normal hours of work will pay either \$37.50 for each semester-hour carried* or the regular tuition plus the \$50 fee for Engineering students, whichever amount is lower.

There are no fees for athletics, health service, library, student activities, or student concerts-lectures. In addition, there are no matriculation, graduation, or laboratory fees.

Undergraduate fees are payable prior to registration. A bill will be rendered by the Bursar's Office which will indicate the payment date. If desired, payment may be made in installments of

*In computing tuition charges on the semester-hour basis, English 0 and Mathematics 0 are considered three-hour courses.

60%, plus a service charge of \$3.00 per semester, due prior to registration, 20% due one month after registration and 20% due two months after registration. The \$3.00 service charge is not refundable.

MILITARY DEPOSITS. A deposit of \$25.00 is made by each student taking courses in military or air science and tactics. This deposit is refunded when the government property issued to the student is returned.

CHEMISTRY BREAKAGE. Students taking chemistry laboratory courses are required to reimburse the University for returnable equipment broken or otherwise damaged and for all chemicals used in excess of reasonable amounts. To cover possible charges of this nature, all students registering for laboratory courses in chemistry purchase coupon books costing \$5.00, the unused portions of which are redeemed.

EXAMINATION FEES. Students who for satisfactory reasons absent themselves from final examinations will be allowed, upon petition, to take make-up examinations without payment of any examination fee. A fee of \$5.00 is charged for any examination subsequent to the first regular final or make-up examination allowed upon petition in any course. This regulation applies to the psychological and placement examinations required of new students if taken at some time other than that scheduled.

A fee of \$5.00 is charged for anticipatory examinations taken by students to establish advanced standing on the basis of work completed in secondary schools. (See page 49).

SHOP AND SURVEYING COURSES. A three-week shop course for Industrial and Mechanical Engineering, a six-week surveying course for Civil Engineering, and a three-week surveying course for Mining Engineering are required during the summer between the freshman and sophomore years. A two-week mine survey course is required at the end of the sophomore year in Mining Engineering. A tuition charge is made for the shop course which is given in Bethlehem under the Department of Mechanical Engineering. A tuition and maintenance charge is made for the surveying courses which are conducted at camps under the auspices of the Departments of Civil Engineering and Mining Engineering. The tuition charge for all of these courses is the regular summer rate

per semester hour. To this is added the cost of room and board at prevailing rates.

LATE REGISTRATION FEES. The penalty for procuring a registration ticket after the time specified by the Registrar shall be \$10.00. A student who does not complete his registration within three days after the date of his registration ticket is subject to a penalty of \$10.00. No registration will be accepted later than the tenth day of instruction in a regular semester or the fifth day of instruction in any summer term.

LATE PRE-REGISTRATION FEE. The penalty for a late pre-registration or a change in pre-registration is \$10.00. This will be waived for cause upon the recommendation of the curriculum director or dean concerned.

CHANGE-OF-ROSTER FEE. Having once registered in any semester, a student may not add or drop any course except on the recommendation of the director of his curriculum. There will be a \$10.00 change-of-roster fee for each such change unless it is waived by the curriculum director or college dean.

REFUNDS. In the event that a student withdraws from the University, he is entitled to receive a refund of his tuition, including the fee paid by undergraduates in the school of Engineering, less \$50 and less a deduction of 2% of the tuition and engineering fee paid for each day of instruction completed, computed from the first day of instruction in the semester.

A graduate or adult education or summer session student who formally withdraws from the University is entitled to receive a refund of his total tuition less \$5.00 for each credit hour for which he is registered and less a deduction for each day of regular instruction of two per cent* of the total tuition paid, computed from the first day of instruction in the semester.

In the event of the death of a student or his involuntary induction into the armed forces, tuition will be refunded in proportion to the fraction of the semester remaining at the time of his death or induction.

No student who is suspended or expelled from the University shall be entitled to any refunds.

*This rate is four per cent during the summer session.

No refunds will be made to any student for any reduction in his schedule after the tenth day of instruction in a regular semester or the corresponding relative date in a summer session.

A minimum of 10 days is normally required to process refund checks.

Estimate of Expenses for the College Year

Items of personal expense are dependent upon each student's personal habits and circumstances. There are certain basic expenses, however, which must be met by all students. An *estimate* of annual cost is listed below.

	<i>Arts and Science</i>	
	<i>Business Administration</i>	<i>Engineering</i>
Tuition	\$ 900	\$ 900
Engineering Fee		100
Books and Supplies	75	150
†Room	300	300
Subsistence (estimate)	540	540
	<hr/>	<hr/>
	\$1815	\$1990

(Note: Students taking military or air science are required to make a \$25 deposit which is refundable at the end of the school year.)

Books, stationery, and drawing instruments may be purchased at the Supply Bureau in the new University Center.

Dormitory students are required to eat in the University Center. Board will be billed on a semester basis payable prior to registration.

Living Arrangements

Nearly all Lehigh undergraduates live in the six University residence halls (50 per cent), or in 30 fraternity houses by invitation (40 per cent), or as commuters (10 per cent). All Freshmen who do not live at home are required to live in the residence halls. Each student who lives in the residence halls is provided with room and with board in the University dining service on a single contract basis. Other students may eat in the dining service on a cafeteria or contract basis.

The Freshmen occupy three residence halls staffed by a corps of

†Freshman rental \$300, upperclass range \$150 to \$300 per year.

carefully selected upperclass counselors, undergraduate house fellows, responsible to the Director of Residence Halls and the Dean of Students.

Room rents in the residence halls range from \$75.00 to \$150.00 per student per semester, with maid service included. The typical room is shared by two students. For each student there is provided a bed, mattress, pillow, chest of drawers, desk and chair; residents supply desk lamps, waste baskets, bedding, etc. Commercial linen service is available at a rate presently \$13.50 per semester. Personal laundry is arranged for by the student on an individual basis.

The University's Bureau of Housing Information stands ready to aid married students with their housing problems.

Use of Motor Vehicles at Lehigh University

Permission for student in Lehigh University to have and drive motor vehicles while in residence is granted so long as there is no evidence that having a motor vehicle at college interferes with academic progress and the demands of good citizenship, EXCEPT THAT:

1. A freshman in Lehigh University is not permitted to have or operate a motor vehicle at college before the mid-term marking period of the first semester, and only then under the following conditions:
 - a. He received no failing grades at mid-term.
 - b. He has been the subject of no disciplinary action of any kind.
 - c. His parent specifically requests that he may be permitted to bring a motor vehicle to college.
 - d. The student and the car are adequately covered by liability insurance.
 - e. Official permission has been received by the student from the Dean of Students.
2. If at any time a student classified as an academic freshman shall be placed on scholastic or valentine probation, or is the subject of disciplinary action, all motor vehicle privileges shall be

withdrawn until he is again in good standing and has *reapplied* for motor vehicle privileges.

3. Exceptions to the above regulations may be made by the Dean of Students for commuting freshmen, freshmen living at home, or for other exceptional reasons, upon petition from the student.

**The College of
Arts and Science**

The College of Arts and Science

Administrative Officers

Martin Dewey Whitaker, *President*

Harvey Alexander Neville, *Vice-President and Provost*

Earl Kenneth Smiley, *Vice-President*

Glenn James Christensen, *Dean of the College of Arts and Science*

Wray Hollowell Congdon, *Dean of Students*

Charles Augustus Seidle, *Director of Admissions*

James Harold Wagner, *Registrar*

The College of Arts and Science of Lehigh University comprises the departments of biology, classical languages, education, English, fine arts, geology, German, history and government, international relations, mathematics and astronomy, music, philosophy, psychology, religion, and romance languages. Interdepartmental programs are offered in foreign careers and natural resources. Courses in economics, sociology, accounting, and finance are provided by the College of Business Administration; physics and chemistry are supplied by the College of Engineering.

The degree of Bachelor of Arts is conferred upon graduates of the College.

PURPOSES

Under the name "School of General Literature," The College of Arts and Science was a part of the original plan of the University, and its aims have remained constant although the means employed have been adapted to the changing times.

The purpose of the College is to prepare a man for the exercise of his individual responsibility in the affairs of mature life. This purpose recognizes three distinguishing characteristics of an educated man; the ability to think in a disciplined manner, the ability and willingness to make discriminating judgements, and the capacity to apply his creative imagination.

In order to achieve this purpose the faculty shares with the student the range of human knowledge: the world of fact, and its counterpart, the world of ideas. The fundamentals of this experience remain what they have been for generations: a comprehensive study of all the broad areas of knowledge—the Humanities, the Natural and Physical Sciences and the Social Sciences — and a rigorous training in one of them.

REQUIREMENTS FOR GRADUATION

1. The completion of one hundred twenty credit hours of collegiate work, apportioned so as to cover the distribution and concentration requirements, in addition to the basic courses in military or air science and tactics, and physical education, both of which are required of all students.
2. The passing of a comprehensive examination in the major field.
3. The passing of an impromptu writing test in the junior year.

THE COURSE OF STUDY

Each student in the college of Arts and Science is considered from the beginning of his course as an individual. The College expects every student to have a well-defined purpose at entrance, but recognizes the student's right to change his objectives, and for that reason gives him two years in which to find himself and establish the direction of his future career. To help the student in his decision, the College provides an advisory staff consisting of the dean of the College, who is adviser of freshmen, and the directors of major sequences. The individual program for each student is outlined tentatively in an interview with the dean of the College during the summer preceding his freshman year or during freshman week. This preliminary program is determined by the nature and quality of the student's preparation and by his personal interests. The final program, which is made out in detail at the end of the sophomore year, takes into account, in addition, demonstrated aptitudes and pre-professional or vocational needs.

These individual programs admit of considerable elective choice. The number of elective courses depends upon the demands of the distribution and concentration requirements, which occupy from sixty to eighty per cent of the student's time. The number of purely elective hours ranges from twenty-one to forty-five out of the hundred and twenty required for graduation. In general the student in the College of Arts and Science may elect any undergraduate course given at the University for which he has the prerequisites. This privilege, combined with the wide choice offered by the major sequences, *i. e.*, the concentration requirements, enables the College to provide specialization in a large number of fields and preparation for individual careers.

PREPARATION FOR PROFESSIONAL SCHOOLS AND THE PROFESSIONS

The College of Arts and Science provides the preliminary training necessary for admission to the various graduate schools and, in some cases, prepares directly for a profession. Since a large proportion of the graduates of the College of Arts and Science of Lehigh University continue their work in graduate schools, the College offers a number of course combinations designed to give preliminary training for such various fields as medicine, dentistry, public service, public health, law, theology, engineering, and business administration. Students who are looking forward toward any one of the graduate schools should consult the dean of the College, and the director of their major program.

THE FIVE-YEAR COMBINED COURSE IN ARTS AND ENGINEERING

In the five-year combined course in Arts and Engineering, the opportunity exists for the student to provide himself with an unusually broad educational background for his career. Recognition that the demands of our society increasingly call for knowledge of and appreciation for the arts as well as the highest of technical skills suggests the consideration of this course whenever circumstances permit. At Lehigh, the entire program can be undertaken without transfer to another institution.

During their first four years, Arts-Engineering students are normally enrolled in the college of Arts and Science, and the dean of the college is their curriculum director. In these four years, all Arts-Engineers will meet the distribution requirements of the College of Arts and Science and will take the appropriate major sequence.

Those who are preparing for civil, electrical, industrial, mechanical, metallurgical, or mining engineering will take as a major sequence all of the work in science, mathematics, and engineering prescribed for the first three years of the engineering curriculum of their choice. Their senior comprehensive examination will normally be the Graduate Record Examination in engineering. Students who plan to combine the curriculum in Arts and Science with either the curriculum leading to the B.S. in Chemistry or Chemical Engineering, or that leading to the B.S. in Engineering

Physics will take as their major sequence the regular major in chemistry or in physics, as the case may be.

At the end of four years of successful study, the B.A. degree is conferred. For the fifth year, the student transfers to the College of Engineering and completes the requirements for the engineering degree in one more year. In some instances it may be advisable to take the two degrees at the end of the fifth year.

THE CURRICULUM

The curriculum is based upon the principles of distribution and concentration. The object of the distribution requirements is to give the student an elementary knowledge of the fields of contemporary thought and to orient him in the world of man and nature.

Distribution Requirements

The distribution requirements are administered by the dean of the College of Arts and Science in accord with the group regulations given below. The subjects required of the individual student depend in part upon the field in which he expects to major, in part upon his personal preference, and in part upon the subjects he has taken in secondary school.

Group I: Humanities

ENGLISH. Twelve semester hours. The normal requirement in English is Engl. 1 and 2, Composition and Literature (6 hours) in the freshman year, and two courses (6 hours) in English or American literature in the sophomore year, a total of twelve hours. Students who demonstrate satisfactory ability in written composition in the freshman placement tests will meet the distribution requirement by passing Engl. 11 and 12, Types of World Literature (6 hours). Three extra hours of composition, carrying no credit toward graduation, must be taken and passed by those whose preparation, as evidenced by the placement tests, has been poor.

FOREIGN LANGUAGE. Number of hours varies. Each student is required to complete successfully one year (6 hours) of advanced college courses in one language. The requirement may be met either by passing an examination or by pursuing in course the language to be used in satisfaction of the requirement. Students

who present at entrance three or four years of foreign language normally are able to meet this requirement with one year of advanced college work. Eighteen hours of course work are normally taken by students who begin a new language in college.

Students planning to continue with a language previously studied take a freshman week placement test in that language to determine at what level they are prepared to resume their study.

With the approval of the dean of the College, an option is offered those who find it necessary to pursue in college the study of two foreign languages, provided that neither language was studied in secondary school. Such students may offer in satisfaction of the language requirement two years of one foreign language and one year of another.

FINE ARTS OR MUSIC. Three semester hours.

PHILOSOPHY OR RELIGION. Three semester hours.

Group II: Natural and Physical Science

Twelve semester hours, chosen from at least three of the following fields: astronomy, biology, chemistry, geology, mathematics, physics, psychology. Normally, a student will take work in fields not represented among those studied in secondary school.

Group III: Social Science

Twelve semester hours, chosen from at least three of the following fields: ancient civilization, economics, education, government, history, international relations, sociology.

Concentration Requirements

During the second semester of the freshman year if possible, and in any event no later than the end of the sophomore year, each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Including preliminary college work, the minimum number of hours constituting a major is twenty-four. Change of major is permitted up to the end of the sophomore year. Majors must be approved by the director of the major chosen and by the dean of the College.

The major work is designed to enable a student to master his chosen field so far as that is possible in the two years devoted to the subject. In all fields certain courses are prescribed, but the mere passing of courses will not satisfy the major requirements. It is expected that the student will read widely in his subject and prepare himself largely through his own reading and his own independent work for his final comprehensive examination. After a student has selected a major subject, the head of the department in which the major selected becomes the official adviser of the student and guides him in his choice of courses.

Comprehensive Examination

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examination is given under the direction of the head of the major department. At least two university teachers and, whenever possible, representatives of at least two departments take part in the examination.

No student is allowed to take the senior comprehensive examination more than twice in any one field. In case of failure on the first attempt, a second trial is not permitted until a period of three months has passed.

UNSCHEDULED WORK

On the advice of the head of the department in which the major work is being done and with the consent of the dean of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of elective work otherwise required for graduation.

COLLEGE HONORS PROGRAM

The College Honors Program is open to undergraduates from all three Colleges. It offers to students who have demonstrated outstanding ability the opportunity to devote part of their junior and senior years to independent study through a series of limited-

enrollment seminars and the writing of a thesis. The seminars, one in each of four large areas of human knowledge, combine breadth, which balances the concentration in a major, with the depth which is possible in small classes of students carefully selected from all majors. The seminars and the thesis also provide a foretaste of the kind of work and of the standards the students will encounter in graduate and professional schools.

Students in this program are graduated with College Honors if, in addition to meeting all requirements for graduation, they have:

(1) Completed the four Honors Seminars with an average grade of at least 3.25.

(2) Completed a thesis adjudged by the Honors Council to be of distinguished quality.

(3) Passed with distinction the senior comprehensive examination required by their major department.

(Honors students who have met all the requirements for graduation in their college but who fail to achieve the specified levels will receive their degree without College Honors.)

Admission

A student will apply for admission to the Honors Program during his fourth semester. (Application forms may be procured in the Office of the Dean, College of Arts and Science.) Admission will be granted if the applicant:

(1) Has a cumulative three-semester average of at least 3.0, or in unusual cases, has had an outstanding record in the preceding two semesters.

(2) Has the approval of the head of the department in which he is majoring and of the Honors Council.

Each applicant will be notified of the decision on his application far enough in advance of pre-registration for his fifth semester to make appropriate plans.

In unusual situations, an outstanding student may, with the approval of the Honors Council, schedule one or more Honors Seminars without committing himself to the whole program. Such special permission will be granted, however, only when the Council feels certain that his admission will not interfere with the maximum effectiveness of the program for those regularly enrolled.

The Program

A student admitted to the Honors Program will:

- (1) Continue with his departmental major.
- (2) Schedule one Honors Seminar (see course offerings) each semester of his junior and senior years.
- (3) Write an undergraduate thesis (usually, but not necessarily, in his major department). Time for the writing of the thesis may be provided by scheduling a thesis course or through the provision for unscheduled work.

The College Honors Program is administered by the dean of the College of Arts and Science. The organization and conduct of the Honors Seminars will be directed by the Honors Council, which shall consist of (a) all faculty members currently teaching in the program or designated to teach in it, (b) the teacher or teachers who have conducted seminars during the preceding semester, and (c) the dean of the College, *ex officio*. Seminar teachers may be members of the faculty of any of the three colleges. The writing of the thesis will be directed by the head of the department in which the student has scheduled the thesis or by someone designated by the department head.

SPECIAL HONORS

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate during their junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced by either a final examination or a thesis, as the head of the department involved may direct. No student who fails to pass his comprehensive examination with distinction is graduated with special honors.

SPECIAL REGULATIONS FOR ENGLISH

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the dean of the College. He may require that they take additional English without credit toward graduation.

Toward the end of the junior year each junior in the College of Arts and Science must report to the department of English for an exercise in impromptu writing. Students found seriously deficient in this test are reported to the dean of the College, who may require that they take additional English without credit toward graduation.

DETAILS OF CONCENTRATION REQUIREMENTS

Major Sequences

BIOLOGY. Two majors are offered by the department of biology: zoology and bacteriology.

Zoology. This major is designed for men who intend to enter medical school or to continue advanced instruction in a graduate school.

<i>Required Courses: Elementary</i>			
Biol.	31.	32.	Zoology (6)
<i>Required Courses: Advanced</i>			
Biol.	3.		Comparative Anatomy (3)
Biol.	4.		Embryology (3)
Biol.	6.		Botany (3)
Biol.	18.		Genetics (2)
Biol.	61.		Bacteriology (3)
Biol.	162.		Advanced Bacteriology (3)
Biol.	220.		Physiology (3)
Biol.	313.		Histology (3)
<i>Suggested Electives</i>			
Chem.	371.		Elements of Biochemistry (3)
Phil.	261.		Philosophy of the Natural Sciences (3)

Bacteriology. This major is for men who intend to go into public health work or bacteriology either upon graduation or following graduate study.

<i>Required Courses: Elementary</i>			
Biol.	31.	32.	Zoology (6)
<i>Required Courses: Advanced</i>			
Biol.	3.		Comparative Anatomy (3)
Biol.	6.		Botany (3)
Biol.	18.		Genetics (2)
Biol.	61.		Bacteriology (3)
Biol.	162.		Advanced Bacteriology (3)
Biol.	220.		Physiology (3)
Biol.	353.		Virology (3)
<i>Suggested Electives</i>			
Biol.	313.		Histology (3)
Biol.	355.		Industrial Bacteriology (3)
Biol.	361.		Public Sanitation (3)
Chem.	371.		Elements of Biochemistry (3)

Students taking their major work in zoology or bacteriology are required to take the following collateral courses.

Chem.	4.	5.	General Chemistry (8)
Chem.	35.		Analytical Chemistry (4)
Chem.	93.		Elements of Physical Chemistry (3)

Chem.	150, 151.	Organic Chemistry	(6)
Chem.	165.	Organic Chemistry Laboratory.....	(2)
Phys.	12.	Introduction to Physics.....	(3)
Phys.	16.	General Physics	(3)
Phys.	17.	General Physics Laboratory.....	(2)

and two of the following courses:

Math.	3, 4.	Introduction to Mathematical Analysis.....	(6)
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Note: Students who do not have entrance credit in Trigonometry must also take
Math. 1. Trigonometry

Biology: Natural Resources Option. Students interested in natural resources and their conservation may take the major in zoology, slightly modified to permit taking collateral courses in geology and other pertinent fields.

CHEMISTRY.

Required Courses: Elementary

Chem.	4, 5.	General Chemistry	(8)
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Required Courses: Advanced

Chem.	35, 36.	Analytical Chemistry	(8)
Chem.	91.	Physical Chemistry	(3)
Chem.	92.	Physical Chemistry Laboratory.....	(1)
Chem.	150, 151.	Organic Chemistry	(6)
Chem.	165, 167.	Organic Chemistry Laboratory.....	(4)
Chem.	190.	Physical Chemistry	(3)
Chem.	192.	Physical Chemistry Laboratory.....	(1)
Chem.	194.	Physical Chemistry and Electrochemistry.....	(3)
Chem.	197.	Electrochemistry, Laboratory	(1)
Chem.	302.	Inorganic Chemistry	(3)

and at least one of the following:

Chem.	303.	Nuclear and Radiochemistry	(3)
Chem.	337.	Advanced Analytical Chemistry.....	(3)
Chem.	357.	Qualitative Organic Chemistry.....	(3)
Chem.	358.	Advanced Organic Chemistry.....	(3)
Chem.	371.	Biochemistry	(3)

Required Courses: Collateral

Math.	11.	Analytic Geometry and Calculus I.....	(3)
Math.	12.	Analytic Geometry and Calculus II.....	(3)
Math.	13.	Analytic Geometry and Calculus III.....	(3)

and either

Phys.	12.	Introduction to Physics.....	(3)
Phys.	16.	General Physics	(3)
Phys.	17.	General Physics Laboratory.....	(2)

or

Phys.	22.	Mechanics and Properties of Matter.....	(4)
Phys.	23.	Heat, Sound and Light.....	(4)
Phys.	24.	Electricity and Magnetism.....	(4)

CLASSICAL LANGUAGES. Students who elect Greek and Latin as a major will choose one of two groups of courses:

Group 1 (Emphasis upon Greek).

Required Courses: Elementary

Gk.	1, 2.	Elementary Greek	(6)
Gk.	3, 4.	Second-Year Greek	(6)

Required Courses: Advanced

Gk.	7.	Thucydides	(3)
Gk.	8.	Tragedy	(3)
Gk.	9.	Dramatic Poetry	(3)
Gk.	10.	Greek Oratory	(3)
Gk.	116.	Plato	(3)

Gk.	21.	Ancient History	(3)
Lat.	22.	Ancient History	(3)
Gk.	200.	Greek Literature in English Translation.....	(3)
Lat.	201.	Latin Literaure in English Translation.....	(3)

Six hours of Latin language, specific courses depending on the student's preparation.

Group 2 (Emphasis upon Latin).

Required Courses: Elementary

Lat.	61.	Beginning Latin	(3)
Lat.	62.	Caesar	(6)
Lat.	64.	Cicero	(3)

Required Courses: Advanced

Lat.	65.	Vergil	(3)
Lat.	66.	Horace	(3)
Lat.	67.	Livy	(3)
Lat.	68.	Latin Drama	(3)
Lat.	169.	Satire	(3)
Gk.	21.	Ancient History	(3)
Lat.	22.	Ancient History	(3)
Lat.	201.	Latin Literaure in English Translation.....	(3)
Gk.	200.	Greek Literature in English Translation.....	(3)

Six hours of Greek language, specific courses depending upon the student's preparation.

Suggested Electives

Phil.	14.	Logic and Scientific Method.....	(3)
Phil.	231.	Ancient and Medieval Philosophy.....	(3)
Govt.	1.	The Foundations of Government.....	(3)
Hist.	25.	European History	(3)
Astr.	1.	Descriptive Astronomy	(3)
Astr.	2.	General Astronomy	(3)
Educ.	330.	History of Education in Europe.....	(3)

CONSERVATION. See Natural Resources, page (78).

ECONOMICS AND BUSINESS ADMINISTRATION. Three majors are offered in the field of economics and business administration: economics, finance, and accounting.

Economics.

Required Courses: Elementary

SOPHOMORE YEAR

Eco.	3.	4.	Economics	(6)
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Required Courses: Advanced

JUNIOR YEAR

Eco.	306.	Intermediate Economic Theory.....	(3)
Eco.	307, 308.	Advanced Economics.....	(6)
E.S.	45.	Statistical Method	(3)
E.S.	346.	Business Cycles and Forecasting.....	(3)
Fin.	129, 130.	Money and Banking.....	(6)

SENIOR YEAR

Eco.	333.	Labor Problems	(3)
Eco.	236.	Public Utilities	(3)
Fia.	241.	International Trade and Finance.....	(3)
Fin.	351.	Public Finance: Federal.....	(3)
Soc.	262.	Social Problems	(3)

Suggested Electives

Acctg.	104.	Accounting for Engineers	(3)
Eco.	11.	Marketing	(3)
Eco.	235.	Transportation	(3)
E.S.	347.	National Income Analysis.....	(3)

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Hist.	327, 328.	Development of American Institutions.....	(6)
Govt.	357.	City Government	(3)
Govt.	360.	Public Administration	(3)
I.E.	162.	Industrial Management	(3)
Soc.	42.	Principles of Sociology	(3)
Soc.	265.	Development of Sociological Theory.....	(3)

Finance.

*Required Courses: Elementary
SOPHOMORE YEAR*

Eco.	3, 4.	Economics	(6)
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*Required Courses: Advanced
JUNIOR YEAR*

Fin.	125, 326.	Corporation Finance	(6)
Fin.	129, 130.	Money and Banking	(6)
E.S.	45.	Statistical Method	(3)
Acctg.	104.	Accounting for Engineers	(3)

SENIOR YEAR

Fin.	323.	Investments	(3)
Fin.	351.	Public Finance: Federal	(3)

plus twelve hours selected from the following:

Eco.	160.	Insurance	(3)
Eco.	333.	Labor Problems	(3)
Fin.	153.	Credits and Collections.....	(3)
Fin.	232.	Monetary-Fiscal Policy	(3)
Fin.	241, 342.	International Trade and Finance	(6)
Fin.	324.	Investments	(3)
Fin.	331.	Bank Credit Problems	(3)
Fin.	352.	Public Finance: State and Local.....	(3)

Suggested Electives

Acctg.	1, 2.	Accounting	(6)
Acctg.	13, 14.	Intermediate Accounting	(6)
Eco.	306.	Intermediate Economic Theory	(3)
E.S.	346.	Business Cycles and Forecasting.....	(3)

Accounting.

Required Courses: Elementary

Acctg.	1, 2.	Accounting	(6)
Eco.	3, 4.	Economics	(6)

Required Courses: Advanced

Acctg.	13, 14.	Intermediate Accounting.....	(6)
Acctg.	115.	Cost Accounting	(3)
Fin.	125, 326.	Corporation Finance	(6)
Law	1, 102.	Business Law	(6)
Law.	204.	Wills, Estates, and Trusts.....	(3)

plus nine semester hours to be selected from the following:

Acctg.	203, 204.	Federal Tax Accounting.....	(6)
Acctg.	218.	Advanced Cost Accounting.....	(3)
Acctg.	219.	Specialized Accounting Systems.....	(3)
Acctg.	304.	Governmental and Institutional Accounting.....	(3)
Acctg.	315.	Advanced Accounting	(3)
Acctg.	320.	Auditing	(3)

*Suggested Electives**

Eco.	306.	Intermediate Economic Theory.....	(3)
E.S.	45.	Statistical Method	(3)
E.S.	346.	Business Cycles and Forecasting.....	(3)
Fin.	323.	Investments	(3)

*The New York State Board of Certified Public Accountant Examiners and the New Jersey State Board of Accountants require 8 credit hours in finance of candidates for the C.P.A. examinations in their states. Also, the New Jersey Board demands 30 credit hours of accounting. Therefore it is recommended that students who anticipate becoming candidates in either state take 3 additional credit hours of finance, and that prospective New Jersey candidates also take 6 additional credit hours in accounting, as part of their elective programs.

EDUCATION.

<i>Required Courses: Elementary</i>			
Educ.	1.	Introduction to Education.....	(3)
Psych.	1.	Elementary Psychology	(3)
Educ.	20.	Educational Psychology	(3)
<i>Required Courses: Advanced</i>			
Educ.	331.	History of Education in the United States.....	(3)
Educ.	350.	Principles of Secondary Education.....	(3)
Educ.	352.	Principles of High School Teaching.....	(3)
Educ.	353.	Observation of Secondary School Teaching.....	(3)
Educ.	354.	Practice Teaching of Secondary School Subjects.....	(3)
		Electives	(3)
<i>Required Courses: Collateral</i>			
Biol.	13.	Human Biology	(3)
Speech	30.	Fundamentals of Speech.....	(3)

ENGLISH. Two majors are offered by the department of English: English literature, and journalism.

English Literature.

The major program in English literature is designed for those men who look forward to teaching English or pursuing graduate courses in the field, and for those who seek the personal development and general benefits that such a study provides.

<i>Required Courses: Elementary</i>			
Engl.	1, 2.	Composition and Literature.....	(6)
or			
Engl.	11, 12.	Types of World Literature.....	(6)
and			
Engl.	8, 9.	English Literature	(6)
<i>Required Courses: Advanced</i>			
Engl.	323, 324.	Shakespeare and the Elizabethan Drama.....	(6)
and		and eighteen semester hours from the following courses:	
Engl.	183, 184.	Readings in English Literature.....	(6)
Engl.	321.	Contemporary American Literature.....	(3)
Engl.	322.	Contemporary English Literature.....	(3)
Engl.	325.	English Literature of the Romantic Era.....	(3)
Engl.	326.	English Literature of the Victorian Era.....	(3)
Engl.	331.	Milton	(3)
Engl.	333.	Restoration and Augustan Literature.....	(3)
Engl.	334.	The Age of Johnson.....	(3)
Engl.	335.	History of the English Language.....	(3)
Engl.	336.	Writing for Publication.....	(3)
Engl.	337.	The Renaissance	(3)
Engl.	338.	The Seventeenth Century	(3)

Collateral courses are recommended in history, philosophy, history and criticism of the fine arts, and classical and modern languages and literature. Students planning to pursue graduate studies should acquire a reading knowledge of German, French, and Latin as undergraduates.

Journalism.

The division of journalism offers five programs of study leading toward specialization in the following areas of communications: (1) newspaper practice; (2) government information;

(3) communications in industry; (4) management of natural resources; (5) business and technical publications. Journalism majors are advised to declare enrollment in one of these programs at the beginning of their sophomore year in order to obtain an early start in the differentiating collateral courses.

Required Courses: Elementary

Journ.	1-4.	Brown and White, four semesters.....	(4)
		and Brown and White during each additional semester of residence.	

Journ.	11.	News Writing	(3)
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Required Courses: Advanced

Journ.	12.	Reporting of Public Affairs.....	(3)
Journ.	13.	Editing	(3)
Journ.	15.	Interpretive Writing	(3)
Journ.	16.	Law of the Press.....	(3)
Journ.	17.	Magazine Article Writing.....	(3)
Journ.	118.	History of American Journalism.....	(3)
Journ.	120.	Journalism Proseminar	(3)

Required Courses: Collateral

Gk.	21.	Ancient History	(3)
Govt.	352.	Civil Rights	(3)
Lat.	22.	Ancient History	(3)
Phil.	14.	Logic and Scientific Method.....	(3)
Phil.	15.	Ethics	(3)

Suggested Electives

Biol.	206.	Natural History and Ecology.....	(3)
Eco.	333.	Labor Problems	(3)
Engl.	321, 322.	Contemporary Literature	(6)
Govt.	51.	American National Government	(3)
Govt.	52.	American State and Local Government.....	(3)
Hist.	25, 26.	European History	(6)
Hist.	328.	Development of American Institutions.....	(3)
I.R.	351, 352.	International Organization	(6)
Journ.	43, 44.	Communications in Industry.....	(6)
Phil.	100.	Philosophy of Contemporary Civilization.....	(3)
Phil.	281.	Philosophy of the Social Sciences.....	(3)
Psych.	304.	Social Psychology	(3)
Soc.	262.	Social Problems	(3)

FINE ARTS.

Required Courses: Elementary

F.A.	11.	Ancient and Medieval Art.....	(3)
F.A.	12.	The Art of the Italian Renaissance.....	(3)
F.A.	5.	Freehand Drawing	(6)
F.A.	7.	Advanced Drawing and Painting.....	(6)

Required Courses: Advanced

F.A.	3.	History of Architecture.....	(6)
F.A.	13.	The Art of the Northern Renaissance.....	(3)
F.A.	14.	Modern Art	(3)
F.A.	16.	Art in the United States.....	(3)
F.A.	17, 18.	Criticism and Analysis of Art.....	(6)

Required Courses: Collateral

Mus.	13, 14.	Introduction to Music Literature.....	(6)
Phil.	151.	The Philosophy of Art.....	(3)

Courses in history and foreign language.

FOREIGN CAREERS. An interdepartmental major designed to give students the grounding in language, history, economics and related subjects needed for successful work with private industry

or governmental agencies in their overseas activities. The program is under the direction of Professor Finn B. Jensen of the department of economics.

Each student in the program will schedule all courses in the Common Core and in one of the Options. In addition, he will, in consultation with the director, select courses in language, history and other subjects which will give him an intensive knowledge of the culture of the area in which he is interested.

The program also affords a broad base for graduate study in social sciences and business administration. Students interested in this aspect of the major sequence should consult with the director early in their college careers.

Common Core

Required Courses: Elementary

Eco.	3,	4.	Economics	(6)
Govt.	3,		Foreign Governments	(3)
Hist.	26,		European History	(3)
Math.	10,		General Mathematics for Business.....	(3)

Required Courses: Advanced

Eco.	3xx†		Comparative Economic Organization	(3)
E.S.	45,		Statistical Method	(3)
Fin.	133,		Money and Banking	(3)
Hist.	1—*		Two courses covering the history of the area of concentration	(6)
or				
Hist.	3—*			
Hist.	3yy, 3zz†		Area Seminar: Comparative political, economic and social forces.....	(6)

Accounting Option

Required Courses: Elementary

Acct.	1,	2.	Accounting	(6)

Required Courses: Advanced

Acct.	13,	14.	Intermediate Accounting	(6)
Acct.	115,		Cost Accounting	(3)
Law	1.		Business Law	(3)

Foreign Trade Option

Required Courses: Advanced

Acct.	104.		Accounting for Engineers	(3)
Eco.	11,		Marketing	(3)
Eco.	113, 115,	214, or 217 (one course only)	Marketing and Distribution Research.....	(3)
Eco.	312,		Marketing and Distribution Research.....	(3)
Fin.	241, 342.		International Trade and Finance.....	(6)

Public Administration Option

Required Courses: Advanced

Acct.	104.		Accounting for Engineers.....	(3)
Fin.	241,		International Trade and Finance.....	(3)
or				
I.R.	361.		International Law	(3)
Fin.	351,		Public Finance	(3)
Govt.	360,		Public Administration	(3)
Govt.	363,		Contemporary Political Thought.....	(3)
Govt.	3xx†		Comparative Administrative Systems.....	(3)

*To be selected from courses now in the catalogue.

†New courses now being developed.

Open Option

In place of any of the three preceding options, a student may take an Open Option by meeting the advanced course requirements for one of the other Arts College majors. The Open Option is most feasible with humanities and social science majors, but will require a careful combining of distribution courses and free electives with the eighteen hours normally given to the option. Students interested in the Open Option should consult the director of the Foreign Careers major as early as possible.

GEOLOGY.

<i>Required Courses: Elementary</i>			
Geol.	1.	Principles of Geology	(3)
or			
Geol.	3,	4. Fundamentals of Geology.....	(6) } (3) (4) or (6)
or			
Geol.	6.	Engineering Geology	(4)
Geol.	12.	Historical Geology	(3)
Geol.	31.	Mineralogy	(3)
Geol.	32.	Petrology	(3)
<i>Required Courses: Advanced</i>			
Geol.	42.	Geologic Surveying	(1)
Geol.	43.	Cartography	(1)
Geol.	141.	Field Geology	(3) } (3)
or			
Geol.	146.	Field Problems	(3)
Geol.	223.	Structural Geology	(3)
Geol.	311.	Paleontology	(3)
Geol.	312.	Stratigraphy	(3)
Geol.	342.	Field Trip	(1)
Geol.	344.	Field Trip	(1)
and at least six semester hours from the following:			
Geol.	146.	Field Problems	(3)
Geol.	255, 256.	Mineral Resources	(6)
Geol.	331.	Optical Crystallography	(3)
Geol.	332.	Petrography	(3)
Geol.	361.	Water Resources	(3)
Geol.	362.	Soil Resources	(3)
<i>Required Courses: Collateral</i>			
Math.	1.	Trigonometry	(3)
Math.	3,	4. Introduction to Mathematical Analysis.....	(6)
C.E.	61.	Engineering Drawing and Descriptive Geometry.....	(3)
C.E.	40.	Land and Topographic Surveying.....	(3)
Chem.	4,	5. General Chemistry	(8)
Phys.	12.	Introduction to Physics	(3)
Phys.	16.	General Physics	(3)
Min.	161.	Mining Engineering	(3)

Variations in the major courses and the suggested electives may be made, depending upon the branch of geology in which the student is interested. For example, six hours of biology are recommended for men interested in paleontology. Additional courses in mathematics are recommended for those interested in certain other branches, such as geochemistry or geophysics. Summer employment in surveying may, with the approval of the department head, be substituted for C.E. 40. A reading knowledge of French

and German is recommended. Engl. 142 is recommended.

Attendance for credit at a summer camp in geology is recommended. As the department does not operate such, attendance at one conducted by a college or university in the United States or Canada may be accepted for credit, provided the camp and its curriculum meet the approval of the department of geology. Such summer sessions usually last four to six weeks and grant three to six hours credit. Students who receive credit for this type of course may be excused from Geology 141 (3) or Geology 146 (3), and, in addition, depending upon credits, course contents, and coverage, C.E. 40, Plane Surveying (3) and Geology 42 (1). Prerequisites: Consent of the department head and Junior standing as a major in earth sciences; in exceptional cases Sophomore standing may be accepted.

Geology: Natural Resources Option: Students interested in natural resources and their conservation may arrange a major in geology, slightly modified to permit taking collateral courses in biology and other pertinent fields.

GERMAN.

For a major in German, students will be required to complete the courses listed below, plus any others which may be required as preparatory work for the courses specified; and they will also be required to acquaint themselves with the chief works, authors and developments in the history of German Literature.

Required Courses: Advanced

Ger.	10.	Goethe's <i>Faust</i>	(3)
Ger.	13, 14.	Lessing, Goethe, and Schiller.....	(6)
Ger.	22.	Advanced Composition and Conversation.....	(3)
Ger.	211, 212.	Nineteenth Century German Drama.....	(6)
Ger.	215, 216.	The German Short Story.....	(6)

Collateral courses will be required or advised in accordance with the candidate's educational interests and objectives. Normally such collateral work should include appropriate courses in European history, fine arts, music, philosophy, and in languages and literature other than German. Students who contemplate doing graduate work in German are strongly advised to acquire, before undertaking such work, at least an elementary knowledge of French, Greek and Latin.

HISTORY AND GOVERNMENT. The department of history and government offers undergraduate courses which provide a foundation for law school, government service, journalism, teaching or

graduate work in the fields of the historical evolution of the world in which we live. Its courses are designed to develop habits of thought and methods of approach which are conducive to an objective consideration of the broader human and political questions of today.

Four majors are offered by the department: American history, European history, English history, and government.

American History.

Required Courses: Elementary

Hist.	13, 14.	United States History.....	(6)
Hist.	25, 26.	European History	(6)
Govt.	51.	American National Government.....	(3)

Required Courses: Advanced

Twelve hours from the following:

Hist.	320.	Eighteenth Century European Imperialism.....	(3)
Hist.	327, 328.	Development of American Institutions.....	(6)
Hist.	329, 330.	American Foreign Policy.....	(6)
Hist.	361.	United States and Pennsylvania History.....	(3)

Six hours from the following:

Hist.	27, 28.	European Expansion and Empire Building.....	(6)
Hist.	29, 30.	Modern Europe	(6)
Hist.	315, 316.	Political and Social History of England.....	(6)
Hist.	317, 318.	The Middle East in World History.....	(6)
Hist.	319.	Eighteenth Century European Civilization.....	(3)
Hist.	331, 332.	Intellectual Expansion of Modern Europe.....	(6)
Hist.	341, 342.	Expansion of the English-speaking Peoples.....	(6)
Hist.	349, 350.	Hispanic America	(6)
Govt.	1.	Foundations of Government	(3)
Govt.	2.	American Political Ideas.....	(3)

Six hours from the following:

Govt.	1.	Foundations of Government.....	(3)
Govt.	2.	American Political Ideas.....	(3)
Govt.	52.	American State and Local Government.....	(3)
Govt.	351.	Constitutional Law	(3)
Govt.	352.	Civil Rights	(3)
Govt.	357.	City Government	(3)
Int.Rel.	341, 342.	International Relations	(6)
Int.Rel.	351, 352.	International Organization	(6)
Int.Rel.	361, 362.	International Law	(6)

Suggested Electives

Eco.	3, 4.	Economics	(6)
Engl.	20, 21.	American Literature	(6)
F.A.	16.	Art in the United States.....	(3)
Soc.	41.	Cultural Anthropology	(3)
Soc.	42.	Principles of Sociology	(3)

European History.

Required Courses: Elementary

Hist.	13, 14.	United States History.....	(6)
Hist.	25, 26.	European History	(6)

Required Courses: Advanced

Hist.	319.	Eighteenth Century European Civilization.....	(3)
Hist.	331, 332.	Intellectual Expansion of Modern Europe.....	(6)

Twelve hours from the following:

Hist.	27, 28.	European Expansion and Empire Building.....	(6)
Hist.	29, 30.	Modern Europe	(6)
Hist.	315, 316.	Political and Social History of England.....	(6)
Hist.	317, 318.	The Middle East in World History.....	(6)
Hist.	341, 342.	Expansion of the English-speaking Peoples.....	(6)

Six hours from the following:

Hist.	320.	Eighteenth Century European Imperialism.....	(3)
Hist.	327, 328.	Development of American Institutions.....	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Hist.	349, 350.	Hispanic America	(6)
Govt.	3.	Foreign Governments	(3)
Govt.	6.	Democracy	(3)
Govt.	101.	History of Political Thought.....	(3)
Govt.	363, 364.	Contemporary Political Thought.....	(6)

Suggested Electives

Eco.	3, 4.	Economics	(6)
Engl.	8, 9.	English Literature	(6)
Int.Rel.	11, 12.	Diplomacy of Europe	(6)
Int.Rel.	361, 362.	International Law	(6)
Gk.	21.	Ancient History	(3)
Lat.	22.	Ancient History	(3)

English History.

Required Courses: Elementary

Hist.	25, 26.	European History	(6)
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Required Courses: Advanced

Hist.	315, 316.	Political and Social History of England.....	(6)
Hist.	341, 342.	Expansion of the English-speaking Peoples.....	(6)
Hist.	343, 344.	Tudor and Stuart History	(6)

Six hours from the following:

Hist.	13, 14.	United States History	(6)
Hist.	320.	Eighteenth Century Imperialism.....	(3)
Hist.	327, 328.	Development of American Institutions.....	(6)
Hist.	329, 330.	American Foreign Policy.....	(6)

Nine hours from the following:

Hist.	29, 30.	Modern Europe	(6)
Hist.	317, 318.	The Middle East in World History.....	(6)
Hist.	331, 332.	The Intellectual Expansion of Europe.....	(6)
Hist.	319.	Eighteenth Century European Civilization.....	(3)

Suggested Electives

Engl.	323, 324.	Shakespeare and the Elizabethan Drama.....	(6)
Engl.	325, 326.	English Romantic and English Victorian Literature (6)	
Govt.	3.	Foreign Governments	(3)
Govt.	101.	History of Political Thought.....	(3)
Gk.	21.	Ancient History	(3)
Lat.	22.	Ancient History	(3)

Government.

Required Courses: Elementary

Govt.	1.	Foundations of Government.....	(3)
Govt.	2.	American Political Ideas.....	(3) } (3)
or			
Govt.	6.	Democracy	(3) }
Govt.	3.	Foreign Governments	(3)

Required Courses: Advanced

Govt.	51, 52.	American Government	(6) }
or			
Govt.	359, 360.	Law Making and Public Administration.....	(6) }
Govt.	357.	City Government	(3)
Govt.	363, 364.	Temporary Political Thought.....	(6)

plus nine hours selected from the following:

Govt.	4.	Political Parties and Electoral Problems.....	(3)
Govt.	101.	History of Political Thought.....	(3)
Govt.	351.	Constitutional Law	(3)
Govt.	352.	Civil Rights	(3)
Govt.	354.	Administrative Law	(3)

plus six hours to be selected, with the approval of the political science staff, from the fields of ancient, medieval, or modern history or international relations.

Suggested Electives

Majors in government will find it advantageous to enroll for certain courses in the fields of public finance, economics, sociology, philosophy, psychology and journalism. The particular course selections should be made in consultation with the political science staff.

INTERNATIONAL RELATIONS. This major is designed for men aspiring to the United States Foreign Service, to journalism on the international plane, to commercial employment abroad, or to advanced study in the field, and for those whose intellectual interests lie across national frontiers. Students contemplating a career in the United States Foreign Service are advised to continue language study throughout their course.

Required Courses: Elementary

Int.Rel.	1, 2.	Diplomacy	(6)
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Required Courses: Advanced

Int.Rel.	341, 342.	International Relations	(6)
Int.Rel.	351, 352.	International Organization	(6)
Int.Rel.	361, 362.	International Law	(6)

and twelve semester hours to be selected from the following:

Int.Rel.	11, 12.	Diplomacy of Europe.....	(6)
Int.Rel.	21, 22.	Diplomacy of the Far East.....	(6)
Int.Rel.	133, 134.	Diplomacy of Russia and the Middle East.....	(6)
Int.Rel.	312.	World Affairs since 1919.....	(3)
Int.Rel.	322.	The Far East in World Affairs.....	(3)
Int.Rel.	334.	The Soviet Union in World Affairs.....	(3)
Int.Rel.	371, 372.	Readings in International Relations.....	(6)
Hist.	317, 318.	The Middle East in World History.....	(6)
Hist.	329, 330.	American Foreign Policy.....	(6)
Hist.	349, 350.	Hispanic America in the Nineteenth and Twentieth Centuries	(6)
Govt.	3.	Foreign Governments	(3)
Govt.	6.	Democracy	(3)
Govt.	51.	American National Government.....	(3)
Govt.	352.	Civil Rights	(3)
Govt.	363, 364.	Contemporary Political Thought.....	(6)

Suggested Electives

Acctg.	104.	Accounting for Engineers.....	(3)
E.S.	45.	Statistical Method	(3)
Eco.	3,	4. Economics	(6)
Eco.	50.	Economic Geography	(3)
Eco.	236.	Public Utilities	(3)
Eco.	306.	Intermediate Economic Theory.....	(3)
Fin.	125.	Corporation Finance	(3)
Fin.	133.	Money and Banking	(3)
Fin.	241, 342.	International Trade and Finance.....	(6)
Govt.	1.	Foundations of Government.....	(3)
Govt.	52.	American State and Local Government.....	(3)
Hist.	13, 14.	United States History	(6)
Hist.	25,	26. European History	(6)
Hist.	28.	European Expansion and Empire Building.....	(3)
Hist.	29, 30.	Modern Europe	(6)
Hist.	327, 328.	Development of American Institutions.....	(6)
Hist.	332.	Intellectual Expansion of Modern Europe.....	(3)
Hist.	342.	Expansion of the English-speaking Peoples.....	(3)
Phil.	281.	Philosophy of the Social Sciences.....	(3)
Psych.	304.	Elementary Social Psychology.....	(3)
Soc.	42.	Principles of Sociology.....	(3)

MATHEMATICS AND ASTRONOMY. Three majors are offered by the department of mathematics and astronomy: mathematics, mathematics and astronomy, and actuarial science.

Mathematics.

Required Courses: Elementary

Math.	11.	Analytic Geometry and Calculus I.....	(3)
Math.	12.	Analytic Geometry and Calculus II.....	(3)
Math.	13.	Analytic Geometry and Calculus III.....	(3)
Math.	14.	Analytic Geometry and Calculus IV.....	(3)

Required Courses: Advanced

Math.	51.	Advanced Algebra	(3)
Math.	54.	Higher Geometry	(3)
Math.	219, 220.	Principles of Analysis.....	(6)
Math.	221.	Differential Equations	(3)
Math.	315.	Theory of Functions of a Complex Variable.....	(3)

Three additional hours from the courses in mathematics numbered from 100 to 399.

Mathematics and Astronomy.

Required Courses: Elementary

Astr.	1.	Descriptive Astronomy	(3)
Math.	11.	Analytic Geometry and Calculus I.....	(3)
Math.	12.	Analytic Geometry and Calculus II.....	(3)
Math.	13.	Analytic Geometry and Calculus III.....	(3)
Math.	14.	Analytic Geometry and Calculus IV.....	(3)

Required Courses: Advanced

Astr.	2.	General Astronomy	(3)
Astr.	103.	Practical Astronomy	(3)
Astr.	104.	Stellar Astronomy and Astrophysics.....	(3)
Math.	219, 220.	Principles of Analysis.....	(6)
Math.	221.	Differential Equations	(3)

Actuarial science.

Required Courses: Elementary

Math.	11.	Analytic Geometry	(3)
Math.	12.	Analytic Geometry and Calculus I.....	(3)
Math.	13.	Analytic Geometry and Calculus II.....	(3)
Math.	14.	Analytic Geometry and Calculus III.....	(3)
Math.	40.	Analytic Geometry and Calculus IV.....	(3)

Required Courses: Advanced

Math.	43.	First Course in Mathematics of Life Insurance.....	(3)
Math.	51.	Advanced Algebra	(3)
Math.	102.	Finite Differences	(3)
Math.	123.	Probability	(3)
Math.	219.	Principles of Analysis.....	(3)
Math.	233.	Mathematical Statistics	(3)

Suggested Electives

Acctg.	1.	2. Accounting	(6)
Eco.	3.	4. Economics	(6)
Eco.	160.	Insurance	(3)
Eco.	306.	Intermediate Economic Theory.....	(3)
Fin.	125.	Corporation Finance	(3)
Math.	220.	Principles of Analysis.....	(3)
Math.	234.	Mathematical Statistics	(3)

NATURAL RESOURCES. An interdepartmental major planned to give the student the basic preparation for a career in the management and conservation of our natural resources, or for graduate work leading to such a career. The major is under the direction of Professor Trembley of the department of biology.

Required Courses

Biol.	6.	Botany	(3)
Biol.	31.	Zoology	(6)
Biol.	61.	Bacteriology	(3)
Biol.	206.	Natural History and Ecology.....	(3)
Chem.	4.	5. General Chemistry	(8)
Chem.	35.	Analytical Chemistry	(4)
Chem.	93.	Physical Chemistry	(3)
Geol.	1.	Principles of Geology.....	(3)
Geol.	12.	Historical Geology	(3)
Geol.	31.	Mineralogy	(3)
Geol.	42.	Geologic Surveying	(1)
Geol.	43.	Cartography	(1)
Geol.	361.	Water Resources	(3)
Geol.	362.	Soil Resources	(3)
Geol.	371.	Meteorology	(3)
Geol.	372.	Climatology	(3)
Math.	3.	4. Introduction to Mathematical Analysis.....	(6)
Phys.	12.	Introduction to Physics.....	(3)
Phys.	16.	General Physics	(3)
Phys.	17.	General Physics Laboratory.....	(2)

Suggested Electives

Biol.	18.	Genetics	(2)
Biol.	36.	Economic Botany	(3)
Chem.	150.	Organic Chemistry	(3)
Geol.	32.	Petrology	(3)
Geol.	181 or 182.	Geological Problems	(1-4)
Geol.	223.	Structural Geology	(3)
Geol.	312.	Stratigraphy	(3)
Geol.	342 or 344.	Field Trip	(1)
Math.	42.	Introduction to Mathematics of Statistics.....	(3)

A student who is taking a major in biology, geology or journalism, and who is interested in natural resources and their conservation, should consult with his major adviser. His program can be so arranged as to provide an adequate major concentration combined with appropriate collateral work so selected as to develop his knowledge of natural resources and the problems of their management.

PHILOSOPHY.*Required Courses: Elementary*

Phil.	3.	Introduction to Philosophy.....	(3)
Phil.	14.	Logic and Scientific Method.....	(3)
Phil.	15.	Ethics: The Theory of Conduct.....	(3)

Required Courses: Advanced

Phil.	231.	Ancient and Medieval Philosophy.....	(3)
Phil.	232.	Modern Philosophy	(3)

and fifteen additional hours, at least nine of which shall be chosen from the courses listed below. The other six may be taken from appropriate advanced courses in other fields as approved by the head of the department of philosophy.

Phil.	151.	Philosophy of Art.....	(3)
Phil.	171, 172.	Readings in Philosophy.....	(6)
Phil.	237.	Nineteenth Century Philosophy.....	(3)
Phil.	238.	Twentieth Century Philosophy.....	(3)
Phil.	261.	Philosophy of the Natural Sciences.....	(3)
Phil.	263.	Special Topics in the Philosophy of Physics and Mathematics	(3)
Phil.	281.	Philosophy of the Social Sciences.....	(3)
Math.	303.	Mathematical Logic	(3)

PHYSICS.

<i>Required Courses: Elementary</i>			
Phys.	22.	Mechanics and Properties of Matter.....	(4)
Phys.	23.	Heat, Sound, and Light.....	(4)
Phys.	24.	Electricity and Magnetism.....	(4) } (12)
<i>Required Courses: Advanced</i>			
Phys.	32.	Electricity and Electronics.....	(3)
Phys.	110, 111.	Electrical Laboratory	(2)
Phys.	171.	Proseminar	(1)
Phys.	191.	Laboratory Techniques	(1)
Phys.	192.	Advanced Physics Laboratory.....	(1)
Phys.	213.	Introductory Theory of Electricity and Magnetism.....	(3)
Phys.	252.	Geometrical and Physical Optics.....	(4)
Phys.	268, 269.	Introduction to Modern Physical Theories.....	(6)
Phys.	270.	Atomic and Nuclear Physical Laboratory.....	(1)
Phys.	314.	Physics of Electronics.....	(4)
Phys.	340.	Heat, Thermodynamics, and Pyrometry.....	(4)
<i>Required Courses: Collateral</i>			
Chem.	4, 5.	General Chemistry.....	(8)
Math.	11.	Analytic Geometry	(3)
Math.	12.	Calculus II	(3)
Math.	13.	Calculus III	(3)
Math.	14.	Calculus IV	(3)
Math.	206.	Advanced Calculus	(3) } (3) or (6)
Math.	219, 220.	Principles of Analysis.....	(6) } (3) or (6)
Mech.	1.	Statics	(3)
Mech.	52.	Dynamics	(3)

PSYCHOLOGY. Three majors are offered by the department of psychology: general, industrial, and premedical.

General Psychology: for majors with an intention of continuing with graduate work in general or in clinical psychology.

<i>Required Courses: Elementary</i>			
Chem.	4, 5.	General Chemistry	(8)
Biol.	31, 32.	Zoology	(6)
Phys.	12.	Introduction to Physics.....	(3)
Phys.	16.	General Physics	(3)
Phys.	17.	General Physics Laboratory.....	(2)
Psych.	1.	Elementary Psychology	(3)
Psych.	24.	Elementary Tests and Measurements.....	(3)
Math.	3, 4.	Introduction to Mathematical Analysis.....	(6)
<i>Required Courses: Advanced</i>			
Psych.	303.	Introduction to Clinical Psychology.....	(3)
Psych.	304.	Social Psychology	(3)
Psych.	324.	Intermediate Tests and Measurements.....	(3)
Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
<i>Suggested Electives</i>			
Psych.	308.	Developmental Psychology	(3)
Psych.	309.	Abnormal Psychology	(3)
Phil.	14.	Logic and Scientific Method.....	(3)
Phil.	261.	Philosophy of the Natural Sciences.....	(3)
Biol.	3.	Comparative Vertebrate Anatomy.....	(3)
Biol.	4.	Vertebrate Embryology	(3)
Biol.	18.	Genetics	(2)
Soc.	41.	Cultural Anthropology	(3)

Industrial Psychology: for majors who expect to seek jobs in business or industry upon graduation.

Required Courses: Elementary

Chem.	4,	5.	General Chemistry	(8)
Biol.	13.		Human Biology	(3)
Phys.	12.		Introduction to Physics.....	(3)
Eco.	3,	4.	Economics	(6)
Psych.	1.		Elementary Psychology	(3)
Psych.	24.		Elementary Tests and Measurements.....	(3)
Math.	3.		Introduction to Mathematical Analysis.....	(3)

Required Courses: Advanced

Eco.	333, 334.		Labor Problems	(6)
I.E.	114.		Plant Administration	(3)
I.E.	115.		Personnel Administration	(3)
I.E.	328.		Work Simplification	(3)
Psych.	303.		Introduction to Clinical Psychology.....	(3)
Psych.	304.		Social Psychology	(3)
Psych.	324.		Intermediate Tests and Measurements.....	(3)
Psych.	327.		Group Testing Techniques.....	(3)
Psych.	329.		Physiological Psychology	(3)
Psych.	335, 336.		Experimental Psychology	(3)
Psych.	351.		Industrial Psychology	(3)
Psych.	354.		Human Engineering.....	(3)

Suggested Electives

Phil.	14.		Logic and Scientific Method.....	(3)
Soc.	42.		Principles of Sociology.....	(3)
Math.	4.		Introduction to Mathematical Analysis.....	(3)

Premedical Psychology: for majors intending to enter medical school and having a primary interest in training for psychiatry.

Required Courses: Elementary

Chem.	4,	5.	General Chemistry	(8)
Chem.	35.		Analytical Chemistry	(4)
Phys.	12.		Introduction to Physics.....	(3)
Phys.	16.		General Physics	(3)
Phys.	17.		General Physics Laboratory.....	(2)
Biol.	31,	32.	Zoology	(6)
Biol.	3.		Comparative Vertebrate Anatomy.....	(3)
Biol.	18.		Genetics	(2)
Psych.	1.		Elementary Psychology	(3)
Psych.	24.		Elementary Tests and Measurements.....	(3)
Math.	3,	4.	Introduction to Mathematical Analysis.....	(6)

Required Courses: Advanced

Psych.	303.		Introduction to Clinical Psychology.....	(3)
Psych.	304.		Social Psychology	(3)
Psych.	324.		Intermediate Tests and Measurements.....	(3)
Psych.	329.		Physiological Psychology	(3)
Psych.	335, 336.		Experimental Psychology	(3)
Chem.	150,	151.	Organic Chemistry	(6)
Chem.	165.		Organic Chemistry Laboratory.....	(2)

Suggested Electives

Psych.	309.		Abnormal Psychology	(3)
Phil.	14.		Logic and Scientific Method.....	(3)
Phil.	261.		Philosophy of the Natural Sciences.....	(3)
Soc.	41.		Cultural Anthropology	(3)

ROMANCE LANGUAGES. Majors are offered in French and Spanish.

French.

Required Courses: Elementary

Fr.	1,	2.	Elementary French	(6)
Fr.	11,	12.	Intermediate French	(6)

Required Courses: Advanced

Eighteen hours from the following of which at least six hours shall be chosen from Fr. 221, 222, 223, 224:

Fr.	13, 14.	Types of French Literature.....	(6)
Fr.	21, 22.	Seventeenth and Eighteenth Centuries French Literature	(6)
Fr.	31, 32.	Nineteenth Century French Literature.....	(6)
Fr.	41, 42.	French Oral and Written Composition.....	(6)
Fr.	221.	French Literature before the Seventeenth Century.....	(3)
Fr.	222.	Contemporary French Literature.....	(3)
Fr.	223, 224.	Proseminar	(6)

The student will be expected to complete supplementary reading, the list of which he will receive at the beginning of his major work, and to correlate the knowledge gained in courses and readings through the use of some recommended history of French literature.

Spanish.

Required Courses: Elementary

Span.	1, 2.	Elementary Spanish	(6)
Span.	11, 12.	Intermediate Spanish	(6)

Required Courses: Advanced

eighteen hours from the following:

Span.	21.	Introduction to Modern Spanish Fiction.....	(3)
Span.	22.	Introduction to Modern Spanish Drama.....	(3)
Span.	31, 32.	Spanish Conversation and Composition.....	(6)
Span.	221.	Spanish Drama of the Golden Age.....	(3)
Span.	222.	Spanish Fiction of the Golden Age.....	(3)
Span.	223, 224.	Proseminar	(6)
Span.	231, 232.	Spanish-American Literature	(6)

In addition to the outside reading and reports required in connection with these courses, the student will be expected to acquire a knowledge of the history of Spanish literature as a whole.

SOCIOLOGY. A major in sociology is designed to provide pre-professional preparation for graduate work in law, social work, social research, the ministry, institutional work, personnel work, teaching, interracial and intercultural work, and civil service appointments with local, state, and federal governmental agencies.

Required Courses: Elementary

Soc.	41.	Cultural Anthropology	(3)
Soc.	42.	Principles of Sociology.....	(3)
Eco.	3,	Economics	(6)
Psych.	1.	Elementary Psychology	(3)

Required Courses: Advanced

Soc.	44.	The American Community.....	(3)
Soc.	262.	Social Problems	(3)
Soc.	263.	Introduction to Social Work.....	(3)
Soc.	264.	The Family	(3)
Soc.	265.	Development of Sociological Theory.....	(3)
Soc.	266.	Population Problems	(3)
E.S.	45.	Statistical Method	(3)

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Suggested Electives

Soc.	271, 272.	Readings in Sociology	(6)
Biol.	13.	Human Biology	(3)
<i>or</i>			
Biol.	33, 34.	Biology and Organic Evolution.....	(6)
Eco.	333 or 334.	Labor Problems	(3)
Educ.	1.	Introduction to Education.....	(3)
Govt.	357.	City Government	(3)
Hist.	327, 328.	Development of American Institutions.....	(6)
Psych.	304.	Social Psychology	(3)
Relig.	101.	Religion in Society and Culture.....	(3)

The College of
Business Administration

The College of Business Administration

Administrative Officers

Martin Dewey Whitaker, *President*

Harvey Alexander Neville, *Vice-President and Provost*

Earl Kenneth Smiley, *Vice-President*

Carl Elmer Allen, *Dean of the College of Business Administration*

Wray Hollowell Congdon, *Dean of Students*

Charles Augustus Seidle, *Director of Admission*

James Harold Wagner, *Registrar*

James Decker Mack, *Librarian*

The College of Business Administration, which is a member of the American Association of Collegiate Schools of Business, offers a program of study designed to provide thorough and systematic training in the fundamentals of business. More specifically, the College aims to develop in the student an intelligent understanding of business principles, an ability to analyze industrial facts, and habits of thought which will enable him to cope with the problems that increasing executive responsibilities will bring him in later life. Stress is on the building of a sound foundation, since it is the firm belief of the College that no substitute can be furnished for the training and experience provided by actual contact with the complex problems of modern business. Accordingly, the student's interests are best served by equipping him with those fundamental facts and insights which will make it possible for him to profit more readily from practical experience after graduation.

In accordance with this plan of training in fundamentals, the student is required to learn the basic principles that underlie all business. No student is permitted to omit basic work in the principles and problems of economics, economic history, accounting, corporation finance, money and banking, marketing, business law, labor problems, management, and statistical method, which are essential for a career in all types of business enterprise. This insistence upon an acquaintance with the fundamentals of the broad field not only equips the student with the elementary

requisites for a career in a variety of commercial and industrial enterprises but also gives him an invaluable means of discovering his real abilities and making a sound choice of a profession. A major function of the curriculum in business administration is to aid students in their efforts to discover their best talents, not only those individuals who enter college uncertain of their ultimate objectives but also those whose choice of a future profession or field of business may have been determined already but predicated upon inadequate grounds.

In addition to this principle of a generalized training in business fundamentals, the College regards as important the principle that the training as a whole shall offer an education commensurate with the standards of a university. The curriculum permits no student to devote himself exclusively to business subjects. He must acquire at least a rudimentary acquaintance with the cultural and humanitarian aspects of the world around him, and at least a brief contact with science. Consequently, a large part of the curriculum is devoted to work in liberal and scientific subjects. In general in the freshman and sophomore years, two courses each semester are taken in the College of Business Administration. Throughout the entire four years work there is emphasis on the social aspects of the subjects considered. If a student develops alongside his business work a special interest in some such field as languages, mathematics, or science, he is given opportunity, through electives, to pursue his special line.

In view of the breadth of training afforded by the variety of required and elective courses, satisfactory preparation for careers in fields other than commerce and industry is also available to students in the College of Business Administration. This is particularly true of law, for which business curricula of the better type are now recognized as "excellent preliminary training. Lehigh University has been included by the leading law schools of the country among the institutions whose business curricula meet their admissions requirements.

Perhaps the most distinctive feature of the work in business administration at Lehigh is the character of the class work. Much of the work of the curriculum is taken in the College of Engineering and the College of Arts and Science, while students of these two divisions in very large numbers avail themselves of the courses given in the College of Business Administration. There

is no segregation of students by colleges, and students in business administration take their courses in competition with students trained in liberal arts and in the exact sciences. This condition has a marked influence on the standards of work and the quality of the student. Qualified students in Business Administration are eligible for the College Honors Program. (See p. 64).

Although emphasis is upon broad training, rather than specialization, the College recognizes that some degree of concentration is desirable after the student's interests may reasonably be expected to have crystallized. Accordingly, in the junior and senior years, every student is required to pursue a series of related courses in some more restricted field. Six fields of concentration are offered, viz: accounting, economics, economic statistics, finance, marketing, and general business. The detailed programs of study in each of the above fields are set forth on the following pages.

In times of normal business activity, students who have made creditable records may reasonably expect to receive one or more offers of positions before the date of their graduation. The College of Business Administration enjoys happy relations with many of the country's leading industries. Representatives regularly visit the campus to engage the services of students graduating in business administration. The University assumes no responsibility for finding positions for its graduates, but every effort is made by the College and by the university placement service to put its graduating students in touch with desirable opportunities for employment.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

A five-year curriculum in industrial engineering and business administration is outlined on pages 98-99.

A graduate program leading to the degree of Master of Business Administration is outlined on page 143.

THE CURRICULUM IN BUSINESS ADMINISTRATION

Total hours required for Degree of B.S. in Business Administration: 128

I. Required Courses (62 hours)

Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Acctg. 1	Accounting	3	Eco. 301	Bus. Mgmt. or	
Acctg. 2	Accounting	3	I.E. 162	Ind. Mgmt.	3
Eco. 1	Ind. Evolution.....	3	Fin. 125	Corporation Finance	3
Eco. 3	Economics	3	Fin. *	Money & Banking.....	3
Eco. 4	Economics	3	Math. 10	Gen. Math. for Bus....	3
Eco. 11	Marketing	3	Math. 40	Math. of Finance.....	3
Eco. 50	Economic Geography ...	3	MS/AS 1	Mil./Air Science.....	2
Eco. 333	Labor Problems	3	MS/AS 2	Mil./Air Science.....	2
Engl. 1	Composition & Lit.....	3	MS/AS 3	Mil./Air Science.....	2
or Engl. 11	Types of World Lit....	3	MS/AS 4	Mil./Air Science.....	2
Engl. 2	Composition & Lit.....	3	Biol. 15	Freshman Hygiene.....	—
or Engl. 12	Types of World Lit....	3	P.E. 1	Physical Education	—
E.S. 45	Statistical Method.....	3	P.E. 2	Physical Education	—
E.S. 346	Business Cycles	3	P.E. 3	Physical Education	—
Law 1	Business Law	3	P.E. 4	Physical Education	—

*Students majoring in accounting, marketing, or general business will take Fin. 133, Money and Banking. Students majoring in economics, economic statistics, or finance will take Fin. 129, Money and Banking.

II. Major Program (24 hours)

Before the end of the second semester of their sophomore year students will select a major or field of concentration. A major program will consist of twenty-four hours of sequential or related courses prescribed by the dean of the College and the head of the department concerned.

III. Optional Courses (33 hours)

ENGLISH OR FOREIGN LANGUAGE OPTION (12 HOURS)

Students who present two units in one foreign language for entrance credit will not be required to take further work in foreign languages. Students who present less than two units of a foreign language for entrance credit will be required to take six hours in one foreign language. Credit for less than six hours in an elementary language will not be accepted in partial satisfaction of this requirement.

All courses offered by the department of English which require work in composition, either oral or written, or a study of literature will be accepted in satisfaction of the English requirement. Journalism courses which do not require work in composition or study of literature will not be accepted.

OTHER ARTS OPTIONS (12 HOURS)

The Arts Options requirement may be met by taking a total of twelve hours work in the following fields, not more than six hours to be in any one of the fields designated; astronomy, education, fine arts, government, history, international relations, mathematics, music, philosophy, psychology, religion, sociology.

SCIENCE OPTION (9 HOURS)

Not more than six hours in the Science Option may be taken in one department. The following courses are acceptable in satisfaction of the science requirement: Biol. 1, 6, 13, or 33 and 34; Geol. 1, or 3 and 4; Chem. 15 and 16; Phys. 12 and 16.

IV. Electives (9 hours)

Any courses in the University for which a student has the prerequisites may be used to meet this requirement.

COURSES OF STUDY

FIRST SEMESTER			UNIFORM FRESHMAN YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Acctg. 1	Accounting	3	Acctg. 2	Accounting	3			
Eco. 1	Ind. Evolution.....	3	Eco. 50	Economic Geography....	3			
Math. 10	Gen. Math. for Bus.....	3	Math. 40	Math. of Finance.....	3			
	English ¹	3		English ¹	3			
	Optional Course ²	3		Optional Course ²	3			
MS/AS 1	Mil./Air Science.....	2	MS/AS 2	Mil./Air Science.....	2			
P.E. 1	Physical Education	—	P.E. 2	Physical Education	—			
		17						17

¹For a statement of the freshmen English requirement see "Freshman Composition" under the heading "English" in the section "Description of Courses."

²Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

Major in Accounting*

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3			
Acctg. 13	Intermed. Acctg.	3	Acctg. 14	Intermed. Acctg.	3			
			E.S. 45	Statistical Method.....	3			
	Optional Courses ¹	9		Optional Courses ¹	6			
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2			
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—			
		—			—			
		17			17			

FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Acctg. 115	Cost Accounting	3	Eco. 11	Marketing	3			
Law 1	Business Law	3	Law 102	Business Law	3			
E.S. 346	Business Cycles	3	Eco. 333	Labor Problems	3			
Fin. 125	Corporation Finance	3	Fin. 133	Money & Banking.....	3			
Eco. 301	Bus. Mgmt. or		Law 204	Wills, Estates & Trusts	3			
I.E. 162	Ind. Mgmt.	3		Optional Courses ¹	6			
	Optional Courses ¹	6		Major Program	6			
	Major Program	6		Electives ²	6			
	Elective ²	3		Free Electives ³	6			
	Free Electives ³	6			—			
		—			—			
		30			30			

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the Accounting Major may be chosen from the following in consultation with advisor:

Acctg. 320	Auditing	3	Acctg. 218	Adv. Cost Acctg.	3
Acctg. 219	Spec. Acctg. Systems....	3	Acctg. 304	Govt. & Inst. Acctg....	3
Acctg. 203	Fed. Tax Acctg.	3	Acctg. 204	Fed. Tax Acctg.	3
			Acctg. 315	Adv. Accounting.....	3

³Suggested Free Electives:

Fin. 323	Investments	3	Eco. 306	Intermed. Eco. Theory	3
Fin. 153	Credits & Collections....	3	Fin. 326	Prob. in Corp. Finance	3
E.S. 352	Adv. Stat. Method....	3			

*The New York State Board of Certified Public Accountant Examiners requires 8 credit hours of finance for candidates for the C.P.A. examinations in that state. The New Jersey State Board of Public Accountants also requires 8 hours of finance and also 30 hours of accounting for candidates for the C.P.A. examination in that state. It is, therefore, recommended that students who anticipate becoming candidates for the C.P.A. examinations in either of those states take 3 additional credit hours of finance courses and students who anticipate becoming candidates for the C.P.A. examinations in New Jersey also take 6 additional credit hours in Accounting, as a part of their elective program. Lehigh University is registered with both the above boards.

B U S I N E S S A D M I N I S T R A T I O N

Major in Economics

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3 Law	Economics Business Law	3 3	Eco. 4	Economics Marketing	3 3			
MS/AS P.E.	Optional Courses ¹ Mil./Air Science..... Physical Education	9 2 3	Eco. 11 E.S. 45	Statistical Method..... Optional Courses ¹ Mil./Air Science..... Physical Education	3 6 2			
			17					17

FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
E.S. 346	Business Cycles	3	Fin. 125	Corporation Finance	3			
Fin. 129	Money & Banking.....	3	Fin. 130	Money & Banking.....	3			
Eco. 333	Labor Problems	3	Eco. 334	Labor Problems	3			
Eco. 307	Adv. Economics.....	3	Eco. 301	Bus. Mgmt. or				
Fin. 351	Pub. Fin.: Fed.....	3	I.E. 162	Industrial Mgmt.*	3			
Eco. 306	Inter. Eco. Theory	3						
	Optional Courses ¹	6						
	Major Program			Optional Courses ¹	6			
	Elective ²	3		Major Program				
	Free Elective ³	3		Electives ²	6			
			30					30

*Offered first semester only

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the Economics major may be chosen from the following in consultation with advisor:

E.S. 347	Nat. Inc. Analysis	3	E.S. 348	Adv. Bus. Cycles	3
Fin. 241	Inter. Trade & Fin....	3	Fin. 342	Inter. Trade & Fin....	3
Eco. 235	Transportation	3	Eco. 308	Adv. Economics.....	3
Eco. 371	Readings in Eco.	3	Eco. 236	Public Utilities	3
			Eco. 372	Readings in Eco.	3

³Suggested Free Electives:

Acctg. 13	Intermed. Acctg.....	3	Phil. 14	Logic & Scient. Meth..	3
Math. 11	Anal. Geom. & Calc. I	3	Math. 12	Anal. Geom. & Calc. II	3
Hist. 327	Dev. Amer. Hist.	3	Hist. 328	Dev. Amer. Inst.	3
Hist. 331	Intel. Expan. Eur.	3	Hist. 332	Intel. Expan. Eur.	3

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Major in Economic Statistics

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3			
Law 1	Business Law	3	E.S. 45	Statistical Method.....	3			
	Optional Courses ¹	9		Optional Courses ¹	9			
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2			
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—			
		17						17
FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 11	Marketing	3	Fin. 125	Corporation Finance	3			
Fin. 129	Money & Banking.....	3	Fin. 130	Money & Banking.....	3			
E.S. 346	Business Cycles	3	Eco. 306	Inter. Eco. Theory	3			
Eco. 333	Labor Problems	3	Eco. 301	Bus. Mgmt. or				
E.S. 347	Nat. Inc. Analysis	3	I.E. 162	Industrial Mgmt.*	3			
E.S. 352	Adv. Stat. Method or		E.S. 348	Adv. Bus. Cycles.....	3			
E.S. 353	Time Series Analysis....	3		Optional Courses ¹	6			
	Optional Course ¹	3		Major Program				
	Major Program			Elective ²	3			
	Electives ²	6		Free Electives ³	6			
	Free Elective ³	3						
		30						30

*Offered first semester only

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the Economic Statistics major are to be selected in consultation with advisor:

³Suggested Free Electives:

Math. 11	Anal. Geom. & Calc. I	3	Math. 12	Anal. Geom. & Calc. II	3
Hist. 327	Dev. Amer. Inst.	3	Math. 340	Higher Algebra	3
E.S. 371	Readings in Eco. Stat. 3	3	Hist. 328	Dev. Amer. Hist.	3

E.S. 372 Readings in Eco. Stat. 3

B U S I N E S S A D M I N I S T R A T I O N

Major in Finance

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3			
Law 1	Business Law	3	E.S. 45	Statistical Method	3			
	Optional Courses ¹	9		Optional Courses ¹	9			
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2			
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—			
		17						17

FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 11	Marketing	3	Eco. 306	Inter. Eco. Theory.....	3			
E.S. 346	Business Cycles	3	Eco. 333	Labor Problems	3			
Fin. 125	Corporation Finance	3	Fin. 326	Corporation Finance	3			
Fin. 129	Money & Banking.....	3	Fin. 130	Money & Banking.....	3			
Fin. 323	Investments	3	Eco. 301	Business Mgmt. or				
Fin. 351	Pub. Fin.: Fed.....	3	I.E. 162	Industrial Mgmt.*	3			
	Optional Course ¹	3		Optional Courses ¹	6			
	Major Program			Major Program				
	Elective ²	6		Elective ²	3			
	Free Elective ³	3		Free Electives ³	6			
		30						30

*Offered first semester only

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the Finance major may be chosen from the following in consultation with advisor:

Fin. 153	Credits & Collections....	3	Fin. 324	Investments	3
Fin. 232	Mon.-Fiscal Policy	3	Fin. 331	Bank Credit Prob.....	3
Fin. 241	Inter. Trade & Fin.....	3	Fin. 342	Inter. Trade & Fin....	3
E.S. 347	Nat. Inc. Analysis	3	Fin. 352	Pub. Finance:	
				State & Local.....	3
			E.S. 348	Adv. Bus. Cycles	3
			Eco. 160	Insurance	3
			Law 204	Wills, Estates & Trusts	3

³Suggested Free Electives:

Acctg. 13	Intermed. Acctg.....	3	Acctg. 14	Intermed. Acctg.....	3
Eco. 307	Adv. Economics.....	3	Eco. 308	Adv. Economics.....	3
Fin. 371	Readings in Fin.....	3	Fin. 372	Readings in Fin.....	3

Major in Marketing

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3			
Law 1	Business Law	3	Eco. 11	Marketing	3			
	Optional Courses ¹	9		Optional Courses ¹	9			
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2			
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—			
		17						17
FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
E.S. 45	Statistical Method.....	3	E.S. 346	Business Cycles	3			
Fin. 133	Money & Banking.....	3	Fin. 125	Corporation Finance	3			
Eco. 113	Advertising	3	Eco. 115	Retailing	3			
Eco. 235	Transportation	3	Eco. 214	Sell. & Sales Mgmt....	3			
Fin. 241	Inter. Trade & Fin....	3	Eco. 301	Business Mgmt. or	3			
Eco. 306	Inter. Eco. Theory	3	I.E. 162	Industrial Mgmt.*	3			
Eco. 333	Labor Problems	3		Optional Courses ¹	6			
	Optional Course ¹	3		Major Program				
	Major Program			Elective ²	3			
	Elective ²	3		Free Electives ³	6			
	Free Elective ³	3						30

*Offered first semester only

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the Marketing major may be chosen from the following in consultation with advisor:

Eco. 217	Industrial Mkt.	3	Soc. 42	Princ. of Soc.....	3
Fin. 153	Credits & Collections....	3	Psych. 16	Psych. of Business.....	3
Acctg. 115	Cost Accounting	3	Eco. 312	Mkt. Research	3
E.S. 347	Nat. Inc. Analysis	3	Fin. 342	Inter. Trade & Fin....	3
Eco. 371	Readings in Eco.	3	Eco. 160	Insurance	3
			Eco. 372	Readings in Eco.....	3

³Suggested Free Electives:

Engl. 41	Business Letters.....	3	Speech 31	Bus. & Prof. Speaking..	3
Journ. 43	Commun. in Industry..	3	Journ. 44	Commun. in Industry..	3

Major in General Business

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3
MS/AS 3	Optional Courses ¹	12	Eco. 11	Marketing	3
P.E. 3	Mil./Air Science.....	2	MS/AS 4	Optional Courses ¹	9
	Physical Education		P.E. 4	Mil./Air Science.....	2
				Physical Education	
					17
					17

FIRST SEMESTER		JUNIOR AND SENIOR YEARS			SECOND SEMESTER	
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	
E.S. 45	Statistical Method.....	3	E.S. 346	Business Cycles	3	
Fin. 125	Corporation Finance ...	3	Fin. 326	Corporation Finance	3	
Acctg. 13	Intermed. Acctg. or		Fin. 133	Money & Banking.....	3	
Acctg. 115	Cost Accounting	3	Eco. 306	Inter. Eco. Theory.....	3	
Law 1	Business Law	3	Law 102	Business Law	3	
Eco. 301	Business Mgmt. or		Eco. 333	Labor Problems	3	
I.E. 162	Ind. Mgmt.	3	Eco. 113	Advertising or		
Fin. 351	Pub. Fin.: Fed.....	3	Eco. 214	Sell. & Sales Mgmt.	3	
	Optional Course ¹	3		Optional Course ¹	3	
	Major Program			Major Program		
	Elective ²	3		Elective ²	3	
	Free Electives ³	6		Free Elective ³	3	

¹Optional Courses fall into three groups: English or Foreign Language, Arts, and Science. For a general statement concerning these groups see page 90.

²Electives in the General Business Program may be chosen from the following in consultation with advisor:

Acctg.	13	Intermed. Acctg. or	Eco.	160	Insurance	3
Acctg.	115	Cost Accounting	Eco.	308	Adv. Economics.....	3
Acctg.	203	Fed. Tax Acctg.....	Eco.	236	Public Utilities	3
E.S.	347	Nat. Inc. Analysis	E.S.	348	Adv. Bus. Cycles	3
Fin.	153	Credits & Collections...	Fin.	352	Pub. Finance:	
Fin.	323	Investments			State & Local.....	3
Fin.	241	Inter. Trade & Fin....	Eco.	312	Marketing Research....	3
Fin.	232	Mon.-Fiscal Policy				
Eco.	113	Advertising or				
Eco.	214	Sell. & Sales Mgmt....				
E.S.	352	Adv. Stat. Method.....				

Suggested Free Electives:

Suggested Free Electives:		
Eco. 235	Transportation	3
Soc. 42	Princ. of Soc.	3

FIVE-YEAR CURRICULUM IN INDUSTRIAL ENGINEERING AND BUSINESS ADMINISTRATON

Students who desire to pursue both industrial engineering and business administration may complete the required work for the degree of Bachelor of Science in Industrial Engineering by the end of the fourth year and that required for the degree of Bachelor of Science in Business Administration by the end of the fifth year. It is necessary that a student be enrolled in the curriculum in industrial engineering for the first four years and that he complete the requirements in this curriculum as outlined on pages 125 and 126. At the beginning of the fifth year the student transfers to the curriculum in business administration and is required to complete thirty-three semester hours in one of the following majors:

Major in Accounting

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
			Required Courses					
Law	1	Business Law.....	3	Law	102	Business Law	3	
Fin.	133	Money & Banking.....	3	Law	204	Wills, Estates & Trusts	3	
E.S.	346	Business Cycles	3	Eco.	11	Marketing	3	
Fin.	125	Corporation Finance	3	Acctg.	218	Adv. Cost Acctg.	3	
and nine semester hours to be selected from the following in consultation with the advisor:								
Acctg.	203	Fed. Tax Acctg.	3	Acctg.	315	Adv. Accounting.....	3	
Acctg.	320	Auditing	3	Acctg.	204	Fed. Tax Acctg.	3	
Acctg.	219	Spec. Acctg. Systems....	3	Acctg.	304	Govt. & Inst. Acctg....	3	

Major in Economics

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
			Required Courses					
Law	1	Business Law.....	3	Eco.	306	Inter. Eco. Theory	3	
Fin.	133	Money & Banking.....	3	Eco.	308	Adv. Economics.....	3	
Eco.	307	Adv. Economics.....	3	Fin.	125	Corporation Finance....	3	
Fin.	351	Pub. Fin.: Federal	3					

*Eco. 214, Sell. & Sales Mgmt. offered second semester only.

and twelve semester hours to be selected
from the following in consultation with the advisor:

Eco.	235	Transportation	3	Soc.	42	Sociology	3
Fin.	241	Inter. Trade & Fin.....	3	Eco.	236	Public Utilities	3
E.S.	347	Nat. Inc. Analysis	3	Eco.	334	Labor Problems	3
Eco.	371	Readings in Eco.....	3	Fin.	342	Inter. Trade & Fin.....	3
E.S.	352	Adv. Stat. Method	3	E.S.	348	Adv. Bus. Cycles	3
E.S.	353	Time Series Analysis....	3	Soc.	262	Social Problems.....	3
				Eco.	372	Readings in Eco.....	3

Major in Economic Statistics

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
<i>Required Courses</i>								
Law	1	Business Law.....	3	Eco.	306	Inter. Eco. Theory	3	
Fin.	133	Money & Banking.....	3	E.S.	348	Adv. Bus. Cycles	3	
E.S.	347	Nat. Inc. Analysis	3	Fin.	125	Corporation Finance....	3	
E.S.	352	Adv. Stat. Method or						
E.S.	353	Time Series Analysis ..	3					
and twelve semester hours to be selected in consultation with the advisor:								

Major in Finance

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
<i>Required Courses</i>								
Law	1	Business Law.....	3	Fin.	326	Prob. in Corp. Fin....	3	
Fin.	133	Money & Banking.....	3	Eco.	306	Inter. Eco. Theory	3	
Fin.	323	Investments	3	E.S.	346	Business Cycles	3	
Fin.	351	Pub. Fin.: Federal	3					
and twelve semester hours to be selected from the following in consultation with the advisor:								
Fin.	153	Credits & Collections....	3	Eco.	160	Insurance	3	
Fin.	241	Inter. Trade & Fin.....	3	Fin.	342	Inter. Trade & Fin.....	3	
Eco.	235	Transportation	3	Fin.	324	Investments	3	
Acctg.	13	Intermed. Acctg.....	3	Fin.	352	Pub. Finance:		
Fin.	371	Readings in Fin.....	3			State & Local.....	3	
Fin.	232	Mon.-Fiscal Policy	3	Eco.	236	Public Utilities	3	
Bus.	301	Bus. Mgmt.	3	Acctg.	14	Intermed. Acctg.....	3	
				Fin.	372	Readings in Fin.....	3	
				Law	204	Wills, Estates & Trusts	3	

Major in Marketing

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
			Required Courses					
Law	1	Business Law.....	3	Eco.	115	Retailing	3	
Fin.	133	Money & Banking.....	3	Eco.	306	Inter. Eco. Theory	3	
Eco.	113	Advertising	3	Eco.	214	Sell. & Sales Mgmt.....	3	
E.S.	346	Business Cycles	3					
and twelve semester hours to be selected from the following in consultation with the advisor:								
Fin.	153	Credits & Collections....	3	Eco.	160	Insurance	3	
Fin.	241	Inter. Trade & Fin.....	3	Fin.	342	Inter. Trade & Fin.....	3	
Eco.	235	Transportation	3	Acctg.	218	Adv. Cost Acctg.....	3	
Eco.	371	Readings in Eco.....	3	Eco.	372	Readings in Eco.....	3	
Eco.	217	Industrial Mkt.	3	Eco.	312	Mkt. Research	3	
Eco.	301	Bus. Mgmt.	3	Soc.	42	Sociology	3	

Major in Personnel and Industrial Relations

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
			Required Courses					
Law	1	Business Law.....	3	Eco.	306	Inter. Eco. Theory	3	
Fin.	133	Money & Banking.....	3	Eco.	334	Labor Problems	3	
Psych.	351	In. Tr. & Work Control.....	3	Soc.	42	Sociology	3	
				E.S.	346	Business Cycles	3	
and twelve semester hours to be selected from the following in consultation with the advisor:								
Fin.	323	Investments	3	Law	102	Business Law	3	
Fin.	351	Pub. Fin.: Federal	3	Eco.	160	Insurance	3	
Fin.	241	Inter. Trade & Fin.....	3	Psych.	352	Ind. Select. & Class....	3	
E.S.	347	Nat. Inc. Analysis	3	Govt.	360	Pub. Adm.	3	
Eco.	371	Readings in Eco.....	3	Soc.	262	Social Problems.....	3	
E.S.	352	Adv. Stat. Method	3	Eco.	372	Readings in Eco.....	3	
E.S.	353	Time Series Analysis....	3	I.E.	115	Personnel Adm.	3	
				Eco.	301	Bus. Mgmt.	3	

The College of
Engineering

The College of Engineering

Administrative Officers

Martin Dewey Whitaker, *President*

Harvey Alexander Neville, *Vice-President and Provost*

Earl Kenneth Smiley, *Vice-President*

Loyal Vivian Bewley, *Dean of the College of Engineering*

Wray Hollowell Congdon, *Dean of Students*

John Douglas Leith, *Associate Dean of Students*

Charles Augustus Seidle, *Director of Admissions*

James Harold Wagner, *Registrar*

The College of Engineering offers curricula in chemical engineering, chemistry, civil engineering, electrical engineering, engineering mechanics, engineering physics, general science and mathematics, industrial engineering, mechanical engineering, metallurgical engineering, and mining engineering. Five-year courses combining the liberal arts and engineering, business administration and industrial engineering, electrical and mechanical engineering, electrical engineering and physics are also provided. In each of these combined curricula one baccalaureate degree is awarded upon the successful completion of four years of study, and a second baccalaureate degree is awarded at the end of the fifth year.

The engineering curricula were formulated on the basis of an intense study, by the faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusion that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practice; and that the engineer must know something of the social sciences and humanities, that is, the sciences which deal with human relations. The various engineering curricula accordingly emphasize the fundamental sciences

and those subjects from the social sciences and the humanities which are part of the equipment of every well-educated man. These latter are now recognized as essential to the proper training of engineers not only because of their practical applications in industrial, business, and civic life, but also because they enrich the whole of a man's private life.

Provision is made for a uniform freshman year in the College of Engineering. The student's tentative choice of a specialized engineering curriculum, as recorded at the time of entrance, may be changed (within the limitations of enrollment in the various curricula) prior to his entering upon the sophomore year, without loss of time. Engineering freshmen are admitted with "open" curriculum choice. Within a year of college experience, and on the basis of conferences with members of the faculty, it is hoped that any student who is uncertain as to his specialized curriculum choice may choose wisely. In the second semester of his freshman year, just prior to preregistration for the sophomore year, each engineering student must select a particular engineering curriculum. The sophomore year for many of the engineering curricula are sufficiently alike so as to be "tradeable" between these curricula, and it is thus possible for a student to transfer from one curriculum to another without loss of credit or having to make up courses, at the end of his sophomore year.

The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants.

Since the University recognizes that an engineer can not be trained by purely academic process, the degree awarded upon graduation is Bachelor of Science in the particular division of engineering that has been studied, for example, Bachelor of Science in Civil Engineering. The successful completion of one year of full-time graduate study leads to the degree of Master of Science.

General Studies

General studies are non-professional, non-specialized studies in the large areas of human knowledge and experience with which

any educated man should be acquainted. These areas are three: the humanities, the natural sciences, and the social sciences. Since all engineers receive extensive training in the physical sciences, their general studies are restricted to life and earth sciences, the humanities and the social sciences. A carefully developed program strengthening the earlier offerings in this area has been developed.

The general studies sequence starts in the freshman year with a study of English composition and literature and a study of history in the course "Development of Western Civilization." It continues with a broad course in economics, including its social aspects, which extends throughout the sophomore year. This is followed by two courses selected from alternates, which are usually taken in the junior year. The first of these alternates is either biology or psychology, and the second either philosophy or literature. The first acquaints the student with an important life science, and the second strengthens his background in the humanities. The final two courses are elected by the student, under the guidance of his curriculum director, from at least two of the eight elective groups shown in the accompanying table.

Several of these required or elective courses (notably History 11 and 12, "Development of Western Civilization"; Biology 13, "Human Biology"; Psychology 12, "Introduction to Psychology"; and Philosophy 100, "Philosophy of Contemporary Civilization") have been developed particularly for this program. They are designed to help it in its major aims: first to acquaint the student with that literary, social, political, and economic background which is our heritage, and second, to open intellectual doors in his mind and thus give him a sound start of self-education which will continue throughout his life.

The objective of the study of the humanities and the social sciences in technical schools has been stated by the American Society for Engineering Education to be the development of an "understanding of the evolution of the social organism within which we live . . . ; and the development of moral, ethical and social concepts essential to a satisfying personal philosophy, to a career consistent with the public welfare, and to a sound professional attitude." We conceive it to be the duty of the engineer to be a professional man in the broadest sense of the term, a member of a group whose primary aim is to advance human well-being.

General Studies Courses

Required Courses

English 1 and 2	Composition and Literature.....	(6)
History 11 and 12	Development of Western Civilization.....	(6)
Economics 3 and 4	Economics	(6)

Alternate Courses

Biology 13	Human Biology or	
Psychology 12	Introduction to Psychology	(3)
Philosophy 100	Philosophy of Contemporary Civilization, or	
Literature	In a foreign language or in English (see Group 4).....	(3)

Elective Course Groups:

6 hours required

Not more than 3 hours from any one group

Group 1:	Biology 6, 13; Geology 1, 6; Astronomy 1; Psychology 12, 309, 351
Group 2:	Greek 21, 183, 202; Latin 22, 184, 203; History, any course other than History 11-12.
Group 3:	Economics 306, 307, 308, 333, 334; Sociology 41, 42, 262, 266
Group 4:	Literature course in a foreign language or in English (English 4, 5, 7, 8, 9, 11, 12, 18, 19, 20, 21, 36, or any English literature course above 100.)
Group 5:	Speech 30, or English 42, or a foreign language beyond the first year.
Group 6:	Fine Arts, any course; Music 13, 14
Group 7:	Philosophy or Religion, any course.
Group 8:	Government or International Relations, any course.

Qualified Engineering students are eligible for the College Honors Program. (See p. 64) Creative Concepts Seminars may be substituted hour for hour for alternate and elective general studies courses.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For schedules of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

FIRST SEMESTER			FRESHMAN YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Chem.	Gen. Chemistry	4	Chem.	5	Gen. Chemistry	4		
*Engl.	Composition & Lit.....	3	Engl.	2	Composition & Lit.....	3		
Hist.	Dev. W. Civilization..	3	Hist.	12	Dev. W. Civilization..	3		
†Math.	Anal. Geom. & Calc. I	3	Math.	12	Anal. Geom. & Calc. II	3		
Phys.	Mech. & Prop. of		C.E.	61	Engr. Draw.	3		
	Matter	4	Phys.	22	or Mech. & Prop.			
C.E.	or Engr. Draw.....	3			of Matter.....	4		
MS/AS	Mil./Air Science.....	2	MS/AS	2	Mil./Air Science.....	2		
P.E.	Physical Education	—	P.E.	2	Physical Education	—		
18 or 19						18 or 19		

*Engl. 1 and 2, Composition and Literature, are the courses normally taken in the first and second semesters respectively of the freshman year. Students who demonstrate superior ability in composition on the English placement tests are assigned to Engl. 11 and 12, Types of World Literature. Those whose performance is regarded as unsatisfactory are required to complete successfully Engl. 0, Elementary Composition, followed by Engl. 1 and 2.

†Students whose performance on a Mathematics Placement Test is regarded as unsatisfactory are required to complete successfully Math. 0, Mathematics Review, before entering Math. 11.

Inspection Trips

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports may be required. These trips are under the general direction and supervision of the faculty committee on inspection trips. They are generally held during the senior year and involve an average expense of about \$25.00. The location of the University in the center of industrial activities of various types furnishes unusual opportunities for visits of inspection to engineering plants.

Combined Arts and Engineering Curricula

Under the five-year plan the student registers in the College of Arts and Science for four years, earning the B.A. degree on completion of a program which includes, along with specific B.A. training, the fundamental mathematical, scientific, and engineering subjects of the engineering curriculum of his choice. The fifth year is spent in the College of Engineering, carrying on a program leading to the degree of B.S. in his selected branch of engineering. This is usually the senior year curriculum of the chosen branch of engineering.

An engineering student who decides at any stage of his course that he wishes to work for both the B.A. and B.S. degrees, may register in one of the colleges concerned for a period of years and complete the combined requirements of both degrees in five or six years, depending upon the program followed before the decision is made. His curriculum is so arranged that the work for one degree may be finished at the end of a four-year period, and the work for the subsequent degree at the close of the fifth or sixth year.

Cooperative Programs With Industry

Lehigh University has entered into agreements with the Philco Corporation and the Pennsylvania Power and Light Company (and agreements with other companies are pending), whereby undergraduate students in various branches of engineering may pursue an interleaved course of study and industrial employment, comprising 8 semesters of study at Lehigh University, and 3

periods (each approximately equal to a semester in length) of employment in industry, totaling 4 calendar years, at the successful completion of which the student will receive a B.S. degree from Lehigh University and a suitable certificate from the industrial concern.

The objective of a cooperative program is: To give the student an opportunity to become familiar with industrial methods, policies, and environment to the end that he will acquire a greater degree of motivation towards his academic studies.

The scope of the academic part of a cooperative program is identical with that of the standard curriculum in which the student is registered. Exactly the same courses are taken and in substantially the same sequence.

The first industrial employment period commences at the end of the sophomore year. The third, or final, period follows the end of the senior year. The degree is conferred upon the completion of the senior year. Students electing a cooperative program are expected to complete it.

During the three periods of industrial employment the student is closely supervised to guarantee that he acquires a balanced training in industrial practice. Representatives from the University make periodic inspections of the industrial training part of the program for the purpose of assuring that this training is in keeping with the above objectives, and that the student is receiving maximum benefits from the cooperative program. The student is required to render a comprehensive report on his observations and work while employed in industry.

While engaged in industrial employment the student is paid at prevailing rates for the type of work in which he is engaged.

There is no obligation, either legal or moral, on the part of the student to agree to accept permanent employment with the industrial concern with which he is connected on a cooperative program; nor is there any obligation on the part of the industrial concern to offer him permanent employment.

The details of cooperative programs vary with different curricula and industrial organizations. Interested students should consult their curriculum director. A typical 4-year program be-

ENGINEERING

tween Electrical Engineering and the Philco Corporation, which comprises 11 approximately equal periods, is as follows:

FALL SEMESTER	SPRING SEMESTER	SUMMER SEMESTER
1. Freshman I	2. Freshman II	Vacation
3. Sophomore I	4. Sophomore II	5. Philco Corp.
6. Junior I	7. Philco Corp.	8. Junior II
9. Senior I	10. Senior II	11. Philco Corp.

During Period 7, while the student is with Philco Corporation, an evening course in Electronics (E.E. 110) is required.

Students interested in such a program should apply to their curriculum director not later than the middle of the semester preceding the first scheduled period with industry.

THE CURRICULUM IN CHEMICAL ENGINEERING

Graduates in chemical engineering are expected to develop competence in all phases of the work conducted by manufacturing establishments in which chemical and certain physical changes of materials are accomplished during the manufacturing processes. The various phases of this work are research, development, design, construction, operation, plant management, and sales. A small number of the industries that utilize such processes are atomic energy, petroleum and petro-chemicals, rubber, soap and foods in addition to the generally recognized chemical industries.

Preparation for this broad field requires a sound background in the fundamental sciences of Physics, Chemistry and Mathematics plus a general background in engineering principles and intensive training in the application of these fundamentals to carrying forward into industrial production the new products and processes discovered in the laboratory. This latter training is directly called Chemical Engineering. In accord with this philosophy, the student is not trained for any specific industry, but the education is sufficiently broad that a graduate is competent in any of the chemical and allied industries.

The aim of the curriculum is to develop expertness in the sciences, the processes and the unit operations which must be integrated into a chemical manufacturing operation. Some familiarity with factory methods under actual working conditions is acquired through contact with operations in nearby plants. Frequent visits for observation and report are made to manufacturing plants in the immediate vicinity and nearby centers of activity in the chemical industry.

The program is also designed to prepare a student for graduate study in Chemical Engineering. Further study at the graduate level leading to advanced degrees is highly desirable in preparation for careers in the more highly technical aspects of manufacturing. The increasing complexity of modern manufacturing methods requires superior training for men working in the research and development fields or for teaching. By proper election of technical option courses, the graduate can prepare for graduate study in Chemistry.

ENGINEERING

THE CURRICULUM IN CHEMICAL ENGINEERING

Effective with the Class of 1960

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

(37 hrs.)

See page 106

FIRST SEMESTER

SOPHOMORE YEAR

SECOND SEMESTER

Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Met. 63	Eng. Mat. & Proc.....	3	Ch.E. 70	Ind. Stoichiometry	3
Chem. 35	Analytical Chem.	4	Chem. 36	Analytical Chem.	4
Eco. 3	Economics	3	Eco. 4	Economics	3
Math. 13	Calculus III	3	Math. 14	Calculus IV	3
Phys. 23	Heat, Sound & Light....	4	Phys. 24	Elect. & Magnetism....	4
M.S. 3 or			M.S. 4 or		
A.S. 3	Mil./Air Science.....	2	A.S. 4	Mil./Air Science	2
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—
19			19		

FIRST SEMESTER

JUNIOR YEAR

SECOND SEMESTER

Ch.E. 171	Unit Operations I.....	3	Ch.E. 172	Unit Operations II	3
Chem. 94	Phys. Chemistry	3	Chem. 191	Phys. Chemistry	3
Chem. 92	Phys. Chem. Lab.....	1	Chem. 192	Phys. Chem. Lab.....	1
Chem. 150	Organic Chemistry	3	Chem. 151	Organic Chemistry	3
Chem. 165	Org. Chem. Lab.....	2	Chem. 179	Lit. of Chem.....	1
Mech. 1	Statics	3	Math. 206	App. Math. I.....	3
*General Study.....			*General Study.....		
18			17		

SUMMER

Ch.E. 100, Eight (8) weeks industrial employment with report.

FIRST SEMESTER

SENIOR YEAR

SECOND SEMESTER

Ch.E. 173	Unit Operations III	2	Ch.E. 174	Plant & Equip. Des...	3
†Ch.E. 177	Unit Ops. Lab.....	2	Ch.E. 175	Ch. Engr. Practice	1
Ch.E. 200	Ch.E. Thermo.....	3	Ch.E. 176	†Ch.E. Projects.....	2
E.E. 160	Elec. Cir. & Appar....	3	Mech. 11	Mech. of Materials....	3
E.E. 161	Elec. Problems.....	1		†Technical Options....	6
E.E. 162	Dynamo Lab.....	1		*General Study.....	3
	†Technical Options....	3			
	*General Study.....	3			
18			18		

†Approximately half the class will be scheduled for Ch.E. 176 in the fall semester and Ch.E. 177 in spring.

‡The technical options must represent a coherent group of approved courses such as: Ch.E. 301, 302, 386, or 390; Chem. 302, 303, 334, 335, 344, 345, 357, or 358 (students expecting to use these last courses are urged to elect Chem. 167 in their Junior Year); Phys. 266, 268 or 367; Math. 208; I.E. 164; M.E. 333, or 334; Law 1; Acct. 104; Eco. 214 or 217.

*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN CHEMISTRY

Chemists constitute nearly one-half of all professional research personnel in industry as shown by a report of the National Resources Planning Board. The American Chemical Society, which requires professional training and experience for eligibility, has a present membership of about 74,300. The consistently rapid increase in the membership of this society in recent years may be taken as an index of the expanding opportunities in the chemical profession.

The curriculum in chemistry provides a thorough grounding in the fundamentals of this science, with the requisite collateral training in physics and mathematics, and gives some consideration to industrial and engineering principles. As a curriculum in the engineering school leading to a bachelor of science degree the fundamentals of chemistry as well as engineering are stressed. In addition to the liberal allotment of time to courses in English, German, economics, history and other non-professional studies, provision is made for twelve semester hours (ordinarily four courses) of professional electives in a minor field of concentration. The tabulation below indicates some of the possibilities of this guided selection of elective courses.

PREPARATION FOR	ELECTIVE SEQUENCE IN
Executive or sales departments of chemical industry	Business administration
Plant operation	Chemical Engineering
Food and pharmaceutical industries	Biochemistry and bacteri- ology
Medicine	Biology
Graduate study or research in physical chemistry	Physics and mathematics
Teaching, especially in public schools	Education
Metals industries	Metallurgy

Since the freshman year of this curriculum is identical with that of chemical engineering, and the sophomore years in the two curricula are nearly the same, it is possible for the student to transfer from one curriculum to the other before the beginning of the junior year without a considerable sacrifice of credits. In

E N G I N E E R I N G

a transfer from chemical engineering to chemistry, the extra courses may be utilized as electives.

Seniors in the curriculum in chemistry may arrange to make the supervised visits to industrial plants which are required in the curriculum in chemical engineering.

THE CURRICULUM IN CHEMISTRY

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER		SOPHOMORE YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Chem. 35	Analytical Chem.	4	Chem. 36	Analytical Chem.	4	
Eco. 3	Economics	3	Eco. 4	Economics	3	
†Ger. 1 or 3	German	3	†Ger. 2 or 4	German	3	
Math. 13	Calculus III	3	Math. 14	Calculus IV	3	
Phys. 24	Elect. & Magnetism.	4	Phys. 23	Heat, Sound & Light.	4	
MS/AS 3	Mil./Air Science 2	2	MS/AS 4	Mil./Air Science 2		
P.E. 3	Physical Education	—	P.E. 4	Physical Education—		
		19			19	

FIRST SEMESTER		JUNIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Chem. 91	Phys. Chemistry 3	3	Chem. 151	Organic Chemistry 3	3	
Chem. 92	Phys. Chem. Lab. 1	1	Chem. 167	Org. Chem. Lab. 2	2	
Chem. 150	Organic Chemistry 3	3	Chem. 356	Quant. Org. Anal. 1	1	
Chem. 165	Org. Chem. Lab. 2	2	Chem. 190	Phys. Chemistry 3	3	
†Ger. 7	Scientific German 3	3	Chem. 192	Phys. Chem. Lab. 1	1	
	*General Study 3	3	Ch.E. 260	Ind. Eng. Chem. 3	3	
	Elective 3	3		*General Study 3	3	
		18		Elective 3	3	
					19	

SUMMER

Chem. 100, Eight (8) weeks industrial employment with report.

FIRST SEMESTER		SENIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Chem. 302	Inorganic Chem. 3	3	Chem. 175	Research Lab. 3	3	
Chem. 357	Qual. Org. Anal. 3	3	Chem. 337	Adv. Analyt. Chem. 3	3	
Chem. 194	Phys. & El'trochem.... 3	3	Chem. 179	Hist. & Lit. Chem. 1	1	
Chem. 197	Electrochem. Lab. 1	1	Chem. 358	Adv. Org. Chem.		
	*General Study 3	3	Chem. 371	or Elem. Biochem. 3	3	
	Elective 3	3	Chem. 303	or Nucl. Radiochem. 3	3	
		16		*General Study 3	3	
				Elective 3	3	
					16	

*For an elucidation of this requirement see pages 104-106.

†Students in this curriculum are required to pass Ger. 7, Scientific German. Those who are able to omit one or both semesters of the courses prerequisite to Ger. 7 will elect other courses as substitutes.

THE CURRICULUM IN CIVIL ENGINEERING

Civil Engineering, the original stem from which have branched the other types of engineering, continues to meet the demands of those branches of industry which prefer a broad, fundamental education to a more specialized training. The curriculum, however, develops depth in the various professional areas of civil engineering.

The field of civil engineering includes the conception, design, construction, operation, and maintenance of private and public projects, including bridges, buildings, highways, airports, railroads, harbors, docks, subways, tunnels, water supply and purification systems, sewage collection and treatment facilities, water power developments, the making of surveys, and research. Many civil engineers are associated with consulting engineering firms, contractors, industrial concerns, or various governmental subdivisions.

The work of the first three years deals chiefly with the scientific and mathematical basis of engineering practice, with emphasis upon the application of these principles during the fourth year. All students receive instruction in surveying, highway engineering, geology, soil mechanics, structural theory and design, foundation engineering, fluid mechanics, and sanitary engineering. Through the use of approved electives, the student may pursue further work in structural, hydraulic, transportation, or sanitary engineering. Opportunity is provided through an elective for a student to determine whether he has an interest in and aptitude for research. Development of abilities in self-expression are stressed throughout the curriculum.

Instruction in the theory and practice of surveying is given during a six-week Summer Session.

Special 5-year combined programs leading to the degrees B.S. in C.E. and either B.A., B.S. in Bus. Adm. or B.S. in M.E. or E.M. can be arranged.

Engineers, through their professional societies, have insisted that the engineering student be trained as a professional man rather than a technician, with a sound understanding of his place in society. This training is provided by the humanistic-social courses extending through the four years and selected with the advice and approval of the curriculum director.

THE CURRICULUM IN CIVIL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

SUMMER

C.E. 40 Land & Topographic Surveying
C.E. 41 Route Surveying(3)
(3)

FIRST SEMESTER

SOPHOMORE YEAR

SECOND SEMESTER

Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3
Math. 13	Calculus III	3	Math. 14	Calculus IV	3
Mech. 1	Statics	3	Mech. 11	Mech. of Materials.....	3
Phys. 24	Elect. & Magnetism... 4 *General Study..... 3	4	Phys. 23	Materials Testing Lab. 1 Heat, Sound & Light... 4	3
MS/AS 3	Mil./Air Science..... 2	2	MS/AS 4	Approved Elective..... 3	3
P.E. 3	Physical Education	—	P.E. 4	Mil./Air Science	2
		—		Physical Education	—
		18			19

FIRST SEMESTER

JUNIOR YEAR

SECOND SEMESTER

C.E. 112	Adv. Mech. of Mat.... 3	C.E. 150	Structural Analysis	4
E.E. 160	Elec. Cir. & Appar.... 3	Geol. 6	Engr. Geology..... 4	4
E.E. 161	Elec. Problems..... 1	C.E. 139	Soil Mechanics	3
E.E. 162	Dynamo Lab..... 1	C.E. 161	Sewage Works Eng. 3	3
Mech. 102	Dynamics	3	*General Study	3
C.E. 121	Mech. of Fluids	3		
C.E. 123	Hydraulic Lab. 1	3		
	*General Study	3		
		18		17

SUMMER

C.E. 100, Industrial Employment

FIRST SEMESTER

SENIOR YEAR

SECOND SEMESTER

C.E. 142	Highway Eng..... 3	C.E. 101	Foundations	2
C.E. 151	Structural Theory.... 3	C.E. 102	Proseminar	1
C.E. 153	Reinf. Conc. Theory... 3	C.E. 152	Structural Design..... 3	3
C.E. 160	Water Works Engng.... 3	C.E. 353	Reinf. Conc. Des..... 3	3
C.E. 350	Adv. Struct. Anal.... 3	M.E. 160	†Adv. Civil Engrg. 3	3
	Approved Elective..... 3		Heat Power	3
			*General Study	3
		18		18

†Any three hours of courses listed below and approved by the curriculum director.					
C.E. 103	Special Problems	2-4	C.E. 321	Hydraulic Machinery.. 3	
C.E. 104	Readings in C.E..... 1-3	1	C.E. 322	Inter. Fluid Mech..... 3	
C.E. 107	Structural Welding..... 1	1	C.E. 351	Structural Design..... 2	
C.E. 140	Transportation Engng... 3	3	C.E. 360	Sanitation	3
C.E. 320	Hydraulic Engineering 3				

*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN ELECTRICAL ENGINEERING

The electrical engineer is one who practices the science and art of economically "directing the sources of electrical energy in nature for the uses and conveniences of man." He may design, manufacture, install, or operate electrical machinery and equipment, manage plants and electric systems, or engage in the promotion of engineering projects. He may design, manufacture or control communication systems, computer systems or automatic control systems.

The object of this curriculum is to give instruction in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical subjects which experience shows are most essential in the equipment of the electrical engineer. In seeking to accomplish this object the department puts chief emphasis upon mastery of the mathematical-physical principles and thoroughness in the analysis of problems.

The curriculum provides a balanced allotment of time in each of four principal divisions: (1) mathematics and the basic sciences, (2) electrical engineering, (3) allied branches of engineering, and (4) general studies. In order to make maximum use of the available time, the electrical courses are highly coordinated with respect to classroom and laboratory work; concurrent courses are designed to augment and supplement each other; and consecutive courses to extend and build upon the previous courses.

In recognition of different talents and inclinations among individuals, and of specialization in industry, two separate options are offered in the senior year: (1) the Power Option for those interested in the design, operation, and development of electrical machinery and power systems; (2) the Electronics Option for those interested in the field of electrical communication or electronics. The work for the first three years and some of that in the senior year is identical for each option; so that all graduates will have had the same basic work. Thus, although a student elects a particular option, he has a foundation sufficiently fundamental to enable him to engage in any branch of electrical engineering.

E N G I N E E R I N G

THE CURRICULUM IN ELECTRICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER

SOPHOMORE YEAR

SECOND SEMESTER

Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3
Math. 13	Calculus III	3	Mech. 11	Mech. of Materials.....	3
Mech. 1	Statics	3	Mech. 13	Materials Testing Lab. 1	
Met. 63	Engr. Mat. & Proc....	3	Math. 14	Calculus IV	3
MS/AS 3	Mil./Air Science.....	2		*General Study	3
Phys. 24	Elect. & Magnetism....	4	MS/AS 4	Mil./Air Science.....	2
P.E. 3	Physical Education	—	Phys. 23	Heat, Sound & Light....	4
			P.E. 4	Physical Education	—
			18		
					19

FIRST SEMESTER

JUNIOR YEAR

SECOND SEMESTER

E.E. 102	D.C. Machines	3	E.E. 106	Alt. Cur. Machines ...	3
E.E. 103	D.C. Mach. Lab.....	1	E.E. 107	A.C. Mach. Lab.	1
E.E. 104	Alt. Cur. Circuits.....	3	E.E. 110	Electronics	3
E.E. 105	Alt. Cur. Cir. Lab....	1	C.E. 121	Mech. of Fluids	3
Math. 206	Adv. Calculus	3	C.E. 123	Hydraulic Lab.	1
Mech. 102	Dynamics	3	M.E. 105	Thermodynamics	3
M.E. 104	Thermodynamics	3	Phys. 111	Elect. Lab.....	1
Phys. 110	Elect. Lab.....	1		*General Study	3
			18		
					18

SUMMER

E.E. 100, Industrial Employment

FIRST SEMESTER

SENIOR YEAR

SECOND SEMESTER

E.E. 108	Alt. Cur. Machines ...	3	E.E. 111	Proseminar	1
E.E. 109	A.C. Mach. Lab.	2	E.E. 331	Elec. & Mag. Fields....	3
E.E. 332	Elec. Transients.....	3		*General Study	3
M.E. 162	Mech. Engrg. Lab....	1			
	*General Study	3			

POWER OPTION

E.E. 133	Transmission Lines.....	3	E.E. 334	Trans. Line Trans.....	3
E.E. 335	Symmetrical Comp.....	3	E.E. 336	System Stability.....	3
			E.E. 337	Adv. Mach. Theory....	3
			E.E. 338	Transients Lab.	1
			M.E. 163	Mech. Engrg. Lab.....	1

ELECTRONICS OPTION

E.E. 141	Electronic Circuits	4	E.E. 142	Electronic Circuits	4
E.E. 143	Commun. Networks	3	E.E. 144	Commun. Networks	4
			E.E. 145	Electromag. Theory	3

18 or 19

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*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN ENGINEERING MECHANICS

The curriculum in engineering mechanics is designed to prepare men for careers in engineering research and development. There is an increasing demand in industry and government service for men with a broad training in the fundamentals of engineering, rather than in a given specific field. Such a training, in which engineering mechanics and applied mathematics play an important part, is provided by this curriculum. It emphasizes the analytical approach to engineering problems and the application to their solution of the basic methods and principles of mechanics.

The first two years of work are the same as those in most of the other engineering curricula. During the junior and senior years, time is about equally divided between (1) engineering mechanics, (2) mathematics, (3) allied branches of engineering and general studies, and (4) technical electives. The major areas of study in engineering mechanics are statics and strength of materials, dynamics and vibrations analysis, elasticity, plasticity, and fluid mechanics. The technical electives should be used to form one of the suggested group options. They are intended to enable the student to correlate his theoretical training with engineering practice in a specific field. They may also be used by those men more theoretically inclined to carry an intensive study of applied mathematics.

Only those men who have achieved high standing in mathematics, mechanics and physics during the first two years of college and who have shown definite analytical ability are encouraged to proceed toward the degree of bachelor of sciences in engineering mechanics. Graduates in engineering mechanics are equipped for immediate work in research and development in government service or in aircraft, automotive and similar industries. They are also eligible for admission to the Graduate School for advanced work in applied mechanics or in some related engineering field.

E N G I N E E R I N G

THE CURRICULUM IN ENGINEERING MECHANICS

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER		SOPHOMORE YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Eco. 3	Economics	3	Eco. 4	Economics	3	
Math. 13	Calculus III	3	Math. 14	Calculus IV	3	
Mech. 1	Statics	3	Mech. 11	Mech. of Materials	3	
Phys. 23	Heat, Sound & Light.	4	Mech. 13	Materials Testing Lab.	1	
Met. 63	Eng. Materials	3	Phys. 24	Elec. & Magnetism	4	
MS/AS		2		*General Study	3	
P.E. 3		—	MS/AS		2	
		—	P.E. 4		—	
		—			—	
		18			19	

FIRST SEMESTER		JUNIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Math. 221	Diff. Equations	3	Math. 322	Diff. Eq. & Harm. Ana.	3	
Math. 301	Vector Analysis	3	Mech. 302	Adv. Dynamics	3	
Mech. 102	Dynamics	3	C.E. 121	Mech. of Fluids	3	
Mech. 301	Adv. Mech. of Mat.	3	C.E. 123	Hydraulic Laboratory	1	
	Elective	3-4	E.E. 160	Elec. Cir. & Appar.	3	
	*General Study	3	E.E. 161	Elec. Problems	1	
		—	E.E. 162	Dynamo Laboratory	1	
		—		Elective	3-4	
		—			—	
		18-19			18-19	

SUMMER
Mech. 100 Summer Employment

FIRST SEMESTER		SENIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Math. 315	Func. of Comp. Var...	3	Math. 324	Theory of Errors	3	
Mech. 303	Mech. of Continua I	3	Mech. 304	Mech. of Cont. II	3	
Phys. 340	Heat, Thermodynamics	4	M.E. 342	Elem. Vibra. Anal.	3	
	Electives	4-6		Electives	6	
	*General Study	3		*General Study	3	
		—			—	
		17-19			18	

Electives in junior and senior years should include (a) a group option (12-13 hrs.), such as listed below, intended to enable the student to correlate his theoretical training with engineering practice in a specific field, or to carry a more intensive study of mathematics, (b) 4-6 hours of additional approved technical electives or an approved foreign language.

Typical Group Options

A. STRUCTURAL ENGINEERING

C.E. 150.	Structural Analysis	(4)
C.E. 151.	Structural Theory	(3)
C.E. 350.	Adv. Struct. Analysis	(3)
C.E. 153.	Reinf. Concrete Theory	(3)

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B. MACHINE DESIGN

M.E. 101.	Elem. Machine Design	(3)
M.E. 102.	Machine Design	(3)
M.E. 103.	Adv. Machine Design	(3)
M.E. 340.	Adv. Machine Design	(3)

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*For an elucidation of this requirement see pages 104-106.

C. FLUID FLOWS			
M.E.	321.	Heat Transfer.....	(3)
M.E.	322.	Compr. Fluids	(3)
Mech.	325.	Aerodynamics	(3)
Mech.	326.	Aerodynamics	(3)
			12
D. METALLURGICAL ENGINEERING			
Met.	230.	Physical Metallurgy I.....	(4)
Met.	231.	Physical Metallurgy II.....	(3)
Met.	323.	Mechanical Metallurgy.....	(3)
Met.	352.	Ferrous Metallurgy	(3)
			13
E. MATHEMATICS			
Math.	219.	Principles of Analysis.....	(3)
Math.	220.	Principles of Analysis.....	(3)
Math.	340.	Higher Algebra	(3)
Math.	350.	Special Topics (Electronic Computers)	(3)
			12

THE CURRICULUM IN ENGINEERING PHYSICS

The curriculum in engineering physics is designed to prepare men for careers in scientific work. Primary emphasis is placed on the fundamental principles of physics, and this is carefully coordinated with thorough laboratory training. The first two years of work are similar to those in any of the engineering curricula, and some further engineering study is required in addition to the work in physics during the final two years. The training is thus consciously practical.

The complete curriculum is not dictated. A liberal number of electives, particularly in the senior year, provides unusual flexibility in allowing the curriculum to be adapted to the needs and interests of the individual student. Those whose interests lie in the theoretical or analytical phases of their science, or who are preparing for graduate study, usually elect additional courses in mathematics and physics. Many others elect additional work in chemistry, engineering, geophysics, education, or business, or further studies in the social sciences and the humanities.

Graduates are prepared to start their professional careers as physicists. They are equipped for work in pure or applied science: their primary function is the solution of problems which have not yet been reduced to standard engineering practice.

E N G I N E E R I N G

THE CURRICULUM IN ENGINEERING PHYSICS

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER		SOPHOMORE YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Eco. 3	Economics	3	Eco. 4	Economics	3	
†Ger. or	German	3	†Ger. or	German	3	
	Approved Elec.	3		Approved Elec.	3	
Math. 13	Calculus III	3	Math. 14	Calculus IV	3	
Mech. 1	Statics	3	Phys. 23	Heat, Sound & Light	4	
Phys. 24	Elect. & Magnetism....	4	Phys. 32	Electricity and		
MS/AS 3	Mil./Air Science	2		Electronics	3	
P.E. 3	Physical Education	—	MS/AS 4	Mil./Air Science	2	
			P.E. 4	Physical Education	—	
		18				18

FIRST SEMESTER		JUNIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
E.E. 104	A.C. Circuits.....	3	Mech. 102	Appr. Math. Elect....	3	
E.E. 105	A.C. Lab.....	1		Dynamics	3	
E.E. 163	Dynamo Lab.....	1	Phys. 111	Elect. Lab.....	1	
Math. 206	Applied Math I.....	3	Phys. 191	Lab. Techniques	1	
Phys. 110	Elect. Lab.....	1	Phys. 252	Optics	4	
Phys. 213	Theo. Elec. & Mag....	3		*General Study	3	
	Elective	3		Elective	3	
	*General Study	3				
		18				18

SUMMER

Phys. 100, Industrial Employment

FIRST SEMESTER		SENIOR YEAR			SECOND SEMESTER	
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	
Phys. 340	Heat and Thermo.....	4	Phys. 269	Modern Theories.....	3	
Phys. 314	Phys. of Electronics....	4	Phys. 270	Atom. & Nucl. Lab....	1	
Phys. 268	Modern Theories.....	3	Phys. 171	Proseminar	1	
Phys. 192	Advanced Lab.....	1	Phys. 363	Mod. Th. Solids.....	3	
	*General Study	3		Appr. Phys. Elect....	2	
	Electives	3		*General Study	3	
				Electives	5	
		18				18

*For an elucidation of this requirement see pages 104-106.

†Students planning graduate study should elect German. A selection from Chem. 38, Met. 63 and Mech. 11, 13 is suggested for others.

THE COMBINED FIVE-YEAR CURRICULUM IN ELECTRICAL ENGINEERING AND ENGINEERING PHYSICS

This curriculum is designed to meet the needs of those who plan a career in electronics and communications research and development. It differs from the standard four-year Communications Option in Electrical Engineering in that certain courses of primary interest to power engineers have been replaced by subjects in physics and mathematics. It differs from the four-year curriculum in Engineering Physics with a communications minor in that the fundamental electrical engineering courses in fields, transients, and machines have been added. The similarity of the basic requirements of the two curricula permits the inclusion of the necessary advanced work in mathematics and dynamics.

For men planning careers in the electronics communications area, it is believed that the greater breadth of training afforded by this combined program is preferable to early specialization in either field alone. It should be particularly noted that this program lays a solid foundation for graduate study in either physics or electrical engineering.

It is expected that students undertaking this combined program will make every effort to complete the five years. The B.S. (E.E.) degree is conferred on the successful completion of the fourth year, and the B.S. (E.P.) degree at the end of the fifth year.

**THE COMBINED FIVE-YEAR CURRICULUM IN
ELECTRICAL ENGINEERING AND ENGINEERING PHYSICS**

FRESHMAN AND SOPHOMORE YEARS

See E.E. Curriculum

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
E.E. 102	D.C. Machines	3	E.E. 106	A.C. Machines.....	3
E.E. 103	D.C. Mach. Lab.....	1	E.E. 107	A.C. Lab.....	1
E.E. 104	A.C. Circuits.....	3	E.E. 110	Electronics	3
E.E. 105	A.C. Lab.....	1	Math. 315	Th. Func. Comp. Var. 3	
Math. 206	Applied Math I.....	3	Phys. 111	Elect. Lab.....	1
Mech. 102	Dynamics	3	Phys. 252	Geometrical and	
Phys. 110	Elect. Lab.....	1		Physical Optics	4
	*General Study.....	3		*General Study.....	3
			18		18

SUMMER

Industrial Employment

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
E.E.	Course Title	E.E.	Course Title	E.E.	Course Title
E.E. 332	Elec. Transients.....	3	E.E. 331	Elec. & Mag. Fields....	3
E.E. 141	Electronic Circuits.....	4	E.E. 142	Electronic Circuits.....	4
E.E. 143	Commun. Networks ...	3	E.E. 144	Commun. Networks ...	4
E.E. 108	A.C. Machines.....	3	E.E. 345	Electromag. Theory.....	3
E.E. 109	A.C. Mach. Lab.....	2		*General Study	3
Phys. 340	Heat and Thermo.....	4	E.E. 111	Proseminar	1
		19			18

FIRST SEMESTER		FIFTH YEAR		SECOND SEMESTER	
Math.	Course Title	Math.	Course Title	Math.	Course Title
Math. 301	Vector Analysis.....	3	Math. 322	Diff. Eq. & Harm. Ana.	3
Math. 221	Diff. Equations.....	3		Elective	3
	Appr. Phys. or		Phys. 363	Modern Th. of Solids	3
	Math. Elect.....	3	Phys. 269	Modern Theories.....	3
Phys. 268	Modern Theories.....	3	Phys. 270	Atom. & Nucl. Lab....	1
Phys. 192	Advanced Lab.	1	†Ger.	German or	
†Ger.	German or			Approved Elective } 3	
	Approved Elective }	3	Phys. 171	Approved Elective }	3
	Elective	2		Proseminar	1
		18			17

*For an elucidation of this requirement see pages 104-106.

†Students planning graduate study should elect German. For others Math. 324 and Mech. 302 are suggested.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

The curriculum is designed with the principal aim of industrial engineering in view, which is the improvement of the general standard of living as the result of increased worker productivity by the application of the principles of scientific management and the utilization of technical improvements when economically justifiable.

Throughout the program there is an integrated series or sequence in the major field which includes not only basic and fundamental courses, but specialized courses as well, in the fields of production planning and control, quality control, product engineering, work simplification, wage and salary administration and industrial relations.

There is a growing tendency on the part of industries to select young men from their engineering departments for managerial positions. Because of this, the industrial engineering curriculum, although basically and primarily engineering, is supplemented by courses in business administration and psychology to enable the industrial engineering graduate to accept and succeed in these opportunities.

It is the aim of the industrial engineering program to develop for industry a potential manager, a graduate well grounded in engineering fundamentals, trained in the principles of economics, accounting and psychology, and adequately prepared to practice the profession of industrial engineering.

THE FIVE-YEAR COMBINED CURRICULUM INDUSTRIAL ENGINEERING AND BUSINESS ADMINISTRATION

Students with definite objectives in mind which require more concentration in business administration may elect to pursue a five-year program which combines the two curricula of industrial engineering and business administration. This combined curriculum will lead to the degree B.S. in Industrial Engineering at the end of the fourth year and B.S. in Business Administration at the end of the fifth year. The first four years are essentially the standard industrial engineering curriculum. For the fifth year please see page 98 under Business Administration.

E N G I N E E R I N G

THE CURRICULUM IN INDUSTRIAL ENGINEERING

FIRST SEMESTER	FRESHMAN YEAR	SECOND SEMESTER
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See page 106

FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3
Math. 13	Calculus III	3	Math. 14	Calculus IV	3
Met. 63	Engr. Mat. & Proc.	3	Mech. 11	Mech. of Materials	3
Phys. 23	Heat, Sound & Light	4	Mech. 13	Materials Testing Lab.	1
MS/AS 2	Mil./Air Science	2	Psych. 1	Elem. Psychology	3
Mech. 1	Statics	3	Phys. 24	Elect. & Magnetism	4
			MS/AS	MS/AS	2

18

19

SUMMER

M.E. 1 Machine Shop Practice (3)

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
I.E.	Engrg. Economy	I.E.	115	Personnel Admin.	3
I.E. 114	Plant Administration	3	I.E. 116	Plant Administration	3
Math. 233	Math. Statistics	3	Math. 234	Math. Statistics	3
M.E. 101	Elem. Machine Design	3	M.E. 102	Machine Design	3
Mech. 102	Dynamics	3	E.E. 160	Elec. Cir. & Appar.	3
	*General Study	3	E.E. 161	Elec. Problems	1
			E.E. 162	Dynamo Laboratory	1

18

17

SUMMER

I. E. 100 Industrial Employment

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Acctg.	Acctg. for Engineers	Acctg.	106	Cost Acctg. for Engrs.	3
M.E. 160	Heat Power	3	I.E. 350	Ind. Engrg. Problems	1
	Business Elective	3	M.E. 161	Engineering Lab	1
*I.E.		3	C.E. 121	Mech. of Fluids	3
*I.E.		3	C.E. 123	Hydraulic Laboratory	1
	*General Study	3	*I.E.		3
			*I.E.		3
			*General Study		3

18

18

*For an elucidation of this requirement see pages 104-106.

*I.E. 325	Production Control	3	*I.E. 328	Work Simplification	3
I.E. 326	Quality Control	3	I.E. 329	Wage & Salary Admin.	3
I.E. 327	Product Engineering	3	I.E. 330	Industrial Relations	3

THE FIVE-YEAR COMBINED CURRICULUM

INDUSTRIAL ENGINEERING AND

BUSINESS ADMINISTRATION

SUMMER

M.E. 1 Machine Shop Practice (3)

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
I.E.	Engrg. Economy	I.E.	115	Personnel Admin.	3
I.E. 114	Plant Administration	3	I.E. 116	Plant Administration	3
Math. 233	Math. Statistics	3	Math. 234	Math. Statistics	3
M.E. 101	Elem. Machine Design	3	M.E. 102	Machine Design	3
Mech. 102	Dynamics	3	E.E. 160	Elec. Cir. & Appar.	3
Eco. 333	Labor Problems	3	E.E. 161	Elec. Problems	1
			E.E. 162	Dynamo Laboratory	1

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NOTE A: Those students who will major in Accounting in the fifth year will take Acctg. 104 and Acctg. 106 in the Junior year in place of Eco. 333 and M.E. 102; and Eco. 333 and M.E. 102 will be taken in the senior year in place of Eco. 111 and Fin. 125; and Acctg. 13 and Acctg. 14 will be taken in place of Acctg. 104 and Acctg. 106; and Eco. 111 and Fin. 125 will be taken in the fifth year.

SUMMER
I.E. 100 Industrial Employment

FIRST SEMESTER		SENIOR YEAR		SECOND SEMESTER	
Acctg.	104	Acctg. for Engineers....	3	Acctg.	106
M.E.	160	Heat Power	3	I.E.	350
Eco.	111	Marketing	3	M.E.	161
*I.E.	3	Fin.	125
*I.E.	3	*I.E.
		English Elective	3	*I.E.
					English Elective

18

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NOTE B: Those students who will major in Economics or Economic Statistics in the fifth year will take E.S. 346 in the senior year in place of Fin. 125, and Fin. 125 will be taken in the fifth year.

*I.E.	325	Production Control.....	3	*I.E.	328	Work Simplification....	3
I.E.	326	Quality Control.....	3	I.E.	329	Wage & Salary Admin.	3
I.E.	327	Product Engineering....	3	I.E.	330	Industrial Relations	3

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical engineering deals with the design, construction, installation, and operation of machinery necessary for the economical and advantageous use of power, and with the management of industries and organizations manufacturing and using power-driven equipment. The high degree of technical skill and efficiency essential to the work of research, design, construction, and operation, which underlies mechanical engineering practice, necessarily prescribes a training based on the fundamental sciences of chemistry, physics, and mathematics.

Aptitude and skill in the interpretation and application of the basic technical sciences are, however, not sufficient. In addition the engineer must acquire an understanding of the influences of his profession on social institutions and traditions. To this end the curriculum requires the student to register for courses in the College of Arts and Science or the College of Business Administration, or both, during each of the four years.

The curriculum is broad and designed to meet the needs of young men interested in the scientific and technical aspects of industry. During the first three years emphasis is placed on the fundamental principles underlying the numerous fields of mechanical engineering. In the senior year opportunity is provided for concentration in one of three broad fields; Power, Design, or Basic Sciences underlying Mechanical Engineering. The young graduate ordinarily enters a graduate apprenticeship in a public utility, manufacturing, or operating organization where opportunity is provided for his development in research, design, construction and operation, depending upon his interests and aptitudes and the opportunities available.

LEHIGH UNIVERSITY

II DESIGN OPTION

FIRST SEMESTER				SECOND SEMESTER			
2 of these		Required:		2 of these		Required:	
M.E.	341	Stress Anal. for Des....	3	M.E.	340	Adv. Machine Design	3
	Plus	one of the following:			Plus	one of the following:	
Math.	221	Diff. Equations	3	M.E.	342	El. Mech. Vibr. Anal.	3
M.E.	343	Instr. & Auto. Control	3	Math.	322	Diff. Eq. & Harm. Anal.	3
I.E.	110	Engrg. Economy.....	3	C.E.	106	Structural Design	3
M.E.	321	Heat Transfer.....	3	Math.	208	Applied Math. II	3

III GENERAL OPTION

FIRST SEMESTER				SECOND SEMESTER			
2 of these		Required:		2 of these		Required:	
Math.	315	Funct. of Compl. Var.	3	Math.	324	Theory of Errors.....	3
Mech.	325	Aerodynamics	3	Mech.	326	Aerodynamics	3
Phys.	268	Mod. Phys. Theory.....	3	Phys.	269	Mod. Phys. Theory.....	3
Any courses from Option I or II						and/or	
				Phys.	363	Modern Th. of Solids	3
				Mech.	302	Adv. Dynamics.....	3
				Any courses from Option I or II			

THE COMBINED FIVE-YEAR CURRICULUM IN
MECHANICAL-ELECTRICAL ENGINEERING

This curriculum is designed to meet the needs of the power engineer engaged in the operation of large public utilities for the generation and distribution of electrical energy, as well as for those concerned with the design of electrical machines and apparatus. It is generally recognized that the engineering work of the electrical manufacturers and public utilities in the power field encounters as many mechanical as electrical problems. These two types of problems are equally important and equally interesting. In order to carry out the design of electrical machinery and power plants it is now generally necessary to employ both mechanical and electrical engineers on the same job because, with rare exceptions, one engineer is not proficient in both fields.

This combined 5-year curriculum in M.E. and E.E. is intended to circumvent this deficiency in the present training of power engineers by offering a highly integrated, comprehensive, and balanced program which is devised to turn out graduates equally proficient in mechanical and electrical engineering and who in addition will have some grounding in those business courses which are deemed essential to the engineer when he eventually takes on executive and administrative responsibilities.

It is the intent of this curriculum that anyone undertaking it will make every effort to complete the five years. The B.S. (M.E.) degree will be conferred at the end of the fourth year, and the B.S. (E.E.), at the end of the fifth year.

E N G I N E E R I N G

**THE COMBINED FIVE-YEAR CURRICULUM IN
MECHANICAL-ELECTRICAL ENGINEERING**

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
Math. 13	Calculus III	3	Math. 14	Calculus IV	3			
Phys. 24	Elect. & Magnetism.....	4	Phys. 23	Heat, Light & Sound..	4			
Mech. 1	Statics	3	Mech. 64	Engr. Mat. & Proc....	3			
Eco. 3	*General Study.....	3	Mech. 11	Mech. of Materials....	3			
MS/AS	Economics	3	Mech. 13	Materials Testing Lab.	1			
P.E. 3	Mil./Air Science.....	2	Eco. 4	Economics	3			
	Physical Education.....		MS/AS	Mil./Air Science.....				
			P.E. 4	Physical Education.....				

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SUMMER

M.E. 1 Machine Shop Practice (3)

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
Math. 206	Applied Math I.....	3	M.E. 101	Elem. Machine Design	3			
M.E. 104	Thermodynamics	3	M.E. 105	Thermodynamics	3			
Met. 67	Met. Lab.....	2	C.E. 121	Mech. of Fluids	3			
E.E. 102	D.C. Machines	3	C.E. 123	Hydraulic Lab.....	1			
E.E. 103	D.C. Lab.....	1	E.E. 106	A.C. Machines.....	3			
E.E. 104	A.C. Circuits.....	3	E.E. 107	A.C. Lab.....	1			
E.E. 105	A.C. Lab.....	1		*General Study.....	3			
Mech. 102	Dynamics	3						

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SUMMER

I.E. 100 Summer Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
M.E. 102	Machine Design	3	M.E. 340	Adv. Machine Design	3			
M.E. 108	Mech. Engrg. Lab.....	3	M.E. 109	Mech. Engrg. Lab.....	3			
Acctg. 104	Acctg. for Engineers	3	E.E. 110	Electronics	3			
E.E. 108	A.C. Machines	3	Phys. 111	Electrical Lab.....	1			
E.E. 109	A.C. Mach. Lab.....	2	Mech. 302	*General Study.....	6			
Phys. 110	Electrical Lab.....	1		Adv. Dynamics.....	3			
M.E. 321	Heat Transfer	3						

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FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
M.E. 333	Power Plants	3	M.E. 342	Mech. Vib. Analysis.....	3			
Math. 315	Func. Comp. Var.....	3	E.E. 331	Elec. & Mag. Fields....	3			
E.E. 332	Transients	3	E.E. 334	Trans. Lines Trans....	3			
E.E. 133	Transmission Lines.....	3	E.E. 336	System Stability.....	3			
E.E. 335	Symmetrical Comp.....	3	E.E. 337	Adv. Mach. Theory....	3			
	Approved Elective.....	3	E.E. 338	Transients Lab.....	1			
				Approved Elective.....	3			

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*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN METALLURGICAL ENGINEERING

The growing importance of metals for industrial and everyday use and for national defense has increased the need for men trained in the metallurgical branch of engineering. Metallurgy includes the production of metals from ores; purifying or refining them; working and fabricating them by such processes as casting; rolling, forging, welding, etc.; development of new alloys; and enhancing the properties of metals through alloying, heat treatment, and other means.

Training for this field of engineering includes the basic studies in mathematics, chemistry, and physics required in all sound engineering education. In addition to fundamental science, it includes certain basic courses from other fields of engineering, required because of their usefulness to the metallurgical engineer as well as to give him a broad engineering background. It provides the essential courses in metallurgy to facilitate entrance of the graduate into the metallurgical industry and his initial progress therein. Finally, it gives the student an introduction to humanistic and social studies which will broaden his outlook and lead to furthering his professional development after graduation.

The curriculum is designed to fulfill the essential requirements of the industry in a four-year course, to give the necessary foundation for those who can pursue graduate work, and to constitute the basis for well-rounded engineering education at the professional level. The "general studies" provide for selected non-technical courses from the College of Arts and Science or the College of Business Administration; the "electives" permit further study in the non-technical field, or additional work in science or foreign language in preparation for research, or additional engineering or business courses in accordance with the special interests or needs of the individual. The latter may include optional preparation in research or metallurgical plant practice. The general studies and elective courses are chosen by the student subject to the approval of the curriculum director.

Metallurgical Practice Option

A Metallurgical Practice Option is offered by the Department of Metallurgical Engineering in cooperation with the Bethlehem Steel Co. In this option, a special course, Met. 325, Metallurgical Practice (8) is taken in the second semester of the senior year in place of an equivalent number of other specified courses. In Met. 325

ENGINEERING

three days per week are spent in the Bethlehem Plant, during which investigations of a development and plant test nature are carried out. The option is limited to a small group of seniors selected by the department from those who apply.

Research Option

For those students whose interests lie in the fields of theoretical metallurgy or research and, in particular, for those students planning to take part graduate work in metallurgy a Research Option is offered in the senior year. In this option the students are required to take Met. 318, Theoretical Physical Metallurgy (3); Met. 340, Research Techniques (2); and Met. 191, Experimental Metallurgy (3). The option is limited to a small group of selected students.

THE CURRICULUM IN METALLURGICAL ENGINEERING

FIRST SEMESTER		FRESHMAN YEAR		SECOND SEMESTER	
FIRST SEMESTER		SOPHOMORE YEAR		SECOND SEMESTER	
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Chem. 38	Analytical Chem.	3	Eco. 4	Economics	3
Eco. 3	Economics	3	Math. 14	Calculus IV	3
Math. 13	Calculus III.....	3	Mech. 11	Mech. of Materials	3
Mech. 1	Statics	3	Met. 1	Intro. to Met.....	3
Phys. 24	Elect. & Magnetism....	4	Phys. 23	Heat, Sound & Light...	4
MS/AS	Mil./Air Science.....	2	MS/AS	Mil./Air Science.....	2
P.E. 3	Physical Education.....	—	P.E. 4	Physical Education.....	—

FIRST SEMESTER		JUNIOR YEAR		SECOND SEMESTER	
Chem.	91	Physical Chem.	..... 3	Chem.	190
Ch.E.	162	Unit Operations.....	2	M.E.	166
Mech.	102	Dynamics.....	3	Met.	102
Met.	230	Physical Met. I.....	4	Met.	105
		Elective	3	Met.	112
*General Study.....		3	Met.	231	Phys. Met. II.....
					*General Study.....
18			18		

SUMMER

Met. 100, Industrial Employment

FIRST SEMESTER			SENIOR	YEAR	SECOND SEMESTER		
Met.	103	Nonferrous Met.	3	E.E.	160	Elec. Cir. & Appar....	3
Met.	318	Theoret. Phys. Met. or Techn. Elective	3	E.E.	161	Elec. Problems.....	1
				E.E.	162	Dynamo Lab.....	1
Met.	323	Mechanical Met.	3	Met.	358	Industrial Met.	3
Met.	352	Ferrous Met. II.	3	Met.	278	Metallurgical Reports.	3
Met.	363	Nonferrous Met. Prob. *General Study	2	P.D.	101	Professional Devel.	1
						Elective	3
						*General Study	3

LEHIGH UNIVERSITY

METALLURGICAL PRACTICE OPTION

E.E.	160	Elec. Cir. & Appar.....	3	Met.	325	Met. Practice.....	8
E.E.	161	Elec. Problems.....	1	Met.	338	Met. Colloquium.....	2
E.E.	162	Dynamo Lab.....	1	Met.	358	Industrial Met.....	3
Met.	103	Nonferrous Met.....	3	P.D.	101	Professional Devel.....	1
Met.	323	Mechanical Met.....	3			*General Study.....	3
Met.	352	Ferrous Met. II.....	3				
Met.	363	Nonferrous Met. Prob.	2				
		*General Study.....	3				

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RESEARCH OPTION

Met.	103	Nonferrous Met.....	3	E.E.	160	Elec. Cir. & Appar....	3
Met.	318	Theoret. Phys. Met....	3	E.E.	161	Elec. Problems.....	1
Met.	323	Mechanical Met.....	3	E.E.	162	Dynamo Lab.....	1
Met.	340	Research Techniques....	2	Met.	191	Experimental Met.....	3
Met.	352	Ferrous Met. II.....	3	Met.	338	Met. Colloquium.....	2
Met.	363	Nonferrous Met. Prob.	2	Met.	358	Industrial Met.....	3
		*General Study.....	3	P.D.	101	Professional Devel.....	1
						*General Study.....	3

19

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*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN MINING ENGINEERING

Mining engineering concerns itself with the exploration, development, extraction, and the initial preparation of the minerals and rocks that are needed to meet the demands of our modern civilization. So basic is the mining industry, so dependent on it are all individuals and industries, that ours has been called a "mineral civilization." Three great classes of materials are provided by the mining engineer: mineral fuels, including coal, petroleum, and natural gas; ores of the metals; non-metallics, such as slate, limestone, sand, and gravel.

Two options are offered in the curriculum in mining engineering: (1) mining engineering, (2) engineering geophysics. The curriculum includes the basic science common to all branches of engineering — mathematics, physics, chemistry and mechanics. The curriculum for the first two years is identical for both options. A thorough and progressive training is provided in the specialized fields of each option.

Mining Engineering Option

The option in mining engineering provides a training in the principles of mining and the methods used in extraction. Special attention is directed to the mechanization of mining operations; to mine ventilation, transportation, economics and administration; to mineral preparation. Technical courses in civil, electrical, and mechanical engineering form a part of this advanced work. All

the operations at the mine are within the responsibility of the mining engineer. The actual work of extraction may be only one of his activities, for he may also have to deal with exploration, construction, transportation, preparation and processing, and all phases of mine administration. Modern mining has become, in many cases, a mass-production industry. The mechanization of mines has gone forward with startling rapidity. The need for engineering training was never more important.

Engineering Geophysics Option

The option in engineering geophysics has been developed to provide a more extensive training in prospecting and exploration. In this option, courses in geophysics, advanced mathematics, advanced physics, and in geology provide the training necessary for this advanced work. While many of the graduates in this option seek employment with the oil companies or geophysical contracting companies, they are equally prepared to pursue geophysics in mining or civil engineering.

THE CURRICULUM IN MINING ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

SUMMER

C.E. 40 Land & Topographic Surveying (3)

FIRST SEMESTER

SOPHOMORE YEAR

SECOND SEMESTER

Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3
Geol. 1	Princ. of Geology.....	3	Geol. 12	Historical Geology.....	3
Math. 13	Anal. Geom. & Calc. III	3	Math. 14	Anal. Geom. & Calc. IV	3
Mech. 1	Statics	3	Mech. 11	Mech. of Materials.....	3
Min. 1	Mine Surveying.....	1	Mech. 13	Materials Testing Lab. 1	
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2
Phys. 23	Heat, Sound & Light..	4	Phys. 24	Elec. & Magnetism.....	4
P.E. 3	Physical Education.....	—	P.E. 4	Physical Education.....	—

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SUMMER

Min. 4, Mine Surveying, Field Work (2)

MINING ENGINEERING OPTION

FIRST SEMESTER

JUNIOR YEAR

SECOND SEMESTER

Chem. 38	Analytical Chem.	104	Acctg. for Engineers....	3	
Chem. 91	Physical Chem.	3	Mech. of Fluids.....	3	
Geol. 31	Mineralogy	3	C.E. 123	Hydraulic Laboratory.. 1	
Mech. 102	Dynamics	3	Geol. 32	Petrology	3
Met. 61	Engrg. Metallurgy.....	2	M.E. 160	Heat Power	3
Met. 68	Met. Problems.....	1	Min. 2	Mineral Land Surv.... 1	
Min. 101	Mining Fund.....	3	Min. 202	Methods of Mining ... 3	
	*General Study.....	3	Min. 208	Mining Lab. 1	

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LEHIGH UNIVERSITY

SUMMER
Min. 100, Summer Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
E.E.	160	Elec. Cir. & Appar.....	3	C.E.	106	Structural Design	3	
E.E.	161	Elec. Problems.....	1	Min.	204	Haul., Hoist., Pump..	3	
E.E.	162	Dynamo Laboratory	1	Min.	206	Mine Administration ..	2	
Min.	203	Mine Ventilation	3			Technical Electives.....	6	
Min.	205	Mining Economics	3			*General Study	3	
Min.	207	Mineral Preparation.....	3					
		*General Study	3					
				17				17

ENGINEERING GEOPHYSICS OPTION

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
Chem.	38	Analytical Chem.}		E.G.	202	Geophysical Applica....	3	
Chem.	91	Physical Chem.}	3	Geol.	32	Petrology	3	
E.G.	201	Geophysical Methods....	3	Min.	2	Mineral Land Surv....	1	
Geol.	31	Mineralogy	3	Min.	202	Methods of Mining....	3	
Math.	206	Applied Math I	3	Phys.	32	Elec. & Electronics....	3	
Mech.	102	Dynamics	3	Phys.	111	Electrical Lab.....	1	
Min.	101	Mining Fund.....	3			*General Study	3	
Phys.	110	Electrical Lab.....	1					
			19					17

SUMMER
Min. 100, Summer Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
C.E.	121	Mech. of Fluids.....	3	E.G.	302	Elec. & Grav. Prospe....	3	
C.E.	123	Hydraulic Laboratory..	1	Geol.	223	Structural Geology.....	3	
E.G.	301	Seismic & Mag. Prospe.	3	Geol.	312	Stratigraphy	3	
Min.	205	Mining Economics	3	Min.	206	Mine Administration ..	2	
Phys.	213	Theo. Elec. & Mag....	3			*General Study	3	
Phys.	314	Phys. of Electronics....	4			*General Study	3	
			17					17

*For an elucidation of this requirement see pages 104-106.

THE CURRICULUM IN SCIENCE AND MATHEMATICS

The curriculum in science and mathematics is designed to qualify men for teaching careers in biology, chemistry, physics and mathematics in secondary schools. In recognition of the increasing need for teachers whose teaching backgrounds are broad rather than highly specialized, the program is intentionally comprehensive. At the same time, sufficient study is required in the four major subjects to ensure adequate preparation in each.

Work in the major teaching subjects is continuous through all four years. During the freshman year the curriculum is identical with that required of all engineering students. The sophomore year includes those liberal arts courses common to other engineering curricula plus courses introductory to teaching. The junior year provides for the study of educational fundamentals and for

practical experience in nearby public high schools. Nine hours of approved electives and a three-hour general-study elective are scheduled for the junior and senior years. One or more periods of summer employment in work with adolescents is required.

Graduates in this curriculum will be qualified for teaching certificates in the public high schools of Pennsylvania, New Jersey and other states. They will be prepared to enter graduate study in education with a view to certification for supervisory and administrative positions in the public schools. Should a student take all nine hours of approved electives in one of his four major teaching fields, he will, in most cases, need little additional preparation to qualify for graduate study in that field.

THE CURRICULUM IN SCIENCE AND MATHEMATICS

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 106

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Phys. 23	Heat, Sound & Light....	4	Phys. 24	Elect. & Magnetism....	4			
Math. 13	Calculus III.....	3	Math. 14	Calculus IV.....	3			
Chem. 35	Analytical Chem.	4	Psych. 1	Elem. Psychology	3			
Eco. 3	Economics	3	Eco. 4	Economics	3			
Hist. 13	U. S. History.....	3	Educ. 1	Intro. to Education....	3			
MS/AS 3	Mil./Air Science.....	2	MS/AS 4	Mil./Air Science.....	2			
P.E. 3	Physical Education.....	—	P.E. 4	Physical Education.....	—			
19			18			18		

FIRST SEMESTER

JUNIOR YEAR

SECOND SEMESTER

Biol. 31	Zoology	3	Biol. 32	Zoology	3
Math. 51	Adv. Algebra.....	3	Math. 54	Higher Geometr.....	3
Chem. 150	Organic Chemistry....	3	Speech 30	Fund. Speech.....	3
Educ. 20	Educ. Psychology....	3	Educ. 352	Prin. H. S. Teach....	3
Educ. 353	Obs. Sec. Th. Teach....	3	Educ. 354	Pract. Teaching.....	3
Approved Elective			Approved Elective		
18			18		

Eight weeks summer employment.

FIRST SEMESTER

SENIOR YEAR

SECOND SEMESTER

Biol. 3	Comparative Anatomy..	3	Biol. 6	Botany	3
Biol. 61	Bacteriology	3	Biol. 206	Nat. Hist. & Ecol.....	3
Chem. 91	Phys. Chemistry	3	Phys. 269	Mod. Phys. Theories..	3
Chem. 92	Phys. Chem. Lab.	1	Educ. 350	Prin. Sec. Educ.....	3
Phys. 268	Mod. Phys. Theories..	3	*General Study.....		
Educ. 331	Hist. Educ. in U. S....	3	Approved Elective		
16			18		

*For an elucidation of this requirement see pages 104-106.

The Graduate School

The Graduate School

Administrative Officers

Martin Dewey Whitaker, *President*
Harvey Alexander Neville, *Vice-President and Provost*
Earl Kenneth Smiley, *Vice-President*
Frank Evans Myers, *Dean*
Charles Augustus Seidle, *Director of Admission*
James Harold Wagner, *Registrar*
James Decker Mack, *Librarian*

Executive Committee of the Graduate Faculty

Dean Myers, *Chairman*, President Whitaker, and Vice-Presidents
Neville and Smiley (*ex officiis*), Professors Diamond, Stout,
Parker, Karakash, and Strauch. (Secretary)

Graduate study was a part of the original plan of the University and was announced in its first Register in 1866. More definite organization of the work along lines that are now generally accepted dates from 1883. Since that time the degrees of Master of Arts and Master of Science have been offered without interruption. The degree of Doctor of Philosophy was also announced for a time and twice conferred. In the middle nineties this degree was withdrawn; and doctoral work was not again offered until 1936, when it was once more authorized by the trustees. In 1936 the Graduate School was organized with a Graduate Faculty which has full power to enact the necessary legislation governing the work of the School. In 1952 a program of studies leading to the degree of Master of Business Administration was first offered. The Faculty is composed of the administrative officers of the Graduate School, the Deans of the Colleges, and all professors, associate professors and assistant professors who offer work for graduate credit. The rules and regulations of the Faculty are administered by an Executive Committee composed of the President and Vice-President of the University, the Dean of the Graduate School, and five elected members of the Graduate Faculty.

The Graduate School, in certain areas, offers to students with adequate preparation and ability opportunity for advanced study of an intensive kind and for training in the methods of investigation and research, with a view to their development as scholars and

independent investigators in the fields of their choice. The School also aims to serve the needs of teachers and prospective teachers in elementary and secondary schools by providing opportunities for advanced professional training, and by preparing them for administrative positions.

Major work leading to the master's degree may be taken in the following fields: applied mechanics, bacteriology, biology, business administration, chemical engineering, chemistry, civil engineering, education, electrical engineering, English, geology, history and government, industrial engineering, international relations, mathematics, mechanical engineering, metallurgical engineering, mining engineering, physics, political science, and psychology. In the fields of Greek, Latin, German, French, philosophy, sociology and Spanish, major work is not offered; but students majoring in other fields may take collateral work in these fields from the list of courses acceptable for graduate credit ("200" courses).

Work leading to the doctor's degree is offered in the following fields: biology, chemical engineering, chemistry, civil engineering, electrical engineering, English, geology, history, mathematics, mechanical engineering, metallurgical engineering, physics, and psychology.

Prospective students who are interested in taking graduate work in particular fields are advised to get in touch with the heads of the departments concerned before attempting to register. Such consultation will be to their benefit, in that they will get a definite understanding as to the adequacy of their preparation, as well as of the facilities the University has to offer for the work which they desire.

Admission to Graduate Standing

A student who has taken the bachelor's degree or a degree in technology at a recognized college, university, or technical institution is eligible for admission as a graduate student. Actual admission is subject to enrollment limitations in each department, and is therefore competitive. Each candidate must file at the Office of Admission, on a form provided for the purpose, a statement of his collegiate experience and of his graduate objectives, and an official transcript of his academic record. The submission of Graduate Record Examination scores by a student applying for admission is urged and sometimes required. (for information

about this examination, write to the Educational Testing Service, P. O. Box 592, Princeton, New Jersey.) If a student is applying for admission to graduate work in the Department of Education, scores may be submitted for either the Graduate Record Examination or the National Teachers Examination.

Admission to graduate standing permits the student to take any course for which he has the necessary qualifications. It does not imply admission to candidacy for a degree. Admission to candidacy for an advanced degree is granted in accordance with the provisions set forth below under "Degrees."

Women are admitted as graduate students on the same terms as men. Except during a summer session, however, they are not ordinarily permitted to attend, either as registered students or as listeners, courses intended only for undergraduates.

A graduate student who is absent from the university for a semester or more must obtain the written approval of the head of his major department in order to be readmitted to graduate standing. If the student has not established a major, he must obtain the approval of the Dean of the Graduate School.

Students of Lehigh University who are within a few hours of meeting the requirements for the bachelor's degree may, if given permission by the Graduate Faculty, enroll for a limited amount of work for graduate credit.

Registration

Several days are set aside for graduate registration just prior to the beginning of the semester as indicated in the calendar. However, advance registration can be completed any time in January, June or September, as the case may be, by obtaining a registration ticket in the office of the Registrar and arranging an interview with the student's adviser. Anyone who can register in advance is urged to do so. Normally students are expected to complete their registration before the close of the third day of instruction. Registration after the tenth day of instruction in a regular semester or the fifth day in a summer session is permitted only when the express consent of the Dean of the Graduate School has been obtained.

It should be noted that graduate work itself starts promptly at the beginning of the term, and it is frequently true that graduate courses can be given only if there is a certain minimum demand for them. Delay in enrolling for a given course may therefore cause the course to be withdrawn.

A graduate student in residence must register each semester. A graduate student who is a degree candidate in absentia must register for that semester in which he expects to complete the degree requirements.

Tuition and Fees

The tuition in the Graduate School is \$300.00 per semester or \$25.00 per semester hour, whichever amount is lower, less a discount of 20% for those professionally engaged in the field of education. The maximum full-time roster of graduate courses is 15 semester-hours.

A listener's fee of \$25.00 is charged for each course audited. (See regulation on page 149).

Where the major department requires a master's thesis, the student registers for the thesis and pays at the rate of the regular semester hour charge, the minimum fee being \$50.00 (less 20% for those professionally engaged in the field of education.)

Graduate students in residence must register and pay a minimum tuition or dissertation fee of \$50.00 per semester.

For a doctoral dissertation prepared in absentia a reading fee of \$50.00 is charged to those graduate students who have not paid a dissertation fee of at least \$50.00 while in residence.

Part-time graduate students are given the option of paying or not paying an athletic fee of \$7.50 per semester and a student activities fee of \$3.00 per semester. If they pay these fees, they obtain the corresponding benefits.

Refunds

For University regulations concerning refunds, see page 53.

Members of the University Staff

Full-time members of the University staff may not take more than six semester hours of graduate work in any one semester; half-time members of the staff may not take more than ten semester hours.

Filing of Application for Degree

Candidates for degrees to be conferred in June file with the Registrar, on a form provided for the purpose, on or before April 15, a written notice of their candidacy; candidates for degrees to be conferred in October file a similar notice on or before September

10. Failure to file such notice by the dates mentioned bars the candidate from receiving the degree at the ensuing graduation exercises.

Chemistry Breakage

For University regulations on breakage, see page 52.

DEGREES

In addition to the general regulations set forth below, more detailed instruction for procedures may be obtained from the Office of the Graduate School.

Students desiring to qualify for graduate degrees in the minimum time should have pursued an undergraduate major in the subject equivalent to that offered at Lehigh. At the discretion of the head of the department, a limited number of credits in closely allied subjects may be accepted in lieu of courses in the undergraduate major. Those with undergraduate deficiencies who are admitted because otherwise well qualified will be expected to make up such deficiencies in addition to satisfying the minimum requirement for the degree sought.

In addition to the degree requirements set forth below, there may be departmental requirements in the field of the major. These requirements appear in the separate departmental statements before the lists of course offerings.

**Master of Arts, Master of Science, and
Master of Business Administration**

The master's degree is granted to properly qualified students who complete satisfactory at least two full semesters of advanced work. In meeting the requirements for the degree, the student must comply with the following regulations:

1. Each candidate for the master's degree must submit for the approval of the Graduate Faculty the program of courses he proposes to take to satisfy the requirements. This program must have the approval of the head of the student's major department, and all courses included which are not offered by the student's major department must also be approved by the heads of the departments concerned. Approval of the program by the Graduate Faculty signifies that the student has formally been admitted to candidacy for the degree.

2. The *minimum* program for the master's degree must include:
 - a. Not less than thirty semester hours of graduate work.
 - b. Not less than twenty-four hours of "300" and "400" level course work of which at least eighteen hours shall be from the "400" group (see page 153 for classification of courses).
 - c. Not less than eighteen hours in the major field.
 - d. Not less than fifteen hours of "400" courses in the major field.
3. The eighteen hours required in the major field are ordinarily taken in one department. Specific exceptions to this rule are mentioned in the departmental statements at the head of course listings. The remaining twelve hours of a *minimum* program, or any part of them, may also be taken in the major department; or they may be taken in any other field in which courses for graduate credit are offered, as the needs or interests of the student may indicate, subject to the approval of the head of the major department. In all cases, the work for the master's degree must be taken under at least two instructors.
4. Graduate students registered in "200" and "300" courses may be assigned additional work at the discretion of the instructor.
5. A thesis may be required by the major department. If required, the thesis shall not count for more than six semester hours. The credit to be allowed shall be fixed by the head of the major department. Two bound typewritten copies of the thesis (one of which shall be an original copy), approved by the faculty members, under whom the work was done and by the head of the major department, shall be placed in the hands of the Dean of the Graduate School at least two weeks before the day on which the degree is to be conferred. Information as to the form in which the thesis must be presented may be obtained from the Office of the Graduate School.
6. The master's degree is not granted unless the candidate has earned the grades A or B in at least eighteen hours of the work on his program and in all "300" courses in his major field. No course in which the grade earned is less than C is credited toward the degree.

7. All work which is to be credited toward a master's degree must be done in actual and regular attendance at Lehigh University.
8. All work on a program for the master's degree must be completed within a six-year period.

When all requirements have been met, the candidate is recommended by the Faculty to the trustees for the master's degree appropriate to the work pursued.

Doctor of Philosophy

The degree of Doctor of Philosophy is conferred on candidates who have demonstrated general proficiency and high attainment in a special field of knowledge and capacity to carry on independent investigation in that field as evidenced by the presentation of an acceptable dissertation embodying the results of original research. The requirements for the degree are more specifically set forth in the following regulations:

1. **TIME REQUIREMENTS.** A candidate ordinarily is expected to devote three or more academic years to resident graduate study. In no case is the degree awarded to one who has spent less than two full academic years in resident graduate work. Study for any specified period of time, however, is not in itself regarded as sufficient ground for the award of the degree.

Graduate work done in residence at other institutions will be accepted in partial fulfillment of the time requirements, provided such work is approved by the Graduate Faculty and by the departments concerned.

Work of fragmentary character scattered over a long period of years, or work completed many years before the student becomes a candidate for the degree is subject to special review by the Graduate Faculty. The extent to which such work may be credited towards the fulfillment of the time requirements will be decided by the Faculty. All work on a program for the Ph.D. degree must be completed within a ten-year period.

2. **RESIDENCE REQUIREMENTS.** A candidate for the degree must complete at least one full academic year of resident graduate study at Lehigh University.

3. **ADMISSION TO CANDIDACY.** Candidates for the doctorate are accepted in a limited number of departments only, and a depart-

ment may limit the number of candidates accepted in any year. In exceptional cases new students may be admitted to candidacy immediately upon registration in the Graduate School. Ordinarily however, they are required to spend at least one semester in residence before they are accepted as candidates. Admission to candidacy is at the discretion of the Graduate Faculty and is granted only upon written application by the student. The applicant must have the endorsement of the departments concerned. The proposed major department may require a qualifying examination. In passing upon a student's application, the Faculty will take into consideration the applicant's general education, as well as his special qualifications for work in his chosen field. Each applicant is notified by the Dean of the Graduate School, in writing, of the action of the Faculty upon his application.

The application of a foreign student must be accompanied by a statement from the department in which he intends to specialize, certifying that he has a satisfactory command of English.

At the time of admission to candidacy a special committee is appointed by the Executive Committee of the Graduate Faculty to direct the work of the candidate.

4. PLAN OF WORK. Preparation for the degree is based on the study of a major subject, to which one or two minors may be added. The program of work, to be formulated by the candidate, his special committee, and the head of his major department, should be planned to lead to a general mastery of the major field and to a significant grasp of any minor that may be added. The program must be approved by the Executive Committee of the Graduate Faculty.

While there is no definite requirement as to the number of courses to be taken, two years devoted to formal courses is the customary minimum. In no instance, however, is the degree awarded merely for the faithful completion of any program of courses.

5. LANGUAGE REQUIREMENTS. The candidate must give evidence, through examinations, of a reading knowledge, sufficient for the purposes of his special studies, of at least two foreign languages (in addition to any language which may constitute his major subject). In each case the required languages are designated by the candidate's major department and approved by the Graduate Faculty. The language requirements must be satisfied before the

student presents himself for the general examination, described below.

Language examinations are in charge of a committee consisting of representatives of the language department concerned and of the candidate's major department.

Permission to take the language examinations does not imply admission to candidacy for the degree.

6. GENERAL EXAMINATION. The general examination for the doctorate is designed to test both the student's capacity and his proficiency in his field of study. The examination is not necessarily confined to the content of courses that have been taken at Lehigh University or elsewhere. It is held ordinarily not earlier than toward the close of the second year of work, nor later than seven months prior to the time when the candidate plans to receive the degree. The student's special committee is in charge of the examination, which may be both written and oral.

The Dean of the Graduate School should be notified in advance when the general examination has been scheduled by the candidate's department head. No student is permitted to take this examination who has not been admitted to candidacy for the doctorate or who has not satisfied the language requirements.

Should a candidate fail in the general examination, he may be permitted by the Graduate Faculty to present himself for a second examination not earlier than five months after the first. If the results of the second trial are also unsatisfactory, no further examination is set.

7. DISSERTATION. The candidate is required to present a dissertation prepared under the general direction of a professor at Lehigh University. The dissertation shall treat a topic related to the candidate's major subject, embody the results of original research, give evidence of high scholarship, and constitute a contribution to knowledge. It must be approved by the professor under whose direction it was written, by the candidate's special committee, and by the Graduate Faculty. A copy bearing the written approval of the professor in charge must be presented to the Dean of the Graduate School for transmission to the student's special committee not later than May 1, if the degree is to be conferred in June, not later than September 1, if the degree is to be conferred in October.

The candidate shall deposit with the Dean of the Graduate School, at least one week before the degree is to be conferred, (1) the original typescript of the accepted dissertation, unbound, in standard form, and suitable for microfilming; (2) the first carbon copy of the accepted dissertation in standard form and binding; (3) two copies of an abstract, not exceeding 600 words, of the dissertation; (4) a receipt from the Bursar for the payment of the publication fee of twenty-five dollars (\$25.00); (5) a suitably executed microfilming agreement. The publication fee is used by the University to defray the cost of publishing the dissertation on microfilm (through University Microfilms) and the abstract in *Dissertation Abstracts*. If the candidate wishes to copyright his dissertation, he may do so by paying the copyright fee of ten dollars (\$10.00) to the Bursar at the time the publication fee is paid. Arrangements for copyright in the author's name will then be made by the University through University Microfilm.

8. FINAL EXAMINATION. After the dissertation has been accepted by his special committee, the candidate will be examined orally by the officers of professional rank in the departments concerned and such other persons as may be selected by the candidate's special committee.

9. CONFERRING OF DEGREE IN ABSENTIA. The degree of Doctor of Philosophy will not be conferred in absentia unless the candidate is excused by the President of the University.

Professional Degrees

Applications for professional degrees are no longer accepted and no such degrees will be conferred after the June, 1960 Commencement.

Postdoctoral Work

Students who have completed the requirements for the doctorate may enroll for postdoctoral individualized study under the guidance of selected members of the faculty. Such a program of study contemplates a broad educational and research development at advanced and matured levels, and provides opportunities to prepare for specific positions. A formal certification of such work as may be accomplished by the student will be made.

Miscellaneous Regulations

The normal roster of a full-time graduate student is fifteen semester hours. Larger rosters may be taken only on the specific approval of the Graduate Faculty, and such approval may be expected only under exceptional circumstances. Graduate students who are employed elsewhere and can give only part of their time to graduate work should restrict the size of their rosters accordingly.

Graduate students who hold University appointments of any kind are permitted to enroll for only a limited amount of graduate work. Full-time employees of the University may not take more than six semester hours of graduate work in any one semester; half-time employees may not take more than ten semester hours.

With the consent of the head of his major department and of the head of the department concerned, a graduate student may be admitted as a regular listener in one or more courses, which course or courses shall be outside his approved program of studies for the degree; provided that the total number of hours in which he is registered and in which he is a listener shall not exceed the limits above set forth for employees of the University. In no case shall a student who has attended a course as a listener be given an examination for credit in that course. A listener's fee is charged for each course audited.

Evening Classes and Summer Session

For the benefit of graduate students who, by reason of employment in the fields of teaching or industry, cannot attend classes during the day, a certain number of courses are generally offered in the evening and on Saturday morning. It cannot be announced in advance which courses these will be; but a student who is interested may receive the necessary information by communicating, before the beginning of each semester, with the head of the department in the field in which he is interested. During the 1956-1957 academic year evening and Saturday classes are held in accounting, chemical engineering, civil engineering, economics, education, English, government, history, industrial engineering, international relations, mechanical engineering, metallurgy and psychology. It is expected that in the future such courses will be offered in additional subjects as the demand warrants.

The University offers each summer a limited number of courses which may be taken for graduate credit. The courses offered vary from year to year. Information as to the offerings for any particular year may be obtained by writing to the Director of the Summer Session for the Summer Session Announcement.

Description of Courses

Description of Courses

Following is a list of undergraduate and graduate courses offered by Lehigh University. For purposes of record, all approved courses are listed. It must be understood, however, that the offerings in any given semester are contingent upon a number of factors, including student needs as determined at the time of pre-registration.

Credit Hours

The number in parentheses following each course title indicates the credit value of the course in terms of semester hours. Three hours of drawing, of work in the laboratory, or of practice in the field are regarded as the equivalent of a recitation or lecture of one hour's duration.

Course Numbering

Courses are numbered according to the following system:

- 0-99 Undergraduate courses, primarily for underclassmen.
Not available for graduate credit.
- 100-199 Advanced undergraduate courses. Not open to freshmen and sophomores except on petition. Not available for graduate credit.
- 200-299 Courses open to advanced undergraduates and graduates. Not available for graduate credit in the major field.
- 300-399 Courses open to advanced undergraduates and graduates. Available for graduate credit in the major field.
- 400-499 Courses open to graduate students only.

Prerequisites

Academic preparation required for admission to courses is indicated under "Prerequisites" following course descriptions, stated in most cases, for purposes of convenience, in terms of Lehigh courses. Status required for admission, where numbering does not fully describe this status, is also indicated under "Prerequisites."

A student who does not have the status or the academic preparation set forth as prerequisites must, in order to be admitted to a course, file with the Registrar, at the time of registration and on a standard form provided by the Registrar a waiver of prerequisites signed by the instructor teaching or in charge of the course, the head of the teaching department, and the student's curriculum

director. Academic work completed elsewhere must be attested in this manner as being substantially equivalent to prerequisites listed, unless the student's records in the Office of the Registrar show that the proper officers have so evaluated this preparation previously.

ACCOUNTING

Professors Allen and Bratt

Associate Professors Koch and Moore

Assistant Professors Bourque, Kubelius and Wert

Messrs. Brady, Hessler and Serfass

ACCOUNTING

Acctg. 1. Accounting (3)

The elementary principles of accounting, with problem work to develop a knowledge of accounting method and practice. Financial statements and their preparation, analysis and recording of transactions, journalizing and posting, use of special ledgers and journals, adjusting and closing accounts. First and second semesters.

Acctg. 2. Accounting (3)

Elementary accounting problems peculiar to proprietorships, partnerships, and corporations; manufacturing enterprises; depreciation; and a more detailed consideration of financial statements than is possible in Acctg. 1. *Prerequisite: Acctg. 1.* First and second semesters.

Acctg. 13. Intermediate Accounting (3)

Problems of the balance sheet, its form and content. The nature of assets, liabilities, and capital stock. Criteria of income and the matching of income and expense. Statement analysis. *Prerequisite: Acctg. 2.* First semester.

Acctg. 14. Intermediate Accounting (3)

A continuation of Acctg. 13. *Prerequisite: Acctg. 13.* Second semester.

Acctg. 104. Accounting for Engineers (3)

An intensive course in the principles and practices of accounting, covering the fundamentals in one semester. Especially designed for engineering students. First and second semesters.

Acctg. 106. Cost Accounting for Engineers (3)

A one semester course in cost finding and cost analysis, designed especially for engineering students. Cost elements, costing methods, and the use of cost data for purpose of cost control. *Prerequisite: Acctg. 2 or 104.* Second semester.

Acctg. 115. Cost Accounting (3)

The principles and methods used to determine unit costs of product or services. Material, labor, and overhead costs, methods of distributing overhead, and the application of cost principles to job order and process production. *Prerequisite: Acctg. 2 or 104.* First semester.

For Advanced Undergraduates and Graduates

Acctg. 203. Federal Tax Accounting (3)

The most recent revenue acts; procedures in using the law and regulations to determine the amount of the tax liability for individuals, partnerships, trusts, and corporations. *Prerequisite: Acctg. 2 or 104.* First semester.

Mr. Koch

Acctg. 204. Federal Tax Accounting (3)

A continuation of Acctg. 203. *Prerequisite: Acctg. 203.* Second semester.

Mr. Koch

Acctg. 218. Advanced Cost Accounting (3)

Special cost problems such as: standard costs, distribution costs, joint costs. The managerial use of cost data, control of cost, and design of cost accounting systems. *Prerequisite: Acctg. 115 or Acctg. 106.* Second semester.

Mr. Koch

Acctg. 219. Specialized Accounting Systems (3)

Charts of accounts and the adoption of accounting principles to business enterprises in various industries. *Prerequisite: Acctg. 115 and 13.* First semester

Mr. Hassler

Acctg. 304. Governmental and Institutional Accounting (3)

Application of accounting principles and procedures to problems of budgets, appropriations, and funds in governmental units, educational institutions and hospitals. *Prerequisite: Acctg. 14.* Second semester.

Mr. Moore

Acctg. 315. Advanced Accounting (3)

Problems of partnerships, branches and agencies, consignments and installment sales, consolidations and mergers. Accounting for estates, trusts, and insolvent concerns. Second semester. *Prerequisite: Acctg. 14.*

Mr. Moore

Acctg. 320. Auditing (3)

The different types of audits and special investigations. Problems involving audit principles and procedure; methods of detecting and preventing fraud; the writing of audit reports; the ethics and the legal responsibilities of accountants. *Prerequisite: Acctg. 14.* First semester.

Mr. Moore

Acctg. 371. Readings in Accounting (3)

An unrostered course designed for students having special interest in some phase of accounting not covered by the rostered courses. The study

may be in the history of accounting, accounting theory, municipal or public utility accounts, or any special subject approved by the instructor. *Prerequisite: consent of the head of the department.* First and second semesters. Messrs. Allen, Koch, Moore, Wert

ECONOMIC STATISTICS

E.S. 45. Statistical Method (3)

The methods of statistical description and induction, including tabular and graphic analysis and presentation. *Prerequisite: Eco. 3.* First and second semesters. Mr. Bourque

For Advanced Undergraduates and Graduates

E.S. 346. Business Cycles and Forecasting (3)

The nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. *Prerequisite: E.S. 45 or approved equivalent.* First and second semesters. Mr. Bratt

E.S. 347. National Income Analysis (3)

Analysis of income and product aggregates from the point of view of development and structural breakdown, emphasizing sector accounts, saving and investment. *Prerequisite: E.S. 346.* First semester. Mr. Bratt

E.S. 348. Advanced Business Cycles (3)

Recent business cycle theories; the evolution of the theories, and the problems of economic change which the theories attempt to explain. *Prerequisite: E.S. 346. Second semester.* Mr. Bratt

E.S. 352. Advanced Statistical Method (3)

Sampling and correlation methods employed in industry and government. *Prerequisite: E.S. 45 or approved equivalent.* Given in alternate years. First semester. Mr. Bratt

E.S. 353. Time Series Analysis (3)

Statistical measurement of economic change. *Prerequisite: E.S. 346.* Given in alternate years. First semester. Mr. Bratt

E.S. 371. Readings in Economic Statistics (3)

An unrostered course designed for students with special interests in some field of economic change or economic forecasting. *Prerequisite: E.S. 346 and consent of the head of the department.* First semester. Mr. Bratt

E.S. 372. Readings in Economic Statistics (3)

Continuation of E.S. 371, *Prerequisite: E.S. 346 and consent of the head of the department.* Second semester. Mr. Bratt

For graduate program see Business Administration

B I O L O G Y

L A W

Law 1. Business Law (3)

The law of contracts and bankruptcy, agency bailments and sales. First semester.

Law 102. Business Law (3)

The law of negotiable instruments, partnership, corporations, real property, insurance, and security devices. *Prerequisite: Law 1.* Second semester.

Mr. Kubelius

Law 103. Business Law for Engineers (3)

The law of contracts, agency, partnerships, corporations, and property rights with special emphasis upon the legal problems of the engineering profession. First semester.

Mr. Kubelius

Law 204. Wills, Estates, and Trusts (3)

A study of the basic legal and management principles and practices involved in the planning and administration of wills, estates, and trusts. Second semester. *Prerequisite: Law 1 or Law 103.*

Mr. Kubelius

A S T R O N O M Y

See Mathematics and Astronomy

A T H L E T I C S

See Division of Athletics and Physical Education

B I O L O G Y

Professors Parker and Trembley

Associate Professors Owen and Grainger

Assistant Professors Ritter, Barber

No student may take for credit more than one of the following courses: Biol. 1. Biology (3); Biol. 13. Human Biology (3); Biol. 33 and 34. Biology and Organic Evolution (6).

Biol. 1. Biology (3)

General distribution requirement for arts students who do not intend to major in biology. A general course in biological types and principles. Two lectures and one laboratory period per week. First semester.

Biol. 3. Comparative Vertebrate Anatomy (3)

A course in vertebrate zoology with emphasis on the study of homologous body structures in the various vertebrate classes and their relationship to the functional demands of habit and environment in each class. Detailed dissections of representative vertebrates are made in the laboratory. One lecture and two laboratory periods each week. *Prerequisite: One semester of zoology with laboratory.* First semester.

Biol. 4. Vertebrate Embryology (3)

A study of reproduction from germ cell formation through establishment of the principal organ systems of the vertebrate body. Various mechanical and physiological problems confronting the growing embryo are considered, and direct observation of whole-mounts, sections and living material are made in the laboratory. Two lectures and one laboratory period each week. *Prerequisite: One semester of zoology with laboratory; Biol. 3. Second semester.*

Biol. 6. Botany (3)

Fundamentals of the morphology and physiology of plants. The evolutionary development of the plant kingdom. Two lectures and one laboratory period per week. Field trips in the spring. Second semester.

Biol. 13. Human Biology (3)

A lecture course in biological principles as illustrated by man. Man in relation to his environment, the organ systems of man, population biology, parasitism, elements of human inheritance and human evolution. First and second semesters.

Biol. 18. Genetics (2)

A study of the basic laws governing inheritance in plants and animals, chromosome behaviour, nature of genes. The relation of environmental modifications, hybrid variation, and mutations to the mechanics of evolution. First semester.

Biol. 31. Zoology (3)

A foundation course for majors in biology. Living things are studied from a functional rather than a purely morphological viewpoint. Protoplasm, cellular metabolism, reproduction, and other fundamental conceptions of life-processes. Lectures and laboratory. First semester.

Biol. 32. Zoology (3)

A continuation of Biol. 31. *Prerequisite: Biology 31 or consent of instructor.* Second semester.

Biol. 33. Biology and Organic Evolution (3)

A lecture and recitation course in animal biology with special reference to man. A survey of the lower forms of life and their evolution; the biology of the individual and of populations; genetics and human evolution. First semester.

Biol. 34. Biology and Organic Evolution (3)

A continuation of Biol. 33. Second semester.

Biol. 36. Economic Botany (3)

Economic products of plant origin from the point of view of their development, structural characteristics, uses, and sources. Two recitations and one laboratory period per week. First semester.

Biol. 50. Sanitary Bacteriology (3)

Study of bacteria and allied microorganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water, milk, and sewage. Lectures, recitations, and laboratory. Second semester.

Biol. 61. Bacteriology (3)

An elementary course for students specializing in biological sciences. Special staining methods in the study of morphology; differential media in bacterial physiology; thorough study of staining, cultural and biochemical properties of the microorganisms themselves rather than their specific sanitary or industrial importance. Recitations, lectures, and laboratory work. First semester.

Biol. 162. Advanced Bacteriology (3)

Continuation of Biol. 61. This course will include revelent aspects of medical microbiology and an introduction to immunology as a basic biological phenomenon. *Prerequisites: Biol. 61 or consent of instructor.* Second semester.

For Advanced Undergraduates and Graduates

Biol. 206. Natural History and Ecology (3)

Indentification and life habits of local plants and animals; laboratory training in the use of analytical keys and of collections of reference, and the correct methods of making collections; trips to local regions of natural interest for field identification and study of interrelationships of living organisms; conservation, conservation programs, and appreciation of nature. Two lectures and one field trip per week. Mr. Trembley

Biol. 220. Physiology (3)

Lectures and laboratory work covering the principles underlying the operation of life processes. The subject matter is not limited to any one group of organisms, but is derived from living things in general. *Prerequisite: consent of instructor.* Second semester. Mr. Barber

Biol. 313. Histology (3)

The techniques of preservation and preparation of animal tissues for microscopical study; comparative studies of fresh and preserved vertebrate tissues. One lecture and two laboratory periods per week. *Prerequisite: One semester of vertebrate zoology with laboratory.* Second semester.

Mr. Owen

Biol. 353. Virology (3)

A comprehensive course in the nature of Rickettsiales, Virales and bacterial viruses, dealing with scope, habitat, evolution, taxonomy, physical and chemical properties. *Prerequisite: One semester of bacteriology.* First semester. Mr. Grainger

Biol. 355. Industrial Bacteriology (3)

An advanced laboratory course in bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butanol, acetic, and lactic acids. *Prerequisites: One semester of bacteriology and analytical chemistry.*

Mr. Parker

Biol. 361. Sanitary Microbiology (3)

Laboratory, field work, and reports on the microbiology of water supplies, waste disposal, and food processing. *Prerequisites: One semester each of bacteriology and analytical chemistry.* First or second semester.

Messrs. Grainger and Parker

Biol. 367. History of Microbiology (3)

Classical and contemporary literature, case histories, and the influence of other disciplines. Lectures, conferences, and reports. Second semester.

Mr. Grainger

For Graduates

Prerequisite for graduate work in biology: the amount of biology usually required for an undergraduate major in that department. Prerequisite for graduate work in bacteriology: a satisfactory undergraduate course in bacteriology and sufficient preparation in organic chemistry. Ability to undertake graduate work must be demonstrated by previous scholastic record, and examination, or both.

Biol. 403. Vertebrate Histogenesis and Organogenesis (3)

Careful laboratory work on the development of a vertebrate; tracing of the history of the germ-layers, organs, and tissues; the association of tissues to form organs.

Mr. Owen

Biol. 407. Biological Research (3)

Investigations in any phase of the biological sciences according to the student's preparation and interests. First semester.

Staff

Biol. 408. Biological Research (3)

Continuation of Biol. 407. Second semester.

Staff

Biol. 409. Advanced Morphology (3)

A laboratory course in special phases of morphology, such as comparative osteology, comparative morphology or embryology of the vertebrates, etc., to meet the individual interest of the student.

Mr. Owen

Biol. 410. Topics in Modern Biology (3)

A seminar in Genetics, Evolution, and current developments in Biological sciences.

Staff

Biol. 411. General Cytology (3)

Conference assigned readings, and laboratory work on the structural features of the cell in relation to cellular function and on modern methods of preparing living and fixed tissues for cytological study. *Prerequisite: Biol. 313.* Mr. Owen

Biol. 412. Field Zoology (3)

Methods of biological survey work; animal censuses; collection, preparation, and care of zoological specimens; use of keys; study of the interrelationships existing between the groups of local animals, especially the vertebrates, and of their habitat preferences. Lectures, laboratory work, and field trips. Mr. Trembley

Biol. 413. Problems in Field Zoology (3)

Concentrated work in the life history study of one or more local species. To be taken concurrently with or following Biol. 412, depending upon the previous experience and interest of each student. Mr. Trembley

Biol. 414. Ecology (3)

Conferences and field work with emphasis in such areas as aquatic ecology, limnology, and fisheries biology. Whenever possible this will include participation in research problems conducted by the Water Resources Council of the Lehigh Institute of Research. *Prerequisite: Consent of the instructor.* First and second semesters. Mr. Trembley

Biol. 418. Genetics of Microorganisms (3)

Nature of variation and inheritance in microorganisms. Origin and isolation of mutants. Recombinations, transformation, and transduction, Synergism, antagonism, and resistance. Microbial evolution. *Prerequisite: A course in genetics.* First or second semester.

Messrs. Grainger, Trembley

Biol. 420. Physiology and Biochemistry of Microorganisms (3)

Fundamentals of microbial physiology such as growth, enzymes, nutrition, respiration, and metabolism. The effects of chemical and physical environments. Lectures and laboratory work together with research problems consistent with current interests. *Prerequisite: Chem. 371 or consent of the instructor.* First semester. Mr. Grainger

Biol. 421. Physiology and Biochemistry of Microorganisms (3)

Continuation of Biol. 420 with emphasis on protozoa, algae, and fungi. *Prerequisite: Biol. 420 or consent of the instructor.* Second semester.

Mr. Barber

Biol. 430. Antibiotic Substances (3)

Fundamentals of the interrelationships among microbial populations; preparation and evaluation of penicillin and similar substances. Two lectures and one laboratory period per week. Mr. Parker

Biol. 431. Immuno-Chemistry (3)

Principles of Immunology and experimental aspects of the subject Preparation and standardization of biologicals. Study of antigen-antibody reactions, and immunology of proteins and certain carbohydrates. *Prerequisite: Biol. 162 or consent of the instructors.* First or second semester.

Messrs. Grainger, Benz

Biol. 432. Laboratory Methods in Virology

Basic methods used in the isolation, identification, and handling of viruses. Practical exercises in the preservation of viruses, chick embryo techniques, tissue culture, staining methods, immunological techniques, and microscopy are included. *Prerequisite: Biol. 353.* Second semester.

Mr. Benz

Biol. 440. Bacterial Cytology

Composition of the bacterial cell; the physical, chemical, and biological nature of the cell and the methods used in these studies. *Prerequisite: A course in bacteriology.* First or second semester.

Messrs. Grainger, Owen

Biol. 456. Industrial Mycology (3)

An advanced laboratory course in mycology, including aspects of industrial chemistry in which yeasts and molds play an essential part in the process, such as in the manufacture of industrial alcohol, citric acid, etc.

Mr. Parker

Biol. 462. Microbiology (3)

A recitation and laboratory course in the study of the higher bacteria, yeasts, molds, algae, and protozoa of interest to the micro-biologist.

Mr. Parker

Biol. 464. Epidemiology (3)

A seminar dealing with historic epidemics of typhoids, cholera, plague, diphtheria, and the venereal diseases; the methods of transmission of the organisms concerned with mass infections; modern immunological and sanitary practice in prevention.

Mr. Grainger

Biol. 468. History of Biology (3)

Reading, conferences, and written reports.

Staff

BUSINESS ADMINISTRATION

A candidate who is a graduate, with a major in business administration, of an approved college; and who has had basic courses in accounting, business cycles, business law, corporation finance, economics, labor problems, marketing, money and banking, and statistics, will usually have sufficient background work to enable him to complete the requirements for the M.B.A. degree in one year. For other candidates an additional semester or year devoted to prerequisites and basic courses may be necessary as indicated by the program outlined on the next page.

Fin. 421. Financial Management (3)

A case study of financial management problems of business. Attention is given to the control of current funds, working capital operations, and estimating the need for funds; the problem of long-term capital funds and expansion, and the choice between risk and profitability in the capital structure are also considered. *Prerequisite: Preparation of finance acceptable to the instructor.* Second semester.

Mr. Schwartz

Acctg. 422. Managerial Accounting (3)

Managerial uses of accounting data stressing the importance of proper interpretation, the features of control, and the planning possibilities. Statement analysis, price level adjustments, budgets, cost controls, direct costing, profit planning, and capital equipment replacement will be emphasized. *Prerequisite: Preparation in accounting acceptable to the instructor.* First semester.

Mr. Moore

Eco. 431. Managerial Economics (3)

Problems of business enterprise: Price and output determination analysis of cost and demand functions in markets of various types and under various conditions of general business. Emphasis will be on the application of economic theory to business practice. *Prerequisite: Consent of the instructor.* Second semester.

Mr. Urban

Eco. 433. Labor Management Economics (3)

A study of modern industrial relations: including problems of the labor force, hiring policies, the social aspects of modern industry, collective bargaining practices and policies of management and labor organizations, structure, policy and tactics of contemporary unions, problems and policies of United States labor legislation. *Prerequisite: Consent of the instructor.* First semester.

Mr. Diamond

Fin. 442. The Money Market (3)

A study of the markets for short-term funds in the United States with particular emphasis on the New York markets for bank acceptances, commercial paper, loans to brokers, and U. S. government obligations. The relation of Federal Reserve policy to interest rates and the supply of funds will also receive detailed attention. First semester.

Mr. Bradford

Eco. 450. Marketing Management (3)

A study of the factors affecting consumer demand and methods of satisfying it; the structure of the market; marketing methods and problems of various agencies; competitive practices; the management of the selling activities of a business, distribution policies, pricing, and the planning of marketing operation. Second semester.

Messrs. Snider and Walters

E.S. 454. Forecasting (3)

The problem of predicting cyclical changes and long-term prospects for growth is of vital importance in most lines of business today. It is desirable that business men in managerial positions have some knowledge of the basic methods used in arriving at such predictions. This course provides a study of the methods of business forecasting with special attention to secular and cyclical forecasting. *Prerequisite: E. S. 347.* Second semester.

Mr. Bratt

Eco. 490. Thesis in Business Administration (6)

Subjects for theses may be in the fields of accounting, economics, economic statistics, finance or marketing. First and second semester. Staff

All of the above courses except the thesis will normally be required of all candidates for the M.B.A. degree. In addition, Eco. 306 and E.S. 347 and 348 (see pp. 93 and 94 for description of these courses) will usually comprise the remaining 9 credit hours required for the degree. The selection of Eco. 490, Thesis in Business Administration (6 credit hours) is optional with the student. If the thesis is selected, it will be substituted for six hours of required courses in consultation with the director of the graduate program. A comprehensive examination will be required of all candidates for the M.B.A. degree.

**Program for Graduate Students in Business Administration
Who Lack Background Work in Economics and Business**

FIRST YEAR

Eco.	3.	Principles of Economics.....	(3)
Fin.	125.	Principles of Corporation Finance.....	(3)
Law	1.	Business Law.....	(3)
Acctg.	104.	Accounting for Engineers.....	(3)
E.S.	45.	Statistical Method	(3)
Fin.	133.	Money and Banking	(3)
Eco.	11.	Marketing	(3)
E.S.	346.	Business Cycles	(3)
Acctg.	106.	Cost Accounting for Engineers.....	(3)
Eco.	306.	Intermediate Economics	(3)
		or	
Fin.	326.	Problems in Corporation Finance.....	(3)

SECOND YEAR

Fin.	421.	Financial Management	(3)
Eco.	431.	Managerial Economics	(3)
Eco.	433.	Labor Management Economics.....	(3)
E.S.	347.	National Income Analysis	(3)
Eco.	490.	Thesis (6) or approved 300 or 400 courses	
Acctg.	422.	Managerial Accounting.....	(3)
Fin.	442	The Money Market.....	(3)
Eco.	450.	Marketing Management	(3)
E.E.	348.	Advanced Business Cycles.....	(3)
E.S.	454.	Forecasting	(3)

Students who have had some, but not all, of the background work listed in First Year (above), may have their programs adjusted accordingly.

Of the courses listed in First Year (above), Eco. 3, Fin. 125, Acctg. 104, Fin. 133, Eco. 11, and Eco. 306 are normally offered in the summer session. A total of 12 hours credit may be acquired by attending both 6 weeks summer sessions.

It is planned to offer these preparatory First Year courses in a cycle of two each semester on an evening schedule. The evening courses planned for the 1957-58 academic year are: Fin. 125 and 133; Acct. 104 and 106.

Additional information may be obtained by writing to Professor F. A. Bradford, Chairman, Graduate Committee, College of Business Administration.

For additional graduate courses in Business Administration, see Accounting, Economics and Sociology, and Finance.

C H E M I C A L E N G I N E E R I N G

Professor Foust

Associate Professors Maus and Wenzel

Assistant Professors L. B. Andersen and Clump

Mr. Hillegass

Ch. 70. Industrial Stoichiometry (3)

Chemical and physical calculations upon which energy and material balances are based, and application of these balances to various industrial processes, involving vaporization and condensation, fuels and combustion. Applications are picked from a wide variety of chemical processes. *Prerequisites: Math. 13; Chem. 35; Phys. 23, previously or concurrently. Second semester.*

Ch.E. 100. Industrial Employment (0)

During the summer following the junior year candidates for the degree of B.S. in Chemical Engineering are required to obtain industrial experience through employment for at least eight weeks in a plant or laboratory, or engineering office.

Ch.E. 162. Unit Operations in Metallurgy (2)

Introduction to fluid flow, heat transfer, and separation operations as they enter into process metallurgy. *Prerequisites: Met. E. 1, and Physics 23 previously or concurrently. Fall semester.*

Ch.E. 171. Unit Operations I (3)

A study of the fundamentals of materials-handling including size reduction and separation of solids, and transportation thereof. Principles of fluid flow, including classification, sedimentation, flow measurements, flow thru pipes, flow thru packed beds, filtration, centrifugation and fluidization; and introduction to the equilibrium stage operations of chemical engineering. *Prerequisite: Ch.E. 70. First semester.*

Ch.E. 172. Unit Operations II (3)

A continuation of Ch.E. 171, through the equilibrium stage operations of solid-liquid extraction, liquid-liquid extraction and distillation, and into the rate operations of heat transfer. Three lectures. *Prerequisite: Ch.E. 171. Second semester.*

Ch.E. 173. Unit Operations III (2)

A continuation of Ch.E. 172. A study of those operations controlled by the rate of heat and mass transfer. These include heat transfer, evaporation, crystallization, drying, gas absorption and humidification. Two lectures. *Prerequisite: Ch.E. 172. First semester.*

Ch.E. 174. Plant and Equipment Design (3)

A study of codes and specifications, safety and fire protection, water supply, transportation, service facilities and other factors affecting the location and layout of plants and the design of process equipment. *Prerequisite: Ch.E. 172. Second semester.*

Ch.E. 175. Chemical Engineering Practice (1)

Comprehensive studies in nearby manufacturing plants of processes involving one or more unit operations. *Prerequisite: Senior standing. Second semester.*

Ch.E. 176. Chemical Engineering Projects (2)

Special study of a particular problem involving laboratory and library work. Topics include equipment design, construction and testing; research in unit operations, unit processes, thermodynamics and kinetics; data correlation. Weekly conferences and reports. *Prerequisite: Ch.E. 173 previously or concurrently. First and second semesters.* Staff

Ch.E. 177. Unit Operations Laboratory (2)

One six-hour period per week. *Prerequisite: Ch.E. 173, previously or concurrently. First and second semesters.*

For Advanced Undergraduates and Graduates

Ch.E. 200. Chemical Engineering Thermodynamics (3)

Energy relations and their application to chemical engineering. Consideration of flow and non-flow processes, evaluation of the effect of temperature and pressure on thermodynamic properties of ideal and actual fluids; prediction of the heat effects accompanying phase changes and chemical reactions; application to industrial processes. *Prerequisites: Ch.E. 70, Chem. 94, or equivalents. Second semester.*

Ch.E. 260. Engineering in Chemical Manufacturing (3)

A survey of operations and equipment common to chemical production, planned to acquaint non-chemical engineers with the procedures of chemi-

cal manufacturing, primarily in continuous processes. *Prerequisites: Chem. 36; Math. 12 or consent of the instructor.* Second semester.

Ch.E. 261. Applied Chemical Calculations (3)

This course is planned for those students majoring in Chemistry who contemplate an industrial career in chemical manufacturing. It treats the stoichiometry of industrial systems, thermodynamics of real fluids and the kinetics of constant pressure flow reactors. *Prerequisite: Chem. 190.* First semester.

Ch.E. 301. Process Design (3)

Technical and economic study of selected or proposed chemical processes. Flow diagrams, heat and energy balances, apparatus design, cost estimation; approximation methods for obtaining data. Lectures, discussions, comprehensive reports. The annual A.I. Ch.E. Contest Problem may be used as a part of the course requirements. *Prerequisite: Ch.E. 173.* Second semester.

Ch.E. 302. Chemical Engineering Kinetics (3)

The application of chemical kinetics to the design and operation of reactors. Interrelations of kinetics, thermodynamics and unit operations in steady and unsteady states. *Prerequisites: Ch.E. 173 previously or concurrently and Ch.E. 200; basic courses in chemical engineering.* First semester.

Ch.E. 386. Chemical Engineering Process Control (3)

A study of the fundamentals of primary sensing elements and their application to the measurement, recording, and control of temperature, pressure, concentration, humidity, fluid flow rate, and other variables; discussion of telemetering systems, electronic and mechanical recording systems, pneumatic and electromatic indicating and controlling elements. *Prerequisite: senior standing in a curriculum of the Engineering College, or consent of the instructor.* First semester.

Ch.E. 390. Nuclear Reactor Engineering (3)

A consideration of the engineering problems in nuclear reactor design and operation. Topics include instrumentation and control, reactor fuels and materials, thermal aspects, radiation protection and shielding, fuel processing, and reactor design. *Prerequisites: Phys. 266; and Phys. 367 previously or concurrently.*

For Graduates

Ch.E. 400. Chemical Engineering Thermodynamics I (3)

Applications of thermodynamics in Chemical Engineering. Topics include prediction of physical and chemical equilibria, heat effects accompanying solution, flow of compressible fluids, refrigeration including solution cycles, vaporization and condensation processes. *Prerequisite: An introductory course in thermodynamics.* First semester. Mr. Wenzel

Ch.E. 401. Chemical Engineering Thermodynamics II (3)

A study of the methods available for estimating and correlating the thermodynamic properties of non-ideal fluids. Application of these properties to prediction of phase and reaction equilibria in the fields of azeotropic and extractive distillation, liquid-liquid extraction, gas absorption, and chemical reactor design. *Prerequisite: Ch.E. 400.* Second semester, alternate years.

Mr. Wenzel

Ch.E. 410. Chemical Engineering Kinetics (3)

A continuation of Ch.E. 302. The application of chemical kinetics to the engineering design and operation of reactors. *Prerequisite: Ch.E. 302.* Second semester, alternate years.

Mr. Maus

Ch.E. 420. Heat and Momentum Transfer (3)

Heat and momentum transfer by molecular and eddy mechanisms in the steady state. Analogies between momentum, heat, and mass transfer. Transient heat transfer. Radiation, vaporization, and condensation. Heat transfer in high velocity flow and flow of rarified gases. Applications. First semester.

Mr. Foust

Ch.E. 430. Mass Transfer I (3)

Molecular and turbulent diffusion theory. Review of equilibrium stage and continuous contact equipment for the mass transfer operations. Introductory multicomponent distillation and absorption. Second semester.

Mr. Andersen

Ch.E. 431. Mass Transfer II (3)

Multicomponent distillation and absorption, azeotropic and extractive distillation. *Prerequisite: Ch.E. 430.* First semester, alternate years.

Messrs. Andersen, Clump

Ch.E. 435. Simultaneous Heat and Mass Transfer (3)

Unit Operations involving simultaneous heat and mass transfer. Emphasis on drying, humidification, dehumidification, and condensation in the presence of non-condensable gases. First semester, alternate years.

Mr. Clump

Ch.E. 440. Process Design (3)

Application of chemical engineering principles to the design of chemical processes. Second semester, alternate years.

Mr. Foust

Ch.E. 450. Special Topics (3-12)

An intensive study of some field of chemical engineering not covered in the more general courses. Credit above 3 hours is granted only when different material is covered.

Staff

Ch.E. 455. Seminar (1-3)

Critical discussion of recent advances in chemical engineering. Credit above 1 hour is granted only when different material is covered.

Staff

C H E M I S T R Y

Ch.E. 480. Research (3-4)

Investigation of a problem in chemical engineering. First semester.

Staff

Ch.E. 481. Research (3-4)

Continuation of Ch.E. 480. Second semester.

Staff

CHEMISTRY

Professors Serfass, H. V. Anderson

Amstutz, Zettlemoyer

Associate Professors Billinger, Fish

Assistant Professors Brownell, Rouse, Sturm

Associate Research Professor R. R. Myers

Assistant Research Professors Stubbings, Chessick

Messrs. Collier, Houseknecht, Dignan, Bright, Tyler, Davis,

Kulp, Shultz, Wightman, Schmauch,

Bellissio, Gregorek, Gonis, Laufer, Petfield

Chem. 4. General Chemistry (4)

The principles and applications of general chemistry; descriptive chemistry of the non-metals and their important compounds. One demonstration lecture, two recitations, one laboratory period. First and second semesters.

Mr. Serfass and Staff

Chem. 5. General Chemistry (4)

Continuation of Chem. 4. Principles and applications of general chemistry; descriptive chemistry of the metals and their compounds. One demonstration lecture, two recitations, one laboratory period. *Prerequisite: Chem. 4.* First and second semesters.

Mr. Serfass and Staff

Chem. 15. Elementary Chemistry (3)

An abridgment of Chem. 4. For students not majoring in science or engineering. Two lecture-recitations, one laboratory period. First semester.

Mr. Anderson

Chem. 16. Elementary Chemistry (3)

Continuation of Chem. 15; an abridgment of Chem. 5. Two lecture-recitations, one laboratory period. *Prerequisite: Chem. 15 or Chem. 4.* Second semester.

Mr. Anderson

Chem. 35. Analytical Chemistry (4)

Theory and practice of qualitative and quantitative analysis. Qualitative analysis by semi-micro methods; gravimetric and volumetric quantitative procedures. One lecture, three laboratory periods. *Prerequisites: Chem. 4 and 5.* First semester.

Mr. Fish

Chem. 36. Analytical Chemistry (4)

Continuation of Chem. 35. Volumetric precipitation procedures; oxidation-reduction titrations; electrolytic and electrometric methods of analysis. One lecture, three laboratory periods. *Prerequisites: Chem. 4 and 5, Chem. 35.* Second semester. Mr. Fish

Chem. 38. Analytical Chemistry (3)

An abridgment of Chem. 35 for mining and metallurgical engineers. One lecture, two laboratory periods. *Prerequisites: Chem. 4 and 5.* First semester. Mr. Fish

Chem. 91. Physical Chemistry (3)

Introduction to physical chemistry; states of matter, change of state, solutions, surface phenomena; nuclear, atomic, and molecular structure. *Prerequisites: Chem. 4 and 5; Math. 13, previously or concurrently.* First semester. Messrs. Sturm, Zettlemoyer

Chem. 92. Physical Chemistry Laboratory (1)

Physical chemical measurements. To accompany Chem. 91. *Prerequisites: Chem. 35 or 38; Phys. 22; Math. 13, previously or concurrently.* First semester. Mr. Sturm

Chem. 93. Elements of Physical Chemistry (3)

Kinetic theory, change of state, solutions, equilibria, electrochemistry, colloidal phenomena. Especially designed for biology majors. *Prerequisites: Chem. 4 and 5.* First semester. Mr. Brownell

Chem. 94. Physical Chemistry (3)

Designed especially for engineering students with a working knowledge of the perfect gas laws. A study of states of matter, change of state, solutions, surface phenomena; nuclear, atomic and molecular structure. Introduction to thermochemistry. *Prerequisite: Ch.E. 70 or equivalent.* First semester. Mr. Sturm

Chem. 100. Industrial Employment

During the summer following the junior year candidates for the degree of B.S. in Chemistry are required to obtain industrial experience through employment for at least eight weeks in a plant or laboratory. Proposed employment must be approved in advance by the Director of the Curriculum, and a report covering this experience must be presented to him on or before the following January 8. Staff

Chem. 150. Organic Chemistry (3)

Systematic survey of the typical compounds of carbon, their classification and general relations; study of synthetic reactions. *Prerequisites: Chem. 5 and 35.* First semester. Mr. Amstutz

Chem. 151. Organic Chemistry (3)

Continuation of Chem. 150. *Prerequisite: Chem. 150.* Second semester.
Mr. Amstutz

Chem. 165. Organic Chemistry Laboratory (2)

Preparation of pure organic compounds. *Prerequisites: Chem. 5; Chem. 35.* First semester.
Messrs. Amstutz, Brownell, Rouse

Chem. 167. Organic Chemistry Laboratory (2)

Continuation of Chem. 165 with particular emphasis upon aromatic compounds. *Prerequisite: Chem. 165.* Second semester.
Messrs. Amstutz, Brownell, Rouse

Chem. 175. Research Chemistry Laboratory (3)

Advanced study or an investigation involving intensive work in laboratory and library. Topics in active research include absorption, analytical processes, drying oils, industrial chemical processes, heterocyclic organic compounds, hydration of inorganic salts, kinetics of combustion, photomicrography, natural and synthetic resins, pigments, aldol syntheses, plastics, surface chemistry, tanning and leather technology, and X-ray technique. Second semester.
Staff

Chem. 179. Literature of Chemistry and Chemical Engineering (1)

A systematic study of the reference books, journals, and general treatise with training in the use of the Library. Chronological development of the science with assigned reading and reports. Second semester.
Mr. Billinger

Chem. 190. Physical Chemistry (3)

Continuation of Chem. 91. Study of the laws of thermochemistry, solutions, rates of reaction, and chemical equilibrium in homogeneous and heterogeneous systems based on thermodynamic and kinetic concepts. *Prerequisites: Math. 13, Chem. 91.* Second semester.
Messrs. Zettlemoyer, Sturm

Chem. 191. Physical Chemistry (3)

Continuation of Chem. 94. Study of the laws of thermochemistry solutions, rates of reaction and chemical equilibrium in homogeneous and heterogeneous systems based on thermodynamics and kinetic concepts. The laws of conductivity, current, electromotive force and energy relations of electrolytes in solutions. *Prerequisite: Chem. 94.* Second semester.
Mr. Sturm

Chem. 192. Physical Chemistry Laboratory (1)

Continuation of Chem. 92. *Prerequisites: Chem. 91, Phys. 23; Chem. 92.* Second semester.
Mr. Sturm

Chem. 194. Physical Chemistry and Electrochemistry (3)

Continuation of Chem. 190. The laws of conductivity, current electromotive force and energy relations of electrolytes in solutions and in the molten state. *Prerequisites: Math. 13, Chem. 190.* First semester.
Messrs. Zettlemoyer, Sturm

Chem. 197. Electrochemistry Laboratory (1)

Experimental study of electrochemical reactions. Measurements of conductivity, current and electromotive force. *Prerequisites: Chem. 194, previously or concurrently; Chem. 190.* First semester. Mr. Sturm

For Advanced Undergraduates and Graduates

Chem. 302. Inorganic Chemistry (3)

Introductory consideration of chemical bonding, family relationships among the elements; systematic survey of inorganic chemical compounds their occurrence, properties, and reactions. *Prerequisite: eight hours of general chemistry.* First semester. Mr. Myers

Chem. 303. Nuclear and Radiochemistry (3)

An introductory survey of nuclear structure, the production and detection of radioactivity, and practical problems in the control of nuclear chain reactions. Stable and radioactive isotopes and their use as tracers in chemical investigations. *Prerequisite: three hours of physical chemistry.* Second semester. Mr. Sturm

Chem. 304. Radiochemistry Laboratory (1)

Laboratory practice in the handling and measurement of radioactive isotopes, and the use of isotopes in chemical investigations. *Prerequisites: prior or concurrent registration in Chemistry 303 and consent of instructor.* Spring term. Mr. Sturm

Chem. 334. Radiation Methods (2)

The application of radiation methods, mainly X-ray methods, to chemical and industrial chemical problems. *Prerequisite: Consent of instructor.* First semester. Mr. Anderson

Chem. 335. Radiation Methods (2)

Continuation of Chem. 334. Amplification of X-ray diffraction methods; space groups; crystal chemistry. *Prerequisite: Chem. 334.* Second semester. Mr. Anderson

Chem. 337. Advanced Analytical Chemistry (3)

One conference and two laboratory periods per week. *Prerequisite: eight hours of analytical chemistry.* Second semester. Messrs. Serfass, Fish

Chem. 339. Advanced Analytical Chemistry (2)

Similar to Chem. 357. Lecture and conference only. *Prerequisite: eight hours of analytical chemistry.* Messrs. Serfass, Fish

Chem. 344. Radiation Methods Laboratory (1)

Laboratory in connection with Chem. 334. *Prerequisite: Consent of instructor.* First semester. Mr. Anderson

Chem. 345. Radiation Methods Laboratory (1)

Continuation of Chem. 344. *Prerequisite: Chem. 344.* Second semester.
Mr. Anderson

Chem. 356. Quantitative Organic Analysis (1)

The practice of the common analytical procedures involving the quantitative estimation of carbon, hydrogen, halogen, nitrogen and sulfur; the iodine number method; the hydroxyl value; the acid value, and the saponification number. One laboratory period per week. *Prerequisites: eight hours of analytical chemistry; a course in organic chemistry.* Second semester.

Mr. Fish

Chem. 357. Qualitative Organic Analysis (3)

The theory and practice of the identification of pure organic compounds; preparation of derivatives and separation of mixtures of organic compounds. One lecture and two laboratory periods per week. *Prerequisite: one year of organic chemistry.* First semester.

Mr. Rouse

Chem. 358. Advanced Organic Chemistry (3)

The study of modern theories of reaction mechanisms and their application to the problems of organic chemistry. *Prerequisite: one year of organic chemistry.* Second semester.

Mr. Amstutz

Chem. 368. Advanced Organic Laboratory (2)

The synthesis and study of organic compounds. *Prerequisite: one year of organic chemistry.* First or second semester.

Messrs. Amstutz, Brownell, Rouse

Chem. 371. Elements of Biochemistry (3)

An introduction to the study of carbohydrates, proteins, lipids, minerals and other substances and their importance in life processes. *Prerequisite: one year of organic chemistry.* Second semester.

Mr. Brownell

Chem. 372. Advanced Biochemistry (3)

An intensive study of the chemistry and physics of carbohydrates, proteins and fats with emphasis on modern developments and theories. *Prerequisite: Three semesters of organic chemistry.* Second semester.

Mr. Brownell

For Graduates

The prerequisites for graduate work in chemistry as a major study toward the doctorate or the master's degree are: inorganic or general chemistry (8), analytical chemistry (8), organic chemistry (10), physical chemistry (8), physics (12), and mathematics, including calculus. Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the master's degree within the minimum time.

Chem. 400. Inorganic Chemistry Research (4)

Investigations in the field of inorganic and colloid chemistry. Mr. Myers

Chem. 401. Inorganic Chemistry Research (4)

Continuation of Chem. 400. Second semester. Mr. Myers

Chem. 402. Advanced Inorganic Chemistry (3)

Atomic structure and theories of valence; acid-base theories; study of the properties and reactions of certain elements, with emphasis on recent developments. Second semester. Mr. Myers

Chem. 403. Advanced Topics in Inorganic Chemistry (3)

Subjects of contemporary interest in organic chemistry, including organometallic compounds, metal complexes, co-ordination compounds, and carbonyls; acid-base theory and chemistry in nonaqueous solvents; and modern techniques used in inorganic chemistry. *Prerequisite: Chem. 302 or the equivalent.* First semester. Mr. Myers

Chem. 430. Quantitative Analysis Research (4)

Investigation of problems in analytic procedures. First semester. Messrs. Serfass, Fish

Chem. 431. Quantitative Analysis Research (4)

Continuation of Chem. 430. Second semester. Messrs. Serfass, Fish

Chem. 432. Advanced Analytical Chemistry (3)

Theory of precipitation analysis; physico-chemical methods; micro-analysis; chromatography; organic-analytical reagents; accuracy and precision in analysis. *Prerequisite: eight hours of analytical chemistry.* Second semester. Messrs. Serfass, Fish

Chem. 433. Advanced Topics in Analytical Chemistry (3)

The theory of modern physico-chemical analytical techniques; discussion of optical and electrical instruments for use in research, including mass spectrometry. Raman spectrometry, infra-red and ultraviolet spectrometry, electrometric titrations, polarography, radio-chemical instruments, etc.

Chem. 436. X-ray Research (3)

The investigation of chemical and industrial problems by X-ray diffraction methods. First semester. Mr. Anderson

Chem. 437. X-ray Research (3)

Continuation of Chem. 436. Second semester. Mr. Anderson

Chem. 440. Advanced Physical Chemistry (3)

Definitions and fundamental laws of thermodynamics; statistical thermodynamics; chemical equilibria in homogeneous and heterogeneous sys-

tems; colligative and partial molal properties of solutions; electro-chemistry of solutions. *Prerequisite: one year of physical chemistry.* First semester. Messrs. Zettlemoyer, Sturm

Chem. 441. Advanced Physical Chemistry (3)

Kinetic theory of gases, liquids, and solutions; reaction rate theory; heterogeneous reactions and catalysis; properties of dispersed systems; phenomena of surface chemistry; preparation and general properties of colloidal systems. *Prerequisite: one year of physical chemistry.* Second semester. Mr. Zettlemoyer, Sturm

Chem. 449. Seminar in Analytical and Physical Chemistry (1)

Reports and discussions of recent developments in analytical and physical chemistry. Messrs. Serfass, Zettlemoyer

Chem. 450. Theoretical Organic Chemistry (3)

A survey of current developments in the mechanisms of organic reactions, covering solvolysis, substitutions, rearrangement, oxidation-reduction, and unstable intermediates. *Prerequisite: Chem. 358.* First semester.

Mr. Rouse

Chem. 451. Theoretical Organic Chemistry (3)

The application of physical concepts and methods to the study of organic molecules including acidity and basicity, infra-red and ultraviolet spectra, stereochemistry and conformation, kinetics, bond energies, and elementary valence theory. *Prerequisite: Chem. 358.* Second semester.

Mr. Brownell

Chem. 452. Organic Chemistry, Heterocyclic Compounds (3)

The chemistry of thiophene, pyrrole, furan, pyridine, and their derivatives, considered from the viewpoint of recent organic theories of structure and reaction mechanisms. Mr. Amstutz

Chem. 458. Topics in Organic Chemistry (3)

An intensive study of limited areas in organic chemistry. The subject of "Allylic Rearrangements" was covered in Spring 1955.

Messrs. Amstutz, Brownell, Rouse

Chem. 459. Seminar in Organic Chemistry (1)

Reports and discussions of recent important developments in theoretical and applied organic chemistry. Messrs. Amstutz, Brownell, Rouse

Chem. 460. Organic Chemistry Research (4)

Investigation of a problem in organic chemistry. First semester.

Messrs. Amstutz, Brownell, Rouse

Chem. 461. Organic Chemistry Research (4)

Continuation of Chem. 460. Second semester.

Messrs. Amstutz, Brownell, Rouse

Chem. 463. Physical Organic Chemistry (3)

A study of the fundamental properties of organic molecules, including quantum-mechanical resonance, spectroscopy, dipole moments and thermodynamics; the use of these physical measurements in the solution of problems in organic chemistry.

Mr. Zettlemoyer

Chem. 466. Advanced Organic Preparations (2)

A laboratory course of instruction in advanced techniques of the preparation of organic compounds. First or second semester.

Messrs. Amstutz, Brownell, Rouse

Chem. 471. The Chemistry of the Proteins (3)

A study of the proteins, amino acid, and nucleic acids, their properties, composition, degradation products, oxidation and other chemical reactions, synthesis, and analysis.

Mr. Stubbings

Chem. 472. The Chemistry of the Carbohydrates (3)

A study of the simple and complex sugars, starches, and cellulose, their synthesis, analysis, reactions, biological relations, occurrence, and industrial application.

Mr. Stubbings

Chem. 473. Seminar in the Chemistry of Leather (1)

Reports and discussions of principles of protein chemistry and tanning processes as related to the production of leather.

Mr. Stubbings

Chem. 490. Physical Chemistry Research (4)

Investigation of a problem in physical chemistry. First semester.

Messrs. Zettlemoyer, Sturm

Chem. 491. Physical Chemistry Research (4)

Continuation of Chem. 490. Second semester.

Messrs. Zettlemoyer, Sturm

Chem. 493. Theoretical Chemistry, Kinetics (3)

Kinetics of explosions of solids; combination and explosion of hydrogen and hydrocarbons; polymerization; kinetics of organic reactions. *Prerequisite: Chem. 441.*

Mr. Zettlemoyer

Chem. 495. Theoretical Chemistry, Thermodynamics (3)

Statistical theory of thermodynamics; heat capacity equations; quantum theory in chemical thermodynamics. Reports and discussions on selected topics. *Prerequisite: Chem. 440.*

Mr. Sturm

Chem. 497. Surface Chemistry (3)

Applications of colloid chemistry; special topics in surface chemistry. Lectures and seminar. *Prerequisite: Chem. 441.* Mr. Zettlemoyer

Chem. 498. Advanced Physical Chemistry Seminar (3)

An intensive study of some field of physical chemistry. Mr. Zettlemoyer

Chem. 499. Physical Chemistry Methods (2)

An advanced course in methods of physical chemistry laboratory practice. Mr. Zettlemoyer

CIVIL ENGINEERING

Professor Eney, C. D. Jensen

Associate Professors McPherson, Kolm, Snyder,
Beedle, Thürlmann, Liebig, Ekberg

Assistant Professors Muhlhausen, Errera, Dinsmore,
Dittig, Schiffman, Ketter, Lane

Messrs. Driscoll, Borg, Karr, Nasser, Rumpf, Luck, Sherbourne,
Slutter, Swindlehurst, Grove, Cain, Gearhart,
Sarubbi, Serpico, Tall

C.E. 40. Land and Topographic Surveying (3)

The theory and practice of land surveying, including horizontal and vertical control, topographic surveys, map drawing, computation of areas, elements of surveying astronomy, stadia, construction surveys, with emphasis upon relative precision and means of obtaining optimum precision. Daily recitation and field work for three-week period. *Prerequisites: plane trigonometry; C.E. 61. Summer session.*

C.E. 41. Route Surveying (3)

Reconnaissance, preliminary, and location surveys; theory and practice concerning simple, spiral, and vertical curves; establishment of grades and setting of slope stakes; mass diagrams. Daily recitation and field work for three-week period. *Prerequisite: C.E. 40. Summer session.*

C.E. 43. Advanced Surveying (3)

Adjustment of instruments; investigation of systematic and observational errors; elements of least squares with application to surveying adjustment of level nets and triangulation; celestial observation; precise leveling; photogrammetry. Office work, with some field exercises. *Prerequisite: C.E. 40. Second semester.*

C.E. 60. Descriptive Geometry (1)

A brief course in the elements of descriptive geometry designed for

those students who present transfer credits in engineering drawing without descriptive geometry or who pass an anticipatory examination in engineering drawing, but who require credit for descriptive geometry according to the terms of their programs. Second semester.

C.E. 61. Engineering Drawing and Descriptive Geometry (3)

The use of drawing instruments; instruction in engineering lettering; the theory and practice of mechanical drawing and descriptive geometry; working and assembly drawings; tracing and reproduction of drawings; intersections and developments. The student who presents evidence of training in engineering drawing may take an anticipatory examination (excluding descriptive geometry) and receive two semester hours credit, if successful in passing the examination. See C.E. 60. First and second semesters.

C.E. 100. Industrial Employment

During the summer following the junior year, students are required to spend at least eight weeks in approved office or shop work or on engineering construction. A written report on the shop work or project, outlining the experience obtained, is due on return from Christmas recess. The reports should contain plans, photographs, or calculations, as each case may require.

C.E. 101. Foundations (2)

Study of the design and construction of foundations for bridges and buildings, and of the behavior of soils as foundation materials for bridges, buildings, and earth-retaining structures. Analysis of stresses in soil masses. Analysis of earth pressures and settlements. Special emphasis on the interpretation of boring records. *Prerequisites: C.E. 139; C.E. 153.* Second semester.

C.E. 102. Civil Engineering Proseminar (1)

A study of current civil engineering projects and developments, with written reports. At weekly meetings these reports are presented orally in abstract. *Prerequisite: senior standing.* Second semester.

C.E. 103. Special Problems (2-4)

Supervised individual research problems with report. *Prerequisite: consent of instructor.* First and second semesters.

C.E. 104. Readings in Civil Engineering (1-3)

Study of selected technical papers, with abstracts and reports. *Prerequisite: consent of instructor.* First and second semesters.

C.E. 106. Structural Design (3)

Elementary theory and design of structures in steel, wood, and concrete, An abridged course in stress analysis and design for students other than civil engineers. *Prerequisite: Mech. 11.* Second semester.

C.E. 107. Structural Welding (1)

The design of welded steel structures, together with a study of current literature. A few periods will be devoted to the manual operation of making welds. *Prerequisite: senior standing in civil or mechanical engineering.* Second semester.

C.E. 112. Advanced Mechanics of Materials (3)

Further topics in column and beam theory, including unsymmetrical bending, combined stresses, conjugate beam methods; curved beams, impact loading, buckling. *Prerequisite: Mech. 11* First semester.

C.E. 121. Mechanics of Fluids (3)

The behavior of real fluids and the more important physical laws; potential flow, laminar flow, boundary layers, turbulence, and waves, with practical applications to flow through orifices, and to weirs and pipes, open channels, turbines and pumps. *Prerequisites: Mech. 102 previously or concurrently; Math. 13.* First and second semesters.

C.E. 123. Hydraulics Laboratory (1)

Experiments in the flow of water and in the testing of hydraulic machinery. *Prerequisite: C.E. 121 concurrently or Ch.E. 171 previously or concurrently.* First and second semesters.

C.E. 139. Soil Mechanics (3)

An introduction to the study of the mechanics of soils, including soil classification, permeability, compressibility, shear strength, bearing capacities, stability of embankment. *Prerequisite: Mech. 11.* Second semester.

C.E. 140. Transportation Engineering (3)

Study and design of transportation facilities, including highways, airways, railroads, waterways, and pipe-lines. Emphasis on traffic engineering, including introduction to probability and statistics, design of intersections, traffic control devices, traffic surveys, design of parking facilities. *Prerequisites: C.E. 142; C.E. 121.* Second semester.

C.E. 142. Highway Engineering (3)

The design of highways, including primary roads, secondary roads, limited access highways. The geometry of modern highways, interchanges and intersections. Analysis of highway soils, pavement design, compaction control, frost-heaving, drainage. Behavior and design of asphalts for highways. *Prerequisites: C.E. 41; C.E. 139.* First semester.

C.E. 150. Structural Analysis (4)

Algebraic and graphic determination of stresses in roof and bridge trusses under dead, live, and wind loads. *Prerequisite: Mech. 11.* Second semester.

C.E. 151. Structural Theory (3)

Introductory course in the theory of structural steel and design, including riveted and welded connections, pins, tension members, columns, and beams. *Prerequisites: C.E. 112; C.E. 150.* First semester.

C.E. 152. Structural Design (3)

Advanced course in the analysis and design of several complete steel structures, including a rolled beam bridge, a plate girder bridge, a truss highway bridge, a mill building and a tall office building. *Prerequisite: C.E. 151.* Second semester.

C.E. 153. Reinforced Concrete Theory (3)

Introduction to the theory and design of simple reinforced concrete structures. Laboratory work includes the preparation of concrete mixtures and tests of control cylinders, beams, and columns. *Prerequisites: C.E. 112; C.E. 150.* First semester.

C.E. 160. Water Works Engineering (3)

Theory and design of water supply, purification, pumping, transmission and distribution works. *Prerequisites: C.E. 121; Geol. 6.* First semester.

C.E. 161. Sewage Works Engineering (3)

Theory and design of sanitary and storm sewerage systems and of sewage treatment plants. *Prerequisite: C.E. 121.* Second semester.

For Advanced Undergraduates and Graduates

C.E. 320. Hydraulic Engineering Projects (3)

Hydrology, analysis of design of earth and gravity dams, outlet structures, flood control methods, and flood routing. *Prerequisite: C.E. 121.* First semester. Mr. McPherson

C.E. 321. Water Power and Hydraulic Machinery (3)

Water power hydrology, turbine selection, model turbine tests; study of penstocks, flumes, surge tanks, control gates, etc.; pump selection and pump tests. *Prerequisites: C.E. 121, 123.* Second semester. Mr. McPherson

C.E. 322. Intermediate Fluid Mechanics (3)

Fundamental principles of fluid motion, with emphasis on hydraulic applications. A continuation of Mech. 121. *Prerequisites: Math. 14, C.E. 121.* First semester. Mr. McPherson

C.E. 350. Advanced Structural Analysis (3)

An introduction to the study of stresses in indeterminate structures. *Prerequisites: C.E. 112; C.E. 150.* First semester.

Messrs. Eney, Liebig, Dinsmore

C.E. 351. Structural Design: Timber (2)

Analysis and design of timber columns, beams, tension members, trusses, connections, mechanical fasteners; study of allowable stresses, fire resistance and preservation of timber structures; design project and timber tests with reports. *Prerequisite: C.E. 151.* Second semester.

Messrs. Eney, Liebig

C.E. 353. Reinforced Concrete Design (3)

Application of the principles of continuity to the design of concrete structures, including buildings and rigid frame bridges. *Prerequisites: C.E. 153, C.E. 350.* Second semester.

Mr. Liebig

C.E. 360. Sanitation (3)

Study of those environmental factors having an influence upon public health, including food and milk sanitation; garbage and refuse collection and disposal; insect and rodent control; lighting, heating, and ventilating; plumbing; industrial hygiene; school sanitation; and swimming pools, but excluding water works and sewerage. *Prerequisite: Consent of instructor.* Second semester.

Mr. Snyder

For Graduates

Subject to proper approval a graduate student majoring in Civil Engineering may include the following courses in his program. The prerequisite for any course listed is a course of similar title on a less advanced level. At the end of this group of courses are listed courses in other departments which may be selected as a part of a C.E. major.

C.E. 400. Research Methods (3)

Research procedures as applied to engineering materials and structures; methods of experimental stress analysis. First semester.

Messrs. Beedle, Ketter

C.E. 401. Mechanical Methods of Stress Determination (3)

Use of mechanical devices in investigation of special problems, such as temperature deformations, foundation displacements, and integral action of structures; theory of similitude. First semester.

Mr. Eney

C.E. 402. Structural Model Analysis (2-5)

Individual structural research problems, with report. *Prerequisite: C.E. 401.* Second semester.

Mr. Eney

C.E. 404. Structural Research (2-5)

Individual research problems with reports. First or second semester.

Staff

C.E. 405. Structural Welding (3)

The design of welded connections for buildings, rigid frames, and

bridges, including costs, inspection, selection of electrodes, distortion effects, internal stresses, and a study of current research. Manual practice of arc welding. Given in alternate years. (*Offered Fall 1958*). Mr. Jensen

C.E. 406. Special Problems in Civil Engineering (3)

An intensive study, with report, of some special field of Civil Engineering. May be repeated for credit. Staff

C.E. 407. Thesis (1-6)

Staff

C.E. 410. Prestressed Concrete (3)

Cement, aggregates, strength laws; elastic and plastic properties of concrete; analysis and design of prestressed members by the various methods of prestressing. First semester. Mr. Ekberg

C.E. 411. Selected Topics in Concrete Structures (3)

Analysis and design of prestressed, thin-shelled, rigid frame, and composite concrete structures. Influence of shrinkage and plastic flow on forces in redundant structures. Second semester of alternate years. (*Offered Spring 1958*). Mr. Thürlimann

C.E. 420. Run-Off and Stream-Flow (3)

Occurrence and distribution of water by natural processes. Analysis of climatological and stream flow data. Frequency and intensity of storms and floods. Storage and open channel problems. First semester of alternate years. (*Offered Fall 1958*). Mr. McPherson

C.E. 421. Hydraulic Laboratory Practice (2-5)

Study of theory and methods of hydraulic experimentation simultaneous with laboratory work. First or second semester. Mr. McPherson

C.E. 422. Hydraulic Research (2-5)

Individual research problems with reports. First or second semester. Mr. McPherson

C.E. 439. Advanced Soil Mechanics (3)

Analysis of seepage beneath masonry dams and through earth dams; design of earth dams; consolidation and settlement analyses; shear testing methods and shearing strength of soil; stability of slopes; *Prerequisite: a course in Soil Mechanics*. Mr. Jensen

C.E. 440. Soils Research (2-5)

Individual research problems relating to soil mechanics, with reports. *Prerequisite: a course in soil mechanics*. First or second semester.

Messrs. Jensen, Schiffman

C.E. 441. Foundation Engineering (3)

Soil Mechanics as applied to foundation engineering, bearing capacity

of shallow footings, piers, and piles; soil problems relating to retaining walls; drainage prior to excavation; lateral supports in open cuts; design of foundations for airport runways. Second semester. Mr. Jensen

C.E. 450. Advanced Structural Theory (3)

The design and investigation of statically indeterminate structures of steel and reinforced concrete, including arches. First semester.

Messrs. Eney, Kolm

C.E. 451. Advanced Structural Theory (3)

Continuation of C.E. 450. Second semester.

Messrs. Eney, Kolm

C.E. 453. Structural Members and Frames (3)

General torsion of thin-walled open, closed, and combined open and closed cross-sections; general instability of thin-walled members; inelastic instability; special problems in stability. Desirable preparation: Math. 221 and Mech. 415. Second semester of alternate years (*Offered Spring 1957*). Mr. Thürlimann

C.E. 456. Graduate Seminar (1-3)

Study of current topics in the field of Civil Engineering. (*Offered on sufficient demand*). Messrs. Eney, Beedle

C.E. 458. Plastic Analysis and Design (3)

Theory of plasticity and its applications to structural design. The behavior of steel structures beyond the elastic limit and up to collapse. Study of component parts of frames; methods of predicting strength and deformation in the plastic range. Studies of industrial type frames. Current research. Comparison of conventional design methods with plastic design techniques. Second semester. Messrs. Beedle, Thürlimann, Ketter

C.E. 460. Sanitary and Hydraulic Engineering (3)

Study of the design of reservoirs, tanks, and pipe lines for water supply systems, and the sewers and other appurtenances for sewage systems; inspection of existing plants, with reports thereon. First semester. (*Offered Fall 1957*). Mr. Snyder

C.E. 461. Sanitary and Hydraulic Engineering (3)

Continuation of C.E. 460. Second semester.

Mr. Snyder

Additional courses which may be a part of a C.E. major: Mech. 402 Advanced Analytical Mechanics, Mech. 404 Advanced Vibration Analysis, Mech. 411, 412, Theory of Elasticity and Plasticity, Mech. 415 Structural Mechanics and Elastic Stability, Mech. 416 Theory of Plates and Shells, Mech. 421 Hydrodynamics, Mech. 422 Advanced Mechanics of Compressible Fluids and M.E. 441 Experimental Stress Analysis.

Each candidate for a master's degree is expected to take at least one research course (C.E. 402, 404, 406, 407, 422, 440,) but a minimum of 24 hours of his program should consist of courses outside this group. Research Assistants and Fellows will normally prepare a thesis.

CLASSICAL LANGUAGES

Associate Professor Maurer

Assistant Professor Feaver

GREEK

Gk. 1. Elementary Greek (3)

For all students who desire to obtain a knowledge of the fundamentals of the Greek language. Early in the semester there will be reading in stories and legends in easy Greek. First semester.

Gk. 2. Elementary Greek (3)

Continued work in Greek vocabulary, forms, and syntax. Selections from Xenophon's *Anabasis*. *Prerequisite: Gk. 1.* Second semester.

Gk. 3. Second-Year Greek (3)

Anabasis; Iliad (if time permits): grammar and simple composition. *Prerequisites: Gk. 1 and 2, or one year of entrance Greek.* First semester.

Gk. 4. Second-Year Greek (3)

Continuation of Gk. 3. Second semester.

Gk. 7. Thucydides (3)

One or more books. Composition. *Prerequisite: Gk. 4.* First semester.

Gk. 8. Tragedy (3)

Euripides: *Medea, Bacchae*, or another play; Sophocles: *Oedipus Tyrannus, Antigone*, or another. Literary study of the drama; poetical language, style, and conception; metrical reading; composition. *Prerequisite: Gk. 4.* Second semester.

Gk. 9. Dramatic Poetry (3)

Aeschylus: *Agamemnon* or *Prometheus Bound*; Aristophanes: *Clouds, Frogs, or Birds*; Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized; metres; elementary text-criticism. *Prerequisites: Gk. 4 and consent of head of department.* First semester.

Gk. 10. Greek Oratory (3)

Selections from the earlier Attic orators and Demosthenes. Rapid reading, the student being supposed to have reasonable facility in understand-

ing the Greek directly without rendering into English. Attention is directed largely to those points which illustrate the development of Greek prose style. *Prerequisites: Gk. 4 and consent of head of department.* Second semester.

Gk. 21. Ancient History (3)

The development of civilization from palaeolithic times to the world empire of Alexander the Great. The social, economic, religious, philosophic, artistic, and literary development of the ancient world; the origin of political institutions. First semester.

Gk. 99. Ancient Science (3)

A study of the architecture, mining, machinery, medicine, husbandry, etc., as developed by early peoples, especially by the Greeks and the Romans. A comprehensive view of the knowledge and use of natural resources. No knowledge of the Greek or latin language is required. Second semester.

Gk. 111. Homer (3)

Rapid reading of considerable portions of the *Iliad* or the *Odyssey*. Homeric language, syntax, and metre. *Prerequisites: Gk. 4 and consent of head of department.* First semester.

Gk. 116. Plato (3)

Euthyphro, *Apology*, or other shorter dialogues. Grammar and composition. *Prerequisites: Gk. 4 and consent of head of department.* Second semester.

Gk. 183. The Economic and Social Life of the Greeks (3)

A study of the activities of the Greeks with special reference to domestic arts, religion, athletics, warfare, medicine, education, social customs, and commerce; numismatics and vase painting. Lectures, collateral readings, and reports. No knowledge of the Greek language is required. First semester.

For Advanced Undergraduates and Graduates

Gk. 200. Greek Literature in English Translation (3)

The development of the major departments of Greek literature; required readings in English translations, with special attention to the epic, drama, and lyric poetry. No knowledge of the Greek language is required. First or second semester.

Gk. 202. Greek Archaeology (3)

Aims and methods. A chronological presentation of prehistoric civilizations including the Neolithic, Minoan, Helladic, and Mycenaean periods.

A study of extant ancient monuments, buildings, and city plans of important sites of the classical and Hellenistic periods. Lectures, collateral readings, and reports. No knowledge of the Greek language is required. Second semester.

LATIN

Lat. 22. Ancient History (3)

Continuation of Gk. 21. The Hellenistic Age. Rome from its origin to 395 A.D. Second semester.

Lat. 61. Beginning Latin (3)

For all students who desire to obtain a knowledge of the fundamentals of the Latin language. Special emphasis on English derivations and the principles of grammar. First semester.

Lat. 62. Caesar (3)

The Gallic War, Books I-IV. Prose composition and syntax. *Prerequisite: Lat. 61.* Second semester.

Lat. 63. Caesar (3)

Selections from the later books of the *Gallic War* or from the *Civil War*, Prose composition and syntax, with emphasis on clause construction. *Prerequisite: Lat. 62 or 2 entrance units.* First semester.

Lat. 64. Cicero (3)

Continuation of Lat. 63. Cicero's orations and either *de Senectute* or *de Amicitia*. *Prerequisite: Lat. 63.* Second semester.

Lat. 65. Vergil (3)

Vergil: *Eclogues* and *Aeneid* I-IV; selections from Ovid. Practice in reading aloud and scansion; training in sight translation; the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature. *Prerequisite: Lat. 64 or at least three entrance units.* First semester.

Lat. 66. Horace (3)

Selected Odes. Lectures on the history and development of lyric poetry; constant practice in reading the more important metres; memorization of stanzas and passages. *Prerequisite: Lat. 65 or consent of head of department.* Second semester.

Lat. 67. Livy (3)

Selections from earlier books. Some study of early Roman history and topography. Selected poems of Catullus. *Prerequisite: Lat. 66 or consent of head of department.* First or second semester.

Lat. 68. Latin Drama (3)

Drama among the Romans; native dramatic performances; indebtedness to Greek drama; the various dramatic forms and their vogue; chief writers; dramatic festivals; the Roman theatre; influences on later literature. Reading of selected plays of Plautus, Terence, and Seneca. *Prerequisites: Lat. 66 and consent of head of department.* First or second semester.

Lat. 106. Roman Prose Writers of the Empire (3)

Selections from the following: Petronius, *Cena Trimalchionis*; Apuleius, Cupid and Psyche story from the *Metamorphoses*; Suetonius, *Lives*; Seneca, *Moral Epistles* and *Dialogues*; Tacitus, *Germania*. *Prerequisite: Lat. 68 or consent of head of department.* First or second semester.

Lat. 108. Lucretius (3)

The finest literary passages and selected passages illustrating his philosophy. Ennius and some study of early Roman epic. Vergil's sixth *Aeneid*; an intensive study of its debt to Greek literature, religion, and philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epic of other literatures. *Prerequisite: Lat. 68 or consent of head of department.* First or second semester.

Lat. 169. Satire (3)

Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature; study of social conditions under the empire. *Prerequisites: Lat. 66 and consent of head of department.* First and second semesters.

Lat. 170. Medieval Latin (3)

Selected readings from the works of late Latin writers. *Prerequisites: Lat. 66 and consent of head of department.* Second semester.

Lat. 184. The Economic and Social Life of the Romans (3)

A general survey of Roman life under the following heads: commerce, trade, industrial and domestic arts, agriculture, religion, athletics, amusements, warfare, medicine and surgery, education, marriage, funeral customs, costume, houses, and furniture. Lectures, collateral readings and reports. No knowledge of the Latin language is required. Second semester.

For Advanced Undergraduates and Graduates**Lat. 201. Latin Literature in English Translation (3)**

A study of Latin literature by means of the best English translations. The lives of the most important authors are studied and their works read according to the major departments of literature—history, comedy, epic, lyric, etc. Emphasis is placed on the chronological development of the literature and historical background necessary to the interpretation of the author's works. Lectures and readings with special reports. No knowledge of the Latin language is required. First or second semester.

Lat. 203. Archaeology of Italy (3)

Neolithic, Terramare, Villanovan, and Etruscan cultures. Rome the City: its buildings, monuments, and streets, its destruction and rediscovery through excavation; origin and growth of the city; methods of identifying and dating monuments. A survey of Pompeii, Herculaneum, and Ostia. Lectures, readings, and reports. No knowledge of the Latin language is required. First or second semester.

ECONOMICS AND SOCIOLOGY

Professors Diamond, F. B. Jensen

Associate Professor Jacobi

Assistant Professors Bryski, Snider, Sussna, Urban, Walters

Messrs. Johnson, Keefe, Wolf, Sweet, Tailby

ECONOMICS

Eco. 1. Industrial Evolution (3)

An introductory course outlining the gradual development of economic organization with special attention to the stages of economic progress and social institutions growing out of these stages. First semester.

Eco. 3. Economics (3)

A general course in the principles of economics, covering the fundamental forces governing the production, distribution, and consumption of wealth. The work deals with the basic institutions of economic life, the nature of production, the organization of productive enterprise, and the principles of value and price. *Prerequisite: sophomore standing.* First and second semesters.

Eco. 4. Economics (3)

A continuation of Eco. 3 in which the work deals with the principles of money and banking, national income, and important economic problems such as the business cycle, international trade, labor problems, social security, public finance, and alternative economic systems. *Prerequisite: Eco. 3.* First and second semesters.

Eco. 50. Economic Geography (3)

A survey of world resources and world trade, with special reference to the chief economic materials and the geographic and economic factors responsible for the position of the United States in the economic world. Second semester.

Eco. 11. Marketing (3)

A detailed and critical analysis of the principles of marketing, designed to acquaint the student with major institutions and functions involved in the distribution of goods and services from the producer to the consumer. *Prerequisite: Eco. 3.* First and second semester.

Eco. 113. Advertising (3)

The principles, practices, and problems of advertising with special reference to its social and economic aspects. *Prerequisite: Eco. 11.* First semester.

Eco. 115. Retailing (3)

A study of modern retail institutions; principles and methods of retail organization and management; economic, social, and legislative aspects of the retailing structure. *Prerequisite: Eco. 11.* Second semester.

Eco. 160. Insurance (3)

A non-mathematical course in the economic principles and business practice of insurance, particularly life, fire, and casualty insurance. *Prerequisite: Eco. 4.* Second semester.

For Advanced Undergraduates and Graduates

Eco. 214. Selling and Sales Management (3)

The principles and practices of modern selling and sales management; the function of distribution in modern management. *Prerequisite: Eco. 11, or consent of instructor.* Second semester. Messrs. Snider, Walters

Eco. 217. Industrial Marketing (3)

Analysis of the problems of industrial marketing; make-up of the product, market distribution, sales methods, advertising, etc., as differentiated from the marketing of consumer goods. *Prerequisite: Eco. 11, or consent of instructor.* First semester. Messrs. Snider, Walters

Eco. 235. Transportation (3)

The economics of transportation by rail, highway, water, pipeline, and air; effects of transport costs on prices and on location of industries and markets; rate theory and practice; regulation, finance, government ownership, and coordination. *Prerequisite: Eco. 4.* First semester.

Mr. Bryski

Eco. 236. Public Utilities (3)

Rate-making, finance, combination, public ownership, federal power policy, and related problems in the electric, gas, and telephone industries. *Prerequisite: Eco. 4.* Second semester.

Mr. Bryski

Eco. 301. Business Management (3)

How various functional aspects of business are coordinated in the conduct of an enterprise. Designed to provide the student with an over-all perspective of the problems of management. *Prerequisite: Senior standing in business administration.* First and second semesters.

Mr. Urban

Eco. 306. Intermediate Economic Theory (3)

Determination of prices in terms of the equilibrium of the business enterprise and consumer choices in markets of varying degrees of competi-

tion; determination of wages, rent, interest, and profits; interactions of consumption, savings, employment, and income. *Prerequisite: Eco. 4.* First and second semester.

Messrs. Urban, Sussna

Eco. 307. Advanced Economics (3)

An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans for economic reform, such as socialism. *Prerequisite: Eco. 4.* First semester.

Mr. Jensen

Eco. 308. Advanced Economics (3)

Continuation of Eco. 307. *Prerequisite: Eco. 4.* Second semester.

Mr. Jensen

Eco. 312. Marketing and Distribution Research (3)

Analysis of the techniques of marketing research; determination of research objectives; procedures involved in the conduct of marketing investigations. *Prerequisites: Eco. 11 and one other course in marketing.* Second semester.

Messrs. Snider, Walters

Eco. 333. Labor Problems (3)

The economics of labor; the history of labor movements in the United States, forms of labor organizations and the methods and policies of trade unions. *Prerequisite: Eco. 4.* First and second semester.

Mr. Diamond

Eco. 334. Labor Problems (3)

Labor and the courts. Social and Labor Legislation. Problems of unemployment, safety health, the older worker, etc. *Prerequisite: Eco. 4.* Second semester.

Mr. Diamond

Eco. 371. Readings in Economics (3)

Readings in various fields of economics, designed for the student who has a special interest in some field of economics not covered by the regularly rostered courses. *Prerequisite: Preparation in economics acceptable to the head of the department.* First semester.

Messrs. Diamond, Jensen, Snider, Urban, Walters

Eco. 372. Readings in Economics (3)

Continuation of Eco. 371. Preparation in Economics acceptable to the head of the department. Second semester.

Messrs. Diamond, Jensen, Snider, Urban, Walters

For graduate program see Business Administration

SOCIOLOGY

Soc. 41. Cultural Anthropology (3)

The development of nonliterate cultures and social organizations. A comparative study of primitive institutions and social patterns, including: mar-

riage and the family, religion, economic activities, political organizations, folklore and language. The significance of nonliterate cultures for an understanding of contemporary society. First semester.

Soc. 42. Principles of Sociology (3)

A course designed to introduce the student to the general field of sociology and familiarize him with the basic sociological concepts. Included are: group types, the mechanisms of group behavior, processes of social interaction, social structure, social institutions, social change, the individual and society. Second semester.

Soc. 44. The American Community (3)

Urban and rural communities in the United States, with emphasis on the urban community. Includes: Ecological patterns and growth, institutional organization, population characteristics and trends, social stratification, resources and problems, future development and planning. *Prerequisite: Soc. 42.* Second semester.

For Advanced Undergraduates and Graduates

Soc. 262. Social Problems (3)

Special problems of contemporary society, including population trends, crime, public health, poverty, child welfare, the handicapped, etc. Second semester.

Mr. Jacobi

Soc. 263. Introduction to Social Work (3)

The philosophy and practices of modern social work. Includes: social work as an institution, the fields of social work, private and public welfare, the support and control of agencies, case work and group work, community organization, social legislation. *Prerequisite: Soc. 42.* First semester.

Mr. Jacobi

Soc. 264. The Family (3)

A sociological study of man's basic institution. Includes: an analysis of historical backgrounds, interactions within the family, relation to other-groups and institutions; problems of family disorganization, legal aspects of marriage and divorce, family adjustment, the family in a changing society. *Prerequisite: Soc. 42.* First semester.

Mr. Jacobi

Soc. 265. Development of Sociological Theory (3)

A critical and comparative study of the principal schools of social thought which have contributed to the development of sociological theory. The origins and development of sociology; major contributors; current trends. *Prerequisite: Consent of instructor.* First or second semester.

Mr. Jacobi

Soc. 266. Population Problems (3)

Quantitative and qualitative aspects of U.S. and world population. Includes causes and effects of migrations, racial composition and race rela-

tions, population theories, legal aspects, social consequences of population, trends, present trends and future predictions. Second semester.

Mr. Jacobi

Soc. 271. Readings in Sociology (3)

Reading in various fields of sociology, designed for the student who has a special interest in some field of sociology not covered by the regularly rostered courses. *Prerequisite: Preparation in sociology acceptable to the head of the department.* First semester.

Mr. Jacobi

Soc. 272. Readings in Sociology (3)

Continuation of Soc. 271. *Prerequisite: Preparation in sociology acceptable to the head of the department.* Second semester.

Mr. Jacobi

EDUCATION

Professor H. P. Thomas

Associate Professors Bream, F. G. Armstrong, Ackerlund

Assistant Professor Mazurkiewicz

Messrs. Hayward, L. R. Johnston, Watkins, Komisar, Neidig, Granger, Prestwood, Shuman, Geissinger, Hood, and Miss Gould

Educ. 0. Effective Study Methods

A practical course in study techniques and in the tools of study: including reading and fundamentals of mathematics, as the needs of individual students may require. An extensive testing program is carried on to assist the student in adjusting himself. *Prerequisite: consent of the instructor.* Second half of first semester.

Educ. A. Effective Study Methods (3)

A continuation of Educ. 0. *Prerequisite: Educ. 0.* Second semester.

Educ. 1. Introduction to Education (3)

A general introduction to the field of education, giving a broad survey of the work of the teacher and of the public school; the aims, organization and materials of public education; the place of the Federal Government and the State in a program of public education; local problems, e.g., finance, law, buildings, personnel, school boards. Required for the Pennsylvania college provisional certificate. Should be taken during the sophomore year. First and second semester.

Educ. 20. Educational Psychology (3)

An introductory course furnishing a psychological foundation immediately related to educational problems and practice. Practical problems involving analysis of designated material are assigned regularly for solution and report. Required for the college provisional certificate. Should be

taken concurrently with Educ. 153. during the junior year. *Prerequisite: Psych. 1.* First semester.

For Advanced Undergraduates and Graduates

Educ. 321. The Diagnosis and Adjustment of Reading Difficulties (3)

The psychology of reading as related to learning difficulties; the fundamental skills of reading, including eye movements, the measurement and diagnosis of reading difficulties, and recent experiments with remedial procedure; practice in the development of material for remedial instruction. *Prerequisite: consent of instructor.* First or second semester.

Mr. Mazurkiewicz

Educ. 330. History of Education in Europe (3)

A survey of the Greek, Roman and early Christian periods; late medieval and early modern periods; European movements since the French Revolution and their implications for American education. Second semester.

Mr. Komisar

Educ. 331. History of Education in the United States (3)

The development of primary, secondary and higher education in the United States; the aims, curricula, methods, and systems of education in relation to significant problems, economic changes, social conditions, and processes. First semester.

Mr. Komisar

Educ. 350. Principles of Secondary Education (3)

An introductory course in the field of secondary education. The aims, organizations, and materials of secondary education; characteristics of secondary school pupils; and a general treatment of the problems of secondary education. Recommended for the college provisional certificate. *Prerequisite: consent of instructor.* Second semester.

Mr. Komisar

Educ. 351. Organization of Units of Instruction (3)

A practical course for the teacher in service, offering opportunity for cooperative planning of courses and units of instruction. Applying the principles of curriculum construction to the selecting, assembling, and organizing of learning experiences. The teacher is advised to work in his field of special interest. *Prerequisite: consent of instructor.* Second semester.

Mr. Bream

Educ. 352. Principles of High School Teaching (3)

Basic methods of secondary instruction, including the objectives of education in relation to the curriculum; socialized procedure; problem-project unit method; contract plans; types of teaching related to different fields; directed study; organization of courses around criticized objectives; and the conduct of classes along the lines of individualized instruction. Recommended for the college provisional certificate. Should be taken concurrently with Educ. 354 during the junior year. *Prerequisite: Educ. 20.* Second semester.

Mr. Bream

Educ. 353. Observation of Secondary School Teaching (3)

Study, directed observation, and discussion of the various phases of teaching activity in high schools in or near Bethlehem. The class meets two hours each week. A minimum of 60 clock hours of directed observation and 15 clock hours of supervised practice teaching in the public schools is required. Required for the college provisional certificate. *Prerequisites: Educ. 1 previously or concurrently; Educ. 20 concurrently, consent of instructor.* First semester.

Mr. Bream

Educ. 354. Practice Teaching of Secondary School Subjects (3)

An intensive practical application of the principles of teaching to classroom conditions. The class meets two hours each week. A minimum of 75 clock hours of supervised practice teaching in the public schools is required. Students must have at least one free hour at the same time each day throughout the week. Required for college provisional certificate. *Prerequisites: Educ. 353 and 15 semester hours in the subject area in which the candidate expects to teach; Educ. 352 concurrently, consent of instructor.* Second semester.

Mr. Bream

Educ. 356. Practice Teaching of Secondary School Subjects (3)

A continuation of Educ. 354. Teaching must be done in a field for which practice teaching credit has not been granted previously. *Prerequisites: Educ. 353 and 15 semester hours in the subject area in which the candidate expects to teach; consent of instructor. Educ. 354 may be taken concurrently.* Second semester.

Mr. Bream

Educ. 360. Personnel Practices in Business and Industry (3)

A study of the techniques and principles used in the understanding and treatment of industrial problems confronting the line organization. Personnel administration as both a line and staff function. Case studies used for discussion of employee services, wage administration, and building, training and maintaining the labor force. *Prerequisite: consent of instructor.* Second semester.

Mr. Gould

Educ. 371. Elementary Educational Statistics (3)

Designed to give teachers and administrative officers the techniques necessary to enable them to gather data and present the results of their work in their classrooms and schools. Provides a practical knowledge of the simpler statistical methods for use in handling common problems and in understanding educational literature. *Prerequisite: consent of instructor.* First semester.

Messrs. Armstrong, Thomas

Educ. 373. Diagnostic and Remedial Teaching (3)

The analysis and treatment of difficulties in the various subjects. The student may select any subject in which he has adequate background as his field of work. Practice is given in the development of materials, and actual work with failing pupils is expected. *Prerequisite: consent of instructor.* First semester.

Mr. Oswalt

Educ. 390. Audio-Visual Education (3)

Types of audio-visual aids, the special value of each, their use in different subjects, the psychological basis for the use of such material, and the standards for the selection of these aids. Required for the permanent college certificate. First semester. Mr. Hood

Educ. 391-392. Workshop (3, 5, or 6)

Cooperative study of current educational problems. Designed to provide elementary and secondary school teachers an opportunity to work at their own teaching levels and in their own fields. Students will be limited to one workshop during a summer session but may eventually register for more than one; provided there is no duplication in subject matter. First or second semester. Messrs. Armstrong, Bream, Hayward

For Graduates

The major in education on the graduate level is intended for students preparing for school administration and supervision and for other types of public school positions as well as for specialists in elementary and secondary education. Preparation is offered for such positions as superintendent of schools, supervising principal, elementary principal, secondary principal, guidance counselor, and master teacher. All work is approved by the state councils of education of Pennsylvania and New Jersey.

At least four semester courses in education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 321, 330, 331, 350, 351, 360, 371, 373, and 390, all of which are open to advanced undergraduates and graduate students, and which may be taken as part of a major or as collateral work in education.

Educ. 419. Social Policy and Education (3)

A critique of the aims of education in the modern social order; the nature, needs and adjustments of modern industrial society; the conflicting demands upon education by a changing civilization as represented by modern social points of view; the implications of contemporary American educational philosophy for democratic social progress. *Prerequisite: consent of instructor.* Second semester. Mr. Komisar

Educ. 420. Advanced Educational Psychology (3)

Study and practice of techniques and methods involved in making a detailed psychological analysis of the pupil, particularly in relation to school problems. *Prerequisite: consent of instructor.* First or second semester. Mr. Komisar

Educ. 421. Analytic and Remedial Reading Procedures and Practices (3)

A laboratory course in remedial procedures and practices in the teaching of reading. Provision is made for clinical practice with individual and small groups of children on the elementary or secondary level. Emphasis is placed upon the development of practical and informal techniques and materials for diagnosing reading difficulties and instructing retarded readers. First semester.

Mr. Mazurkiewicz

Educ. 422. Education of Exceptional Children (3)

Methods of instruction and provision of materials for children who differ markedly from the normal, i.e., gifted, subnormal, and maladjusted; the problems of the teacher in a system that makes little provision for the exceptional child. Actual case studies of pupils are required. *Prerequisite: consent of instructor.* First or second semester.

Mr. Oswalt

Educ. 423. Psychology of School Subjects (3)

An analysis of the psychological development and behavior of pupils in connection with school subjects at all levels. Diagnostic work. Each student has an opportunity to emphasize the subject of his special interest.

Mr. Komisar

Educ. 426. Special Problems in Education (3)

Intensive study in an area of education not adequately covered in currently listed offerings. The field of research will be varied to meet the special needs of advanced students of unusual ability and adequate preparation. First and second semester.

Staff

Educ. 432. Educational Sociology (3)

An analysis of the school as a social institution. This includes a consideration of man's cultural heritage and the function of education in preserving and improving it; group behavior relating to school problems; the integration of education with the life and institutions of the community and society; the social role of the teacher; social change and the school. First or second semester.

Mr. Jacobi

Educ. 440. Principles of Elementary Education (3)

The aims, organization, and materials of elementary education; characteristics of elementary school pupils; and a general treatment of the problems of elementary education. First or second semester.

Mr. Komisar

Educ. 443. Elementary School Administration (3)

The major problems of organization and administration of elementary schools; types of organization, pupil promotion, time allotment, service agencies, and plant and equipment. Required for a principal's certificate. First or second semester.

Mr. Hayward

Educ. 444. The Elementary School Curriculum (3)

Problems of curriculum development in the first six grades; scope and sequence of learning experiences, program-making for different types of schools, units of instruction vs. special subjects, articulation, and similar problems. First or second semester. Messrs. Geissinger, Hayward

Educ. 446. Elementary School Supervision (3)

Methods, materials, organization, and evaluation of supervision. Each student will be required to develop a supervisory program for a subject or a school. First or second semester. Mr. Hayward

Educ. 447 A-F. Current Problems in Elementary School Subjects (3)

A. Reading and language. B. Arithmetic. C. Social Studies. D. Science. E. Language Arts. F. Arts and Crafts. Selection, study and development of problems with reference to the various levels of the elementary school. Special attention will be given to students' classroom problems. Classes will be limited to a consideration of one subject. First and second semesters. Mr. Hayward

Educ. 453. Secondary School Administration (3)

The major problems of organization and administration of secondary schools: Program of studies, teaching staff, pupil personnel, plant and equipment, and community relationships. Required for a principal's certificate. *Prerequisite: Educ. 350 or its equivalent.* First or second semester. Messrs. Granger, Johnson

Educ. 454. The Secondary School Curriculum (3)

Related to Educ. 453, but organized in such a way that it may be taken independently. Methods of study of curriculum problems, the selection of subject matter in various fields, the principles of program construction, and similar problems. *Prerequisite: Educ. 350 or its equivalent.* First or second semester. Messrs. Ackerlund, Johnson

Educ. 456. Supervision in Secondary Schools (3)

Related to Educ. 453 and 454, but may be taken independently. The purpose of supervision, a program for the improvement of teaching, the evaluation of teaching, measurement, supervisory relationships, and similar problems, involved in the supervision of instruction in secondary schools. *Prerequisite: Educ. 350 or its equivalent.* First or second semester. Messrs. Granger, Johnston

Educ. 457. Modern Trends in Teaching (3)

Designed for the teacher in service and for principals who wish a knowledge of the most recent developments in the trends and techniques of teaching. Special attention is given to experimental studies in group method. Students will be sectioned on the basis of interest in elementary or secondary education. *Prerequisite: consent of instructor.* First semester. Messrs. Bream, Geissinger, Hayward, Komisar

Educ. 458. Extra-Curricular Activities (3)

A cooperative study in the philosophy and psychology supporting activity programs; their organization and administration. Emphasis will be given to the teacher's part in the program, e.g., clubs, student councils, homeroom and class organization, assemblies, publications, finance. First or second semester.

Messrs. Granger, Johnston

Educ. 463. Public School Administration (3)

A systematic treatment of the problems of administration, local, state, and national. The newer developments which are modifying educational administration: state authorization and organization, the board of education, the superintendent of schools, personnel management, business administration, financial support, and public relations. First or second semester.

Messrs. Ackerlund, Neidig, Thomas, Watkins

Educ. 464. Foundations of Curriculum Construction (3)

Principles of curriculum construction which underlie the reorganization of the program of studies for elementary and secondary schools. Consideration of the origin and background of the curriculum, methods of organization, state, county, and city programs, curriculum planning and development, techniques for developing materials, and similar pertinent topics. First or second semester.

Messrs. Bream, Geissinger

Educ. 466. Supervision of Instruction (3)

Analysis of the principles underlying the organization and supervision of instruction. Applications to specific teaching situations. No lines will be drawn between the elementary and the secondary school. First or second semester.

Messrs. Johnston, Thomas

Educ. 468. Vocational Education (3)

The social basis for vocational education; present practices and trends in the major types of vocational education; recommendations for organization and administration of teaching problems; student employment; laws and regulations. First or second semester.

Mr. Shuman

Educ. 469 A-C. Evaluation of Public Schools (3)

Evaluation of all aspects of the school program in terms of its philosophy and objectives. Criteria will be studied and applied to the instructional program, student activities, guidance, and the library, the school staff, the school plant, and the school administration. Section A will deal with the elementary school. Section B will deal with the secondary school and Section C will deal with a survey of the public school system. First and second semesters.

Mr. Granger

Educ. 472. Educational Tests and Measurements (3)

Selection of education tests, organization of a testing program, use of tests in classification, construction of classroom tests, use of tests, in improving teaching, and diagnosis of pupil difficulties. Students will be

sectioned on the basis of interest in elementary or secondary education. For advanced work in this field attention is called to the seminar and individual research courses. First or second semester. Mr. Armstrong

Educ. 482 A-B. Educational and Vocational Guidance (3)

a. **General Introduction (2)**

General principles of guidance. Discovery of interests and abilities, study of occupations, study of educational opportunities, guidance activities, group programs, student personnel problems.

b. **Organization of School Programs (1)**

Analysis and development of homeroom programs, school programs, and community programs. First or second semester. Mr. Granger

Educ. 483. Techniques of Counseling (3)

An intensive examination of personnel techniques including interviews, rating scales, and counseling by such means as lectures, demonstrations, and case histories. Case studies of selected students are required. Required for guidance counselor's certificate. First or second semester.

Mr. Armstrong

Educ. 484. Occupations (3)

Trends in supply and demand of workers in various occupations; requirements for occupations; sources of descriptive materials; testing for occupational aptitude. Required for guidance counselor's certificate. First or second semester.

Miss Gould, Mr. Shuman

Educ. 491-492. Seminars (3)

One seminar is organized in each half-year provided three or more students select such work. These courses do not duplicate the courses of individual research. It is the purpose of seminar courses to provide for cooperative study of special problems in the field of elementary and secondary education. *Prerequisite: consent of instructor.* First and second semester.

Messrs. Ackerlund, Granger, Hayward, Johnston,
Mazurkiewicz, Thomas

Educ. 493-494. Individual Instruction, Field Work, or Research (3)

Open to students with appropriate preparation and needs for pursuing independent investigation. The student must have shown interest in and capacity for advanced work in the chosen field, evidenced in part by an approved plan of work. *Prerequisite: consent of instructor.* First and second semesters.

Messrs. Ackerlund, Bream, Granger, Hayward, Johnston,
Mazurkiewicz, Thomas, Watkins

Educ. 495-496. Seminar in School Administration (3)

Cooperative study of special problems in the field of school administration. Appropriate problems include: finance, building programs, public re-

lations, teacher-personnel policies, business management, and school law. *Prerequisite: consent of instructor.* First and second semesters.

Messrs. Ackerlund, Neidig, Prestwood, Thomas, Watkins

Educ. 497 A-D. Administrative Clinics (3)

This course, open only to a selected group of advanced students, will concern itself with an examination of duties and responsibilities of the various types of school administrators through analysis of literature, courses, institutional and state programs, and especially clinics with school administrators and representatives of state and national organizations. Students will be sectioned according to their primary interests as follows: Section A, elementary school principals, Section B, secondary school principals, Section C, guidance counselors, and Section D, superintendents of schools. First semester. *Prerequisite: consent of the head of the department.*

Staff

Educ. 498. Internship (3)

A follow-up of Education 497 designed to give a limited number of advanced students an opportunity to obtain experience as administrative assistants in selected school systems. Conference hours for students and staff members will be devoted to discussion of work and problems encountered by students in their internships. Each student is required to submit a report describing and appraising experience gained in this internship. Second semester. *Prerequisite: consent of the head of the department.*

Staff

ELECTRICAL ENGINEERING

Professors Bewley, A. R. Miller, Karakash

Associate Professor McCracken

Assistant Professors Teno, Gardner, Misra

Messrs. Sentz, Takacs

E.E. 100. Summer Work

During the vacation following the junior year each student in electrical engineering is required to spend at least eight weeks getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due on or before January 8. These reports should contain such calculations, photographs, drawings, and plots as each individual case may require.

E.E. 102. Direct Current Machinery (3)

Direct current circuits; magnetic circuits; direct current machine construction, operation, and control; generated voltages, forces on conductors, armature winding, machine characteristics. *Prerequisites: Phys. 24; Math. 14.* First semester.

E.E. 103. Direct Current Laboratory (1)

A coordinated laboratory course supplementing the classroom work in E.E. 102. Experimental studies and tests of direct-current machines and appliances, including characteristics, regulation, efficiency, etc. *Prerequisite: E.E. 102 concurrently.* First semester.

E.E. 104. Alternating Current Circuits (3)

Alternating current conceptions; laws for series and parallel circuits containing R, L, and C; vector methods; complex quantities; single and polyphase circuits and networks; power; Fourier series; harmonics; superposition. *Prerequisites: Phys. 24; Math. 206 previously or concurrently.* First semester.

E.E. 105. Alternating Current Circuits Laboratory (1)

Supplements E.E. 104. Alternating current circuit experiments, with oscillographic studies. *Prerequisite: E.E. 104 concurrently.* First semester.

E.E. 106. Alternating Current Machines (3)

The electrical, magnetic, and mechanical features of single and polyphase transformers and induction motors. *Prerequisites: E.E. 104, E.E. 102, E.E. 107 concurrently.* Second semester.

E.E. 107. Alternating Current Machine Laboratory (1)

Supplements E.E. 106. Laboratory tests on transformers, transformer banks, and induction motors. *Prerequisite: E.E. 106 concurrently.* Second semester.

E.E. 108. Alternating Current Machines (3)

A continuation of E.E. 106. The electrical, magnetic, and mechanical features of synchronous generators, motors, and converters. *Prerequisites: E.E. 102; E.E. 104; E.E. 109 concurrently.* First semester.

E.E. 109. Alternating Current Machine Laboratory (2)

A continuation of E.E. 107, supplementing E.E. 108. Laboratory tests on synchronous generators, motors, and converters; measurement of constants; parallel operation, calculations. *Prerequisite: E.E. 108 concurrently.* First semester.

E.E. 110. Electronics (3)

A study of the fundamentals of electronic discharges in vacua and gases; the motion of charged particles in electric and magnetic fields; electrons in metals; electron emission; operating characteristics of electron tubes and semi-conductor devices. Basic electron circuit theory including a study of rectifiers, amplifiers, oscillators, etc. *Prerequisite: E.E. 104 or Phys. 32.* Second semester.

E.E. 111. Electrical Engineering Proseminar (1)

A weekly meeting for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics. *Prerequisite: senior standing.* Second semester.

E.E. 133. Transmission Lines (3)

Long distance transmission of power; determination of line constants; geometric mean distances; corona; interference; differential equations and solutions; general circuit constants; regulation; losses and efficiency; mechanical design of lines; economics of power transmission. *Prerequisites: E.E. 106, E.E. 108 concurrently.* First semester.

E.E. 141. Electronic Circuits (4)

Principles of vacuum-tube and transistor circuits. Operating characteristics of lumped and distributed parameter linear amplifiers. Laboratory work and measuring techniques on lumped parameter circuits. First semester.

E.E. 142. Electronic Circuits (4)

Continuation of E.E. 141. Non-linearities in amplifiers. Linear and non-linear oscillators. Switching circuits such as power amplifiers, modulators, detectors, rectifiers, mixers, etc. Laboratory work and measuring techniques. Second semester.

E.E. 143. Communication Networks (3)

Introductory theory of transmission lines. Application to problems in the voice, radio, and microwave range. Analysis of impedance transformation and matching techniques. Use of graphical methods and charts. The exponential line. First semester.

E.E. 144. Communication Networks (4)

Continuation of E.E. 143. Introductory theory of two-terminal and four-terminal networks. Determination of external network parameters. Matrix representation of networks. Foster and Cauer forms. Filter theory. Laboratory measurements on transmission lines and networks. Second semester.

E.E. 160. Electrical Circuits and Apparatus (3)

Theory and applications of direct-current and alternating-current circuits, electronics. Direct-current and alternating-current machines and apparatus. *Prerequisites: Math. 13, Phys. 24.* First or second semester.

E.E. 161. Electrical Problems (1)

A three-hour problem period to accompany E.E. 160. *Prerequisite: E.E. 160 concurrently.* First or second semester.

E.E. 162. Dynamo Laboratory (1)

Test on direct-current and alternating-current circuits, apparatus and electronic devices. *Prerequisite: E.E. 160 concurrently.* First or second semester.

For Advanced Undergraduates and Graduates

E.E. 331. Electric and Magnetic Fields (3)

The calculation and construction of electric and magnetic fields for conductors, plates, vacuum tubes, slots, teeth, etc.; analogous problems in fluid flow. The methods of the theory of functions of a complex variable and of Fourier series and integrals are introduced in sufficient detail to serve in the analytical work; the rules for freehand plotting are derived and applied. *Prerequisite: E.E. 108.* Second semester. Mr. Teno

E.E. 332. Electric Transients (3)

Electrical, mechanical, and heat flow transients of circuits, transmission lines, electrical machinery, and power systems; operational calculus, to include Fourier integral, Bromwich integral, Laplacian transform, and the direct operational method. *Prerequisite: E.E. 104.* First semester.

Messrs. Gardner, Teno

E.E. 334. Transmission Line Transients (3)

Traveling waves; free and forced oscillations; reflections; transition points; multi-conductor systems; multi-velocity waves; attenuation and distortion; lightning surges; switching surges; arcing grounds; protective devices; surges in transformer and machine windings. *Prerequisites: E.E. 133; E.E. 332.* Second semester.

Mr. Bewley

E.E. 335. Symmetrical Components (3)

The solution of unbalanced polyphase circuits by means of symmetrical components; system faults, open-circuit and short-circuit currents and voltage calculations; sequence impedances of transmission lines, transformer banks, etc.; metering. *Prerequisite: E.E. 133 concurrently.* First semester.

Mr. Miller

E.E. 336. System Stability (3)

Steady state and transient power limits of transmission systems; electro-mechanical characteristics of electrical machines and networks. *Prerequisites: E.E. 335; E.E. 337 and 338 concurrently.* Second Semester.

Mr. Miller

E.E. 337. Advanced Machine Theory (3)

The transient theory of A.C. machines; balanced and unbalanced conditions; time constants; approximate and rigorous solutions. *Prerequisites: E.E. 335; E.E. 332; and 338 concurrently.* Second semester. Mr. Miller

E.E. 338. Transients Laboratory (1)

An oscillographic laboratory study of transmission line transients, system stability, and machine transients. *Prerequisite: E.E. 337 concurrently.* Second semester.

Mr. Miller

E.E. 345. Electromagnetic Theory (3)

Vector analysis; divergence, gradient, curl; Stokes' and Gauss' theorems; generalized coordinates; Maxwell's equations; Poynting's theorem; transmission, reflection and refraction of waves; retarded potentials; rectangular and cylindrical wave guides; radiation from antennae; simple directive arrays; ground reflection. *Prerequisite: E.E. 104.* Second semester.

Mr. Gardner

E.E. 350. Special Topics (3-6)

Selected topics not covered elsewhere in the curriculum.

For Graduates

Graduate students intending to major in electrical engineering must have completed a program of study equivalent to that required for the B.S. in E.E. at Lehigh University.

Graduate courses are given to qualified men from the industries of the surrounding district.

The following subjects may be considered as a part of the major field for an M.S. in E.E.: Math. 405, 406, 416, 431, 453; Phys. 420, 421, 422, 423, 428, and 429 and Mech. 402, 404, 411, 412, 415, 416, 421.

E.E. 433. Tensor Analysis of Electric Circuits and Machines (3)

The application of dyadics, matrices, and tensors to the theory of electric circuits and machinery; static networks, networks theorems, vacuum tube circuits, transformers, and transmission lines. First semester. Mr. Bewley

E.E. 434. Tensor Analysis of Electric Circuits and Machines (3)

Continuation of E.E. 433. The generalized machine; equation of motion, voltage, torque, small oscillations and power for holonomic, non-holonomic and quasi-holonomic reference systems; applications to all machines constituting special cases of the generalized machine; the equations of Lagrange, Maxwell, and Maxwell-Lorentz are used as starting points in the general theory. Second semester.

Mr. Bewley

E.E. 435. Power System Stability (3)

Power flow in electric circuits; steady state power limits of systems having synchronous and asynchronous machines with salient poles or round rotors; stability criteria; and other related topics. First semester. Given in alternate years.

Mr. Miller

E.E. 436. Power System Stability (3)

Continuation of E.E. 435. Transient stability problems, including machine inertias, governor action, unbalanced system conditions, various excitation systems and exciter transient effects, and switching operation. Second semester. Mr. Miller

E.E. 437. Advanced A.C. Machine Theory (3)

The two-reaction theory of synchronous machines in the steady and transient states; harmonic analysis; field and armature time constants; direct and quadrature synchronous, transient, and sub-transient reactances; electrical and mechanical transients of electrical machines, both singly and in conjunction with external circuits; calculation of voltage, current, mechanical oscillations, and hunting, forces and torques; operation of machines under unbalanced conditions and faults; effect of variable excitation. Two lectures and one laboratory period per week. First semester. Given in alternate years. Mr. Miller

E.E. 438. Advanced A.C. Machine Theory (3)

Continuation of E.E. 437. Second semester. Mr. Miller

E.E. 441. Theory of Control Systems (3)

Characteristic behavior of open and closed-loop systems. Analysis and synthesis methods common to regulators, servomechanisms, feedback amplifiers, analogue computers, etc.; continuous operation in the linear mode. Mr. McCracken

E.E. 442. Theory of Control Systems (3)

Continuation of E.E. 441, including a detailed step-by-step design of feedback systems such as an analogue computer. The theory is extended to sampled data and non-linear control systems. Analysis by means of describing function. Mr. McCracken

E.E. 443. Advanced Network Theory (3)

Consideration of network functions yielding flat gain. Detailed study of maximally flat and equal-ripple response functions. Examination of response functions in terms of critical frequencies in the complex plane. Positive real functions and elements of network synthesis. Mr. Karakash

E.E. 444. Advanced Network Theory (3)

Extension of E.E. 443. Consideration of distributed parameter circuits and determination of their external parameters. Microwave circuit theory and application to coaxial and waveguide networks. Microwave cavities.

Mr. Karakash

E.E. 450. Special Topics (3-6)

Selected topics not covered elsewhere in the curriculum.

ENGLISH

Professors Severs, Christensen, Strauch

Associate Professors Riley, S. B. Ewing

Assistant Professors Rights, Armstrong, Criswell, Dilworth, Hook

Messrs. Hertz, Hartung, Nead, W. A. Neville, Thompson, Emerson,

Paris, Collura, Kilmartin, Levy, Byrne, Israel, Webber

FRESHMAN COMPOSITION

All students are required to complete successfully courses in freshman composition carrying a total of six credit hours toward graduation.

On the basis of their performance in preliminary tests given during freshman week, first semester freshmen are assigned to one of the three courses designed to meet their particular needs. Engl. 1 is taken by all whose preparation appears to have been adequate but who do not give evidence of outstanding ability. Students who demonstrate superior ability and training take Engl. 11. Those who do poorly in the preliminary tests are required to take Engl. 0. Engl. 1 normally is followed by Engl. 2, and Engl. 11 by Engl. 12 in the second semester, while students who take and pass Engl. 0 in the first semester enroll in Engl. 1 in the second. A student whose classwork shows that he has been placed in the wrong group may be transferred to a higher or lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer.

Since Engl. 0 carries no credit toward graduation, students assigned to this course in their first semester are required to continue the study of freshman composition beyond the freshman year until the minimum requirement of six semester hours has been met.

ENGLISH LITERATURE AND COMPOSITION

Students wishing to major in English literature should take as preliminary work Engl. 8 and 9, or such equivalent courses as may be recommended by the head of the department. They should then elect two English courses in each semester of the junior year and at least two in each semester of the senior year. Students working for honors take a seminar course in which they prepare a thesis as part of the honors requirement.

Engl. 0. Elementary Composition (0)

Extensive practice in the fundamentals of composition. First and second semesters.

Engl. 1. Composition and Literature (3)

Practice in expository writing and the application of rhetorical principles; readings in expository prose; a rapid review of functional grammar. First and second semesters.

Engl. 2. Composition and Literature (3)

Continuation of Engl. 1. Further practice in expository writing in conjunction with readings in literature. *Prerequisite: Engl. 1.* First and second semesters.

Engl. 1X. English for Foreign Students (3)

Practice in reading, writing, and speaking the English language, with exercise in listening and notetaking. A substitute for English 1 for foreign students who demonstrate a need. Open also to transfer and graduate students. *Prerequisite: consent of head of department.* First semester.

Engl. 2X. English for Foreign Students (3)

Continuation of English 1X. A substitute for English 2 for foreign students who demonstrate a need. *Prerequisites: Engl. 1X or its equivalent and consent of head of department.* Second semester.

Engl. 4. A Study of the Drama (3)

Reading and critical study of types of drama; theories of the drama; the drama and the stage; the drama as a criticism of life. *Prerequisite: Engl. 2.* First semester.

Engl. 5. A Study of the Drama (3)

Continuation of Engl. 4. *Prerequisite: Engl. 2.* Second semester.

Engl. 7. A Study of the Short Story (3)

A critical study of the short story, English, American, and Continental. Class discussions, extensive collateral reading, and reports. *Prerequisite: Engl. 2.* Second semester.

Engl. 8. English Literature (3)

A survey of English literature from *Beowulf* through the Pre-Romantics, with selected readings. *Prerequisite: Engl. 2.* First semester.

Engl. 9. English Literature (3)

A survey of English literature from Wordsworth to Housman. *Prerequisite: Engl. 2.* Second semester.

Engl. 11. Types of World Literature (3)

A course in composition and literature for superior students who do not need or who have had the basic training of English 1 and 2. In addition to wide and thoughtful reading in world masterpieces the course requires correct and effective writing of critical essays, original sketches, and documented research papers. Not open to students who have taken Engl. 36. First semester.

Engl. 12. Types of World Literature (3)

Continuation of Engl. 11. *Same prerequisites as Engl. 11.* Second semester.

Engl. 18. The Novel (3)

A study of a selection of novels as noteworthy works of literature. *Prerequisite: Engl. 2.* First semester.

Engl. 19. The Novel (3)

Chronological continuation of Engl. 18. *Prerequisite: Engl. 2.* Second semester.

Engl. 20. American Literature, 1607-1855 (3)

A survey of the major writers from the settlement of America to the Civil War. Lectures and class discussions. *Prerequisite: Engl. 2.* First semester.

Engl. 21. Modern American Literature (3)

A study of the development of American literature from Whitman to the present day. Lectures and class discussions. *Prerequisite: Engl. 2.* Second semester.

Engl. 35. Poetry (3)

The analytical and critical reading of poetry, to provide such acquaintance with idiom and technique that poetry may be read with pleasure and understanding. *Prerequisite: Engl. 2.* Second semester.

Engl. 36. Masterpieces of World Literature (3)

A study of great works selected from the literature of epic poetry, the drama, the romance, philosophy, and the essay to illustrate the humanistic traditions of Western civilization. Not open to students who have taken Engl. 11 or 12. *Prerequisite: Engl. 2.* First semester.

Engl. 41. Business Letters (3)

Rhetorical and psychological principles and forms in modern business communication; practice in writing letters of inquiry, request, reply, acknowledgment, adjustment, credit, collection, sales, and application. *Prerequisite: Engl. 2.* First and second semesters.

Engl. 117. The Modern Play and Playwright (3)

Readings and discussion of the foremost American dramas and dramatists. Summer session.

Engl. 142. Technical Writing (3)

Study and practice in forms and methods of technical exposition, description, definition, classification; the technical report, abstract. *Prerequisite: Engl. 2.* First and second semesters.

Engl. 181. Undergraduate Thesis (3)

Open to advanced undergraduates who wish to submit thesis in English.
Prerequisite: consent of head of department. First semester.

Engl. 182. Undergraduate Thesis (3)

Continuation of Engl. 181. *Prerequisite: consent of head of department.* Second semester.

Engl. 183. Readings in English Literature (3)

Open to advanced students who wish to pursue special courses of reading in English literature. *Prerequisite: consent of head of department.* First semester.

Engl. 184. Readings in English Literature (3)

Continuation of Engl. 183. *Prerequisite: consent of head of department.* Second semester.

For Advanced Undergraduates and Graduates

Engl. 318. American Literature (3)

Movements that have shaped American thought and feeling as expressed in the national literature. Puritanism, Americanism, Romanticism, Transcendentalism, Individualism, the Civil War, Democracy, the West, Realism, Internationalism, and Skepticism, as presented by Jonathan Edwards, Franklin, Paine, Longfellow, Poe, Emerson, Thoreau, Mark Twain, Henry James, and Henry Adams. Summer session. Mr. Strauch

Engl. 320. The Novel (3)

The great masterpieces of prose fiction produced in England, in America, and on the Continent during the nineteenth and twentieth centuries. Development of types of the novel. The theory and technique of the novel. Summer session. Mr. Dilworth

Engl. 321. Contemporary Literature (3)

Present-day American literature. Collateral readings and reports. First semester. Mr. Strauch

Engl. 322. Contemporary Literature (3)

Present-day English and European literature. Collateral readings and reports. Second semester. Mr. Strauch

Engl. 323. Shakespeare and the Elizabethan Drama (3)

The development of the English drama, including the important plays of Shakespeare. First semester. Mr. Hook

Engl. 324. Shakespeare and the Elizabethan Drama (3)

Continuation of Engl. 323. Second semester. Mr. Hook

Engl. 325. English Literature of the Romantic Era (3)

Poetry and prose of the chief romantic writers—Wordsworth, Coleridge, Scott, Byron, Shelley, Keats, Lamb, Hazlitt, DeQuincey—with consideration of the political, religious, and social problems of the period as they are exhibited in the literature. Readings and class discussions. First semester.

Mr. Severs

Engl. 326. English Literature of the Victorian Era (3)

Poetry and prose of the chief Victorian writers—Tennyson, Browning, Arnold, Clough, Rossetti, Morris, Swinburne, Macaulay, Carlyle, Mill, Newman, Ruskin—with consideration of the political, religious, and social problems of the period as they are exhibited in the literature. Readings and class discussions. Second semester.

Mr. Severs

Engl. 331. Milton (3)

The life and works of John Milton in connection with the history of his times and the chief sources of his inspiration. First or second semester.

Mr. Riley

Engl. 333. Restoration and Augustan Literature (3)

Prose and poetry from 1660 to 1745 with emphasis on the works of Dryden, Pope, and Swift. First or second semester.

Mr. Dilworth

Engl. 334. Age of Johnson (3)

English prose and poetry from 1745 to 1798—Dr. Johnson and his circle, and the Pre-Romantics, including Burns and Blake. First or second semester.

Mr. Dilworth

Engl. 335. History of the English Language (3)

A survey of the development of the English language, in vocabulary, pronunciation, and structure, beginning with its relation to the other Germanic languages and coming down to modern English usage. First or second semester.

Mr. Ewing

Engl. 336. Writing for Publication (3)

Comprehensive study of the short-story and practice in the various techniques of writing short-stories, essays, and poems with a view to publication. First or second semester.

Mr. Criswell

Engl. 337. The Renaissance (3)

The growth of English non-dramatic literature in the sixteenth century and the stimulus of the Italian Renaissance and northern humanism. Readings in and class discussions of the works of the chief writers—Petrarch, Erasmus, More, Wyatt, Surrey, Lly, Sidney, and Spenser. First semester.

Mr. Ewing

Engl. 338. The Seventeenth Century (3)

The rich variety of English literature from Donne to Dryden—Donne and the "Metaphysical School"; Johnson and "The Tribe of Ben"; Cavalier

and religious poetry; the prose of Bacon, Browne, Burton, Walton, and Bunyan. Second semester. Mr. Armstrong

For Graduates

Candidates for the master's degree majoring in English literature may qualify for the degree under either of two plans offered by the department. Under Plan I the candidate is required to complete successfully eight semester courses (twenty-four hours), and to write a thesis representing the equivalent of six hours of course work, but he is not required to take an examination covering the entire field. Under Plan II no thesis is required; but the student, in addition to completing successfully ten semester courses (thirty semester hours), must pass an examination, usually oral, covering the entire field of English literature. The candidate selects the plan better suited to his needs and abilities, upon the advice and with the approval of the head of the department.

If his needs and interests make it desirable for him to do so, the candidate for the master's degree is permitted to take collateral work in other departments to the extent of six semester hours in lieu of an equivalent amount in the major field.

Candidates for the doctor's degree are expected to master the subject matter of the entire field of English and American literature. Other requirements for the doctorate will be found on pages 145-148.

Students desiring to qualify for graduate degrees in this department should have taken as part of their undergraduate work at least twelve semester hours of advanced courses in English literature. Those with undergraduate deficiencies who are admitted because otherwise well qualified will be expected to make up such deficiencies in addition to satisfying the minimum requirements for the degree sought.

Engl. 420. Graduate Seminar (3)

An intensive study of the works of an English author or a type of literature. Summer session.

Messrs. Armstrong, Dilworth, Ewing, Hook, Riley, Severs, Strauch

Engl. 421. Graduate Seminar (3)

An intensive study of the works of one or more English or American authors. Subject and instructor vary from semester to semester according to the needs of the students and the wishes of the department. Courses which have been given and are available are Donne (Mr. Armstrong), Pope (Mr.

Dilworth), Johnson's Literary Criticism (Mr. Dilworth), Prose Satire (Mr. Dilworth), Sir Philip Sidney (Mr. Ewing), Spenser (Mr. Ewing), Shakespeare's History Plays (Mr. Hook), Epic Poetry (Mr. Riley), Keats (Mr. Severs), Wordsworth (Mr. Severs), Emerson and Hawthorne (Mr. Strauch), Whitman and Melville (Mr. Strauch). First semester.

Messrs. Armstrong, Dilworth, Ewing, Hook, Riley, Severs, Strauch

Engl. 422. Graduate Seminar (3)

Continuation of Engl. 421. Second semester.

Messrs. Armstrong, Dilworth, Ewing, Hook, Riley, Severs, Strauch

Engl. 427. Old English (3)

A study of the Old English language and literature. First or second semester. Mr. Riley

Engl. 429. Literary Criticism (3)

A course aimed to correlate and unify the student's previous work in literature by means of wide readings in critical literature and discussions of theories and schools of criticism. First semester. Mr. Ewing

Engl. 430. Literary Criticism (3)

Continuation of Engl. 429. Second semester. Mr. Ewing

Engl. 431. Graduate Thesis (3)

First semester. Mr. Severs

Engl. 432. Graduate Thesis (3)

Second semester. Mr. Severs

Engl. 433. Literature of the Fourteenth Century (3)

Types of medieval literature with special attention to Langland, Gower, Chaucer. Mr. Severs

Engl. 434. Chaucer (3)

A study of the life and works of Chaucer, with some attention to his chief contemporaries. Readings, reports, and class discussions. First semester. Mr. Severs

Engl. 435. Chaucer (3)

Continuation of Engl. 434. *Prerequisite: Engl. 434.* Second semester. Mr. Severs

Engl. 436. Bibliography and Methods of Research (3)

A study of the bibliographical tools essential to an advanced student of English literature. Survey of historical, or critical, bibliography, of both printed books and manuscripts; of practical bibliography, including direction in the compilation of a list of books and articles on an assigned subject and in the procedures of thesis writing; and of enumerative bibliography, including an introduction to the chief printed bibliographies of the English language and literature. First or second semester. Mr. Severs

SPEECH — RADIO — THEATRE

Professor Davis

Assistant Professors Vasilew, Rights

Messrs. Barker, Prosper*

Speech Clinic

For the purpose of diagnosis and treatment of speech defects. Individual instruction provided for students with minor disturbances of voice and speech, as well as those with more serious handicaps. Open to all students in need of corrective treatment and to those desiring speech tests. By appointment. No credit.

Speech 30. Fundamentals of Speech (3)

A foundation course designed to develop knowledge of the basic principles of speech and ability to speak effectively on the platform. First and second semesters.

Speech 31. Business and Professional Speaking (3)

Development of speech for business and professional problems: technique of expository speaking; use of visual graphics; persuasive speaking applied to the emotional or analytical approach in selling; methods of interviewing; techniques of conference. *Prerequisite: Speech 30.* First and second semesters.

Speech 32. Discussion and Argument (3)

The technique of investigation, analysis, evidence, inference, briefmaking, and refutation in oral argument; participation in the various forms of discussion—conference table, panel, and symposium—and in various types of debate—conventional, cross-examination, and direct clash. *Prerequisite: Speech 30.* First and second semesters.

Speech 33. Parliamentary Procedure (1)

Study and drill in modern rules and methods of conducting organized group-deliberation. First and second semesters.

Speech 34. Debate (1)

A study of the principles and techniques of debate, analysis, evidence, reasoning, refutation, briefing, speech composition and delivery skills. Members required to participate in the activities of the Debate Society. First and second semesters.

Speech 51. Radio Workshop (3)

A practical course in the organization and production of radio and television programs, development of radio voice, and radio techniques, with emphasis on the use of radio in the fields of journalism, advertising, business, and dramatics; practical experience over local radio station. First and second semesters.

*On leave, 1956-57

Speech 52. Radio Workshop (3)

Continuation of Speech 51. *Prerequisite: Speech 51.* Second semester.

Speech 61. Dramatics (3)

The practical technique and production of plays; acting, stage-lighting, scenic design and execution, and student direction of plays. Each member must write either an original one-act play or a thesis upon any practical problems of the modern theatre. One play is presented each semester.

Speech 62. Dramatics (3)

Continuation of Speech 61. *Prerequisite: Speech 61.*

For Advanced Undergraduates and Graduates

Speech 251. Radio Workshop (3)

A practical course in the organization and production of radio programs, development of radio voice, and radio techniques. Particular attention will be given to the difficulties encountered by those who teach radio or have to produce school programs. Practical experience over local radio station. Summer session. Mr. Davis

Speech 260. Speech for the Teacher (3)

An orientation course in the field of speech for those engaged in classroom teaching or in directing extra-curricular speech activities. Discussion as a teaching device; integration of speech with other subjects; recognition of common defects of speech; modern emphases in speech contest; individual investigations, report, and conferences. Summer session. Mr. Davis

Speech 261. Dramatics (3)

A practical course in the production of plays; problems of designing of scenic effects, directing, and acting. Particular attention will be given to the difficulties encountered by those who teach dramatics. A production will be given by the class. Summer session. Mr. Davis

JOURNALISM

Associate Professor McFadden

Messrs. Hutchins, Breth

Students majoring in journalism may elect at the beginning of their sophomore year one of five sequences leading toward professional training in the following areas of communications: (1) newspaper practice; (2) government information; (3) communications in industry; (4) management of natural resources; (5) business and technical publications. The differentiation is largely on the basis of the nature of the collateral courses taken.

Journalism majors must successfully complete at least four credits in Journ. 1-10, *Brown and White*, taking it during each semester of residence following the declaration of their major. They must also take Journ. 11, 12, 13, 15, 16, 17, 118, 120 and the following required collateral courses: Greek 21, Government 352, Latin 22, Philosophy 14 and Philosophy 15.

A minimum of thirty credits in journalism, including *Brown and White*, shall be offered in satisfaction of the requirements for graduation. In addition, at the end of their senior year, journalism majors are required to pass the comprehensive examination in their field. Reading in preparation for the comprehensive examination begins in the sophomore year and is in addition to regular course work.

Journ. 1-10. Brown and White (1)

Enrollment constitutes membership on the staff of the semi-weekly paper. The student elects either editorial or business subdivision, and wins promotion on a merit system. Students enrolling for their first semester register for Journ. 1; for their second semester, Journ. 2, etc.; by faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. First and second semesters.

Journ. 11. News Writing (3)

Definition, determinants, and components of news; the lead; news structure and style; sources; interviewing; practice in gathering and writing news about speeches, sports, special features; the readability formula. *Prerequisite: Engl. 2.* First semester.

Journ. 12. Reporting of Public Affairs (3)

Reporting and writing about public affairs, including news of government on the local, county, state, and federal levels; civil and criminal courts; labor science, and entertainment news. *Prerequisite: Journ. 11.* Second semester.

Journ. 13. Editing (3)

Study and practice of newspaper desk work; headline writing, makeup, and typography; selecting, editing and rewriting news and feature copy; use of reference works and morgue. *Prerequisite: Journ. 11.* First semester.

Journ. 14. Press Photography (3)

A study of the fundamentals of news and feature photography; practice in planning, taking and developing pictures, and in making suitable enlargements for publication; lecture-demonstrations and laboratory assign-

ments in the use of cameras, lights, filters, special lenses, and enlargers. Second semester.

Journ. 15. Interpretive Writing (3)

Editorial interpretation of current events; practice in interpretive writing, including editorials, side and follow-up features, the news review, column, newsletter, magazine article, departmentalization. *Prerequisite: Journ. 11.* Second semester.

Journ. 16. Law of the Press (3)

Libel, privacy, rights and privileges of the press, ethics, postal regulations, copyright, and crusades; dealing with pressure groups. Second semester.

Journ. 17. Magazine Article Writing (3)

Writing and marketing magazine non-fiction articles from short filler items to full length features as dictated by current market needs; article types; manuscript preparation; illustrating; mailing; market analysis; slanting; editorial contacts, taboos. First semester.

Journ. 21. Creative Writing (3)

The study and writing of essays and short-stories (and verse, if requested), with a view to developing each student's particular talent. *Prerequisite: Engl. 2.* First semester.

Journ. 22. Creative Writing (3)

Continuation of Journ. 21. *Prerequisite: Engl. 2.* Second semester.

Journ. 31. Community Journalism (3)

An elective for students interested in the small-town weekly field. A study of ethical and legal problems, community news sources, business and promotional problems. Careful examination of community papers which lead in local news coverage, classified advertising, photography, circulation, community service, and local advertising. Laboratory work on community newspapers in this region. First semester.

Journ. 32. Community Journalism (3)

Continuation of Journ. 31. Second semester.

Journ. 43. Communications in Industry (3)

Study of the problems of human relations and communications in business and industry; theory and practice of management communications with employees, customers, stockholders and the community, with emphasis on methods and techniques currently being used to develop improved human relations. *Prerequisites: Engl. 2, and consent of head of department.* First semester.

FINANCE

Journ. 44. Communications in Industry (3)

Continuation of Journ. 43. *Prerequisite: Journ. 43.* Second semester.

Journ. 118. History of American Journalism (3)

English background of the American newspaper; development of press from Colonial days to the present; influence of newspaper on American life; contributions of outstanding journalists. Second semester.

Journ. 120. Journalism Proseminar (3)

Required of students of senior standing who are majoring in journalism. Survey of the newspaper field in its relation to public affairs. Extensive reading in books, magazines, and newspapers. First semester.

Journ. 123. Editing the House Organ and Trade Publication (1)

A course in selecting copy, in planning layouts, and in handling elementary problems of editing trade magazines. *Prerequisite: Engl. 2.* First semester.

For Advanced Undergraduates and Graduates

Journ. 201. Modern Newspaper Practice (3)

A course in methods of securing, writing, and editing news. Evaluation and organization of news; study of news sources and values and reader interest; difficulties encountered by faculty advisors of secondary school publications; individual conferences with such advisors. Summer session.

Mr. McFadden

FINANCE

Professors Bradford, F. B. Jensen

Assistant Professor Schwartz

Mr. Krouse

Fin. 125. Principles of Corporation Finance (3)

An intensive course covering the fundamentals of corporation finance in one semester. *Prerequisite: Eco. 3.* First and second semester.

Fin. 129. Money and Banking (3)

A general course dealing with the nature and functions of money and commercial banking, monetary and banking development in the United States, the banking process, banking problems, the value of money, international exchange, and monetary and credit policies. *Prerequisite: Eco. 4.* First semester.

Fin. 130. Money and Banking (3)

Continuation of Fin. 129. *Prerequisite: Fin. 129.* Second semester.

Fin. 133. Money and Banking (3)

The nature of money and commercial banking, the banking process in the United States, current banking problems, the value of money, and credit policy. *Prerequisite: Eco. 4.* First and second semesters.

Fin. 153. Credits and Collections (3)

A course devoted to the part played by consumer and mercantile credit in modern business, with emphasis upon the place of these types of credit in the economy, credit instruments, sources of credit information, analysis and evaluation of the credit risks, collection methods and procedures, and technical and legal aspects. *Prerequisites: Acctg. 2 or 104; Eco. 4.* First semester.

Fin. 232. Monetary-Fiscal Policy (3)

A course devoted to the study of monetary, credit and fiscal policies of governments and central banks with particular reference to policies of the United States Treasury and the Federal Reserve System. Current problems will receive special emphasis. *Prerequisite: Fin. 130 or 133.* First semester.

Mr. Bradford

Fin. 241. International Trade and Finance (3)

Economics, commercial, and financial relations of nations, including economic organizations, basic principles and practices of international trade, finance, and investment. *Prerequisites: Fin. 130 or 133 or graduate standing and consent of head of department.* First semester.

Mr. Jensen

For Advanced Undergraduates and Graduates

Fin. 323. Investments (3)

A study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields, and the machinery of investment, including stock exchange operation. *Prerequisite: Fin. 125.* First semester.

Mr. Schwartz

Fin. 324. Investments (3)

A project course in investment analysis for advanced students who are already familiar with investment principles. Sources of data and analysis procedures; the securities of industrials, railroads, public utilities, and municipalities. *Prerequisite: Fin. 323.* Second semester.

Mr. Schwartz

Fin. 326. Problems in Corporation Finance (3)

Continuation of Fin. 125. Consideration is given to the financial policies of management, with considerable emphasis placed on the corporation's relationship to government and the general economy. *Prerequisite: Fin. 125.*

Mr. Schwartz

Fin. 331. Bank Credit Problems (3)

A course dealing with the problems surrounding the extension of loans to customers and the purchase of open market paper by the individual banker. Legal regulations and restrictions, the instruments of bank credit extension, and the analysis of the bank borrower's credit position will be treated in detail. *Prerequisite: Fin. 130 or 133.* Second semester.

Mr. Bradford

Fin. 342. International Trade and Finance (3)

Continuation of Fin. 241. *Prerequisites: Fin. 241, or Fin. 130, or Fin. 133 and consent of instructor.* Second semester.

Mr. Jensen

Fin. 351. Public Finance: Federal (3)

A course dealing with government expenditures and revenues, the economics of taxation, and government administration. *Prerequisite: Eco. 4.* First semester.

Mr. Krouse

Fin. 352. Public Finance: State and Local (3)

The major issues regarding revenues, expenditures, debt and budgeting policy will be examined in the light of fiscal principles and economic effects. Particular attention will be given to current practices in Pennsylvania and contiguous states. *Prerequisite: Fin. 351.* Second semester.

Mr. Schwartz

Fin. 371. Readings in Finance (3)

A course of readings in various fields of finance, designed for the student who has a special interest in some field of finance not covered by the regularly rostered courses. *Prerequisite: Consent of head of department.* First semester.

Mr. Bradford

Fin. 372. Readings in Finance (3)

Continuation of Fin. 371. *Prerequisite: Consent of head of department.* Second semester.

Mr. Bradford

For graduate program see Business Administration

FINE ARTS

Professor Quirk

Mr. Rosser

F.A. 3. History of Architecture (3)

The development of architecture from Egypt and Mesopotamia, through Greece and Rome, the early Christian and Romanesque periods to the rise of Gothic. First semester.

F.A. 4. History of Architecture (3)

Continuation of F.A. 3. The spread of Gothic architecture, the incoming of the renaissance, followed by discussions of succeeding styles, classicism,

romanticism, functionalism, the international style, and contemporary movements. Second semester.

F.A. 5. Freehand Drawing (3)

Elementary freehand drawing from nature, portrait models, still life, and casts with practice in various media. Beginners and trained students. Evaluation based on individual advancement. First semester.

F.A. 6. Freehand Drawing (3)

Further practice in techniques; color theory with painting in chosen media. Second semester. Beginners and trained students. Emphasis on contemporary expression, development of basics.

F.A. 7. Advanced Drawing and Painting (3)

A continuation of the work in F.A. 5 and 6. *Prerequisites: F.A. 5 or 6; consent of head of department.* Advanced students only. First semester.

F.A. 8. Advanced Drawing and Painting (3)

A continuation of the work in F.A. 5 and 6. *Prerequisites: F.A. 5 or 6; consent of head of department.* Advanced students only. Second semester.

F.A. 11. Ancient and Medieval Art (3)

An approach to the understanding and enjoyment of the arts; development of art through the ancient and medieval periods; relations between artistic expression and the age which produced it. Lectures. Open to all classes. First semester.

F.A. 12. The Art of the Italian Renaissance (3)

Painting, sculpture, and architecture are examined as the outgrowth of conditions in Italy during the fourteenth, fifteenth, and sixteenth centuries: the influence of medieval thought and tradition, the awakening interest in nature, the effect of antiquity, especially the stimulus it gave to individual effort. Lectures. Open to all classes. Second semester.

F.A. 13. The Art of the Northern Renaissance (3)

Art in Europe other than Italy from the fifteenth century to the French revolution; contrasts between native tendencies and foreign influences, especially those of the Italian renaissance, with the resulting struggle between idealism and realism. Lectures. First semester.

F.A. 14. Modern Art (3)

The nineteenth and twentieth centuries; historical relationships, underlying theories, and influence of contemporary thought as aids in understanding modern art. The discussions include classicism, romanticism, impressionism, and the various modern schools. Second semester.

F.A. 16. Art in the United States (3)

A survey of Architecture, painting and sculpture; including colonial America, traditional influences, periods and styles. The evolution of American Art. Contemporary Expression.

F.A. 17. Criticism and Analysis of Art (3)

A critical analysis of the divergent views of the nature of arts, its origin and intention. The ancient writers are consulted for views held in Greece and Rome. Factors in molding art opinion in the middle ages; changes in the renaissance. Primarily for majors. *Prerequisites: F.A. 11 and 12, or suitable preparation in the history of fine arts; and consent of head of department.* First semester.

F.A. 18. Criticism and Analysis of Art (3)

Continuation of F.A. 18 with special attention to art criticism since the 17th century. *Prerequisite: same as for F.A. 17.* Second semester.

F.A. 21. Architectural Design (3)

An introduction to rendering, three-dimensional forms, utility, organization of space. Perspective, color, textures of materials, site and light. Emphasis on contemporary design. Plans. For beginners and trained students. *Prerequisites: Either engineering drawing, architectural drawing, or field experience; and consent of head of department.* First and second semesters.

F.A. 22. Architectural Design (3)

Further study in techniques. Plans and details, models, design problems. Integration of function and visual satisfaction. For beginners and trained students. *Prerequisites: Either engineering drawing, architectural drawing, or field experience; and consent of head of department.* First and second semesters.

Art Galleries

The Lehigh Art Gallery, located on the second floor of the University Library, is the scene of opening teas and receptions for the exhibiting artists. These Sunday afternoon openings are held once a month. Drawings, paintings, sculpture and prints by contemporary American and foreign artists, are continually on display. The exhibitions, intended for campus family and community, are open to the public, without charge, Sundays, Tuesdays, Wednesdays, and Thursdays from 2:00 to 5:00 P.M.

The Memorial Portrait Gallery, containing a number of portraits presented by alumni and friends in honor of the sitters, and located in the South Wing of the Alumni Memorial Building, is open to the public during the regular University hours as is also the Gallery of American Art, which occupies the North Wing of the same building. This collection changes as new items are acquired, by gift or through the Art Department Purchase Fund.

These Galleries offer definite evidence of the University's educational and cultural program, and docent service may be obtained for groups of ten or more as a Department of Fine Arts service.

FRENCH

See **Romance Languages**

GEOLOGY

Professors Willard, Gault

Associate Professor Whitcomb

Assistant Professors G. R. Jenkins, Ryan

Messrs. DuMontelle, Ern, Goodwin, Mentzer

Geol. 1. Principles of Geology (3)

An introductory survey of geologic processes. Lectures; laboratory exercises on common minerals, rocks, ores, and fossils; study of topographic maps. First semester.

Geol. 3. Fundamentals of Geology (3)

A basic study of earth materials and geologic processes. Emphasis on the development of the land forms; study of minerals, rocks and topographic maps. Lectures, laboratory. First semester.

Geol. 4. Fundamentals of Geology (3)

Continuation of Geology 3. Elementary meteorology and economic geology. An interpretation of geology as it effects the average citizen. Lectures, laboratory and field trips. *Prerequisite: Geol. 3 or consent of instructor.* Second semester.

Geol. 6. Engineering Geology (4)

Designed primarily for students in Civil Engineering. Basic geologic principles; selected minerals, rocks, building materials, geologic structures; applications of geology to such problems as dam sites, tunnels, foundations, highways, underground water, and flood control. Three lectures and one laboratory period or field trip per week. Second semester.

Geol. 12. Historical Geology (3)

The development of the continents and life forms; evolution based on the remains of animal and plant life preserved in the rocks. Lectures, laboratory, and field trips. *Prerequisites: Geol. 1, or 3 and 4, or 6. Geol. 4 may be taken concurrently.* Second semester.

Geol. 31. Mineralogy (3)

The principles of crystallography, with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association and alteration of minerals; a study of common minerals species and varieties, with practice in identification based on physical properties. *Prerequisite: Chem. 4 or its equivalent.* First semester.

Geol. 32. Petrology (3)

Introduction to the origin and classification of rocks. Megascopic study and identification of common rock-forming minerals and rocks in the laboratory. Lectures and laboratory. *Prerequisite: Geol. 31.* Second semester.

Geol. 42. Geologic Surveying (1)

Field and laboratory practice in methods of geologic mapping and measurement. Use of plane table and alidade, Brunton compass, aneroid barometer, hand level, topographic maps and aerial photos. *Prerequisites: Geol. 12, Math. 1, and C.E. 40, or their equivalent.* Second semester.

Geol. 43. Cartography (1)

The making and interpretation of maps; photogrammetry and the use of the stereoscope. Field and laboratory. *Prerequisite: Geol. 12.* First semester.

Geol. 141. Field Geology (3)

Practice in mapping and field work. Each student is assigned a field problem and is required to prepare a report thereon with geologic map, structure section, and collection of a full set of specimens. *Prerequisites: Geol. 223, 312.* First semester.

Mr. Willard

Geol. 146. Field Problems (3)

Essentially the same in purpose as Geol. 141, though of different content, this course may be taken separately or as a continuation of Geol. 141. *Prerequisites: Geol. 312, 223 previously or concurrently.* Second semester.

Mr. Willard

Geol. 181. Geological Problems (1-4)

Special problems in field, laboratory, and library. Specific work is assigned in individual cases. *Prerequisite: Consent of head of department.* First semester.

Messrs. Gault, Jenkins, Ryan, Whitcomb, Willard

Geol. 182. Geological Problems (1-4)

Similar to Geol. 181. Geol. 182 may be elected as a continuation of Geol. 181 or separately. *Prerequisites as for Geol. 181.* Second semester.

Messrs. Gault, Jenkins, Ryan, Whitcomb, Willard

For Advanced Undergraduates and Graduates

Geol. 223. Structural Geology (3)

The major and minor rock structures of the earth's crust. Problems of the type encountered in geological, geophysical, and mining work are studied in the laboratory and field. *Prerequisites: Geol. 12; Geol. 32 previously or concurrently.* Second semester. Mr. Ryan

Geol. 255. Mineral Resources (3)

Discussion of world mineral deposits, their distribution, occurrence and origin. Includes fuel, non-metal and metal deposits. Lectures, laboratory and visits to operating deposits. *Prerequisites: Geol. 12, 32.* First semester. Mr. Gault

Geol. 256. Mineral Resources (3)

A continuation of Geol. 255. *Prerequisite: Geol. 255.* Second semester. Mr. Gault

Geol. 311. Paleontology (3)

Morphology of plant and invertebrate fossils, their use in interpreting geologic history; evolution of the faunas and floras. Lectures and laboratory work. *Prerequisites: Geol. 12 or Biol. 1, or 31, and 32.* First semester. Mr. Whitcomb

Geol. 312. Stratigraphy (3)

The origin, history, sequence, and correlation of bedded rocks; their fossils, ages, distribution, and structures. Lectures, laboratory, and field trips. *Prerequisites: Geol. 12, 32.* Second semester. Mr. Willard

Geol. 331. Optical Crystallography (3)

The polarizing microscope and its application in the examination and identification of minerals by the immersion method and in thin-section. *Prerequisites: Geol. 12, 32.* First semester. Mr. Ryan

Geol. 332. Petrography (3)

Microscope studies of igneous, sedimentary, and metamorphic rocks in thin-section. *Prerequisite: Geol. 331.* Second semester. Mr. Ryan

Geol. 333. Descriptive Mineralogy (1-2)

The important rock-forming mineral families, their chemical properties, equilibrium relations, isomorphism, and polymorphism. Examination of selected collections. Lectures, laboratory and reports. *Prerequisite: Geol. 331, previously or concurrently.* Offered as required. First semester. Messrs. Gault and Ryan

Geol. 334. Descriptive Mineralogy (1-2)

Continuation of Geol. 333. *Prerequisite: Geol. 333.* Offered as required. Second semester. Messrs. Gault and Ryan

Geol. 342. Field Trip (1)

The spring field trip, of several days' duration, is held after mid-semester. The first part of the semester is devoted to literature, reports, and discussions germane to the announced trip. A written summary of the excursion is required of each participant. *Prerequisites: Geol. 12 and 32. Second semester, alternate years. (Offered 1958-59.)*

Geol. 344. Field Trip (1)

Similar to Geol. 342, but arranged to visit a different region. *Prerequisites: Geol. 12 and 32. Second semester, alternate years. (Offered 1957-58.)*

Geol. 361. Water Resources (3)

Occurrence and management of water resources: the hydrologic cycle; survey of water resources and problems; hydrometeorology; disposition of precipitated moisture by runoff, infiltration, and evapotranspiration; occurrence and utilization of ground water resources. Lectures, laboratory and field trips. *Prerequisite: consent of head of department. First semester. (Offered 1958-59.)*

Mr. Jenkins

Geol. 362. Soil Resources (3)

Fundamentals of soil science: physical, chemical, and organic constituents of soils; soil morphology and classification; soil moisture; plant nutrition. Land classification and problems of land utilization. Lectures, laboratory and field trips. *Prerequisite: consent of head of department. Second semester. (Offered 1958-59.)*

Mr. Jenkins

Geol. 371. Meteorology (3)

Principles of meteorology, composition of the atmosphere, physics of the air, weather phenomena, air masses and fronts, wind systems, cyclones and anticyclones, weather instruments and forecasting. First semester. *(Offered 1957-58.)*

Mr. Jenkins

Geol. 372. Climatology (3)

Climatologic observations, climatic statistics and problems, world climate types; application of climatology to man's needs and activities. Second semester. *Prerequisite: Geol. 371 or its equivalent. (Offered 1957-58.)*

Mr. Jenkins

For Graduates

Geol. 402. Advanced Physiography (3)

Detailed study of physiographic types of processes. Conferences and reports; laboratory and field work. Second semester. *(Offered 1957-58.)*

Mr. Whitcomb

Geol. 411. Advanced Paleontology (3)

Detailed study of selected groups of fossils: generic and specific differences, identifications, descriptions; preparation of fossils; paleoecology. First semester. *(Offered 1958-59.)*

Messrs. Whitcomb, Willard

Geol. 412. North American Index Fossils (2)

Study of a limited series of representative North American index fossils, their distinguishing characters, geographic distribution, geologic ranges. Laboratory work supplemented by field excursions to demonstrate stratigraphic paleontology. Second semester. (Offered as required.)

Mr. Willard

Geol. 413. Applied Stratigraphy (3)

Stratigraphic problems, laboratory preparation of collected material, megascopic and microscopic studies of sediments. First semester. (*Offered 1957-58.*)

Messrs. Gault, Ryan, Willard

Geol. 414. History of Geology (2)

The growth of geologic thought from the Greeks to the present; the great geologists, their theories, controversies and contributions. Reading, conferences, preparation of reports. Second semester. (*Offered 1958-59.*)

Mr. Whitcomb

Geol. 416. Vertebrate Paleontology (3)

The origin and evolution of the several classes of vertebrate animals based upon paleontology and comparative osteology. Lectures and laboratory supplemented by museum trips. Admission with the permission of the instructor. (Offered as required.)

Mr. Willard

Geol. 421. Tectonics (3)

The principles of structural geology; nature and origin of minor structures in crystalline and sedimentary rocks; petrofabrics. Conferences, assigned reading, laboratory and field work. First semester. (*Offered 1957-58.*)

Mr. Ryan

Geol. 432. Advanced Petrology (3)

Problems in the petrogenesis of crystalline rocks. Particular attention is directed toward the correlation of field, chemical and petrographic data. Lectures, laboratory and occasional field trips. Second semester. (Offered as required.)

Mr. Ryan

Geol. 434. Physical Crystallography (2)

An advanced course in the geometrical and physical properties of crystals, with special reference to the Goldschmidt method of crystal measurement and projection. Second semester. (Offered as required.)

Mr. Ryan

Geol. 435. Advanced Mineralogy (1-3)

A survey of the more advanced methods of mineral study such as differential thermal analysis, radiography, x-ray, and chemical methods and the application of one to an original problem. (Offered as required.) First semester.

Messrs. Gault and Ryan

Geol. 436. Advanced Mineralogy (1-3)

Similar to Geology 435. May be elected as a continuation of Geol. 435 or separately. Second semester. (Offered as required.)

Messrs. Gault and Ryan

Geol. 441. Geology of Pennsylvania (3-6)

The geology of Pennsylvania and certain other portions of the east-central United States. The stratigraphic sequence embraces the pre-Cambrian, the entire Paleozoic, most of the Mesozoic and Tertiary, the Pleistocene, and recent deposits. Structures are chiefly those of the northern Appalachians. Conferences, reading assignments, preparation of reports, and field trips. First or second semester. May also be arranged to run throughout the year. (Offered as required.)

Mr. Willard

Geol. 451. Principles of Mineral Deposits (3)

Advanced study of mineral deposits including historical development of present-day concepts, theories of origin, and principles of classification. Discussion of structure, alteration, mineralogy, and occurrence of types of metallic and non-metallic deposits throughout the world. Microscope study of ore minerals and textures. First semester. (Offered 1958-59.)

Mr. Gault

Geol. 452. Principles of Mineral Deposits (3)

Continuation of Geol. 451. Second semester. (Offered 1958-59.)

Mr. Gault

Geol. 453. Mineral Deposits of North America (3)

Description and discussions of origin of the metallic and non-metallic mineral deposits of North America and comparison with similar types throughout the world. Laboratory study of suites from important deposits including microscope examination of ores and rock slices. First semester. (Offered 1957-58.)

Mr. Gault

Geol. 454. Mineral Deposits of North America (3)

Continuation of Geol. 451. Second semester. (Offered 1958-59.)

Mr. Gault

Geol. 481. Geological Investigation (1-6)

The investigation of special problems. Field, laboratory, library work on some limited area; presentation of a report thereon. Geol. 481 may be elected separately from Geol. 482. First semester.

Messrs. Gault, Jenkins, Ryan, Whitcomb, Willard

Geol. 482. Geological Investigation (1-6)

Similar to Geol. 481. May be elected as a continuation of Geol. 481 or separately.

Messrs. Gault, Jenkins, Ryan, Whitcomb, Willard

GERMAN

Associate Professor Tremper

Assistant Professor Lazenby

Messrs. Weisstein, Glebe

First semester freshmen who have studied German in secondary school and who plan to continue the language in college will take

a placement test during freshman week. The results in the test will be taken into consideration in assigning them to the proper initial course in college.

Ger. 1. Elementary German (3)

Drill in the fundamentals of German grammar; pronunciation; simple conversation and composition; extensive outside reading of simple vocabulary-building texts. No previous study of German required. First and second semesters.

Ger. 2. Elementary German (3)

Continuation of Ger. 1. *Prerequisite: Ger. 1.* First and second semesters.

Ger. 3. Intermediate German (3)

German prose and poetry; outside reading; composition. *Prerequisite: one year of college German or two units of entrance German.* First and second semesters.

Ger. 4. Intermediate German (3)

Continuation of Ger. 3. *Prerequisite: Ger. 3.* Second semester.

Ger. 7. Scientific German (3)

Reading of selected texts in the German of science, with particular emphasis on chemistry and physics. Recitations and individual conferences. *Prerequisite: one year of college German or three units of entrance German.* First or second semester.

Ger. 9. Advanced German, Prose and Poetry (3)

Rapid reading of representative texts; collateral reading. *Prerequisite: two years of college German or three units of entrance German.* First semester.

Ger. 10. Goethe's Faust (3)

Study of Part I; lectures on the origin and development of the Faust story; collateral reading. *Prerequisite: Ger. 9 or high standing in Ger. 3, 4, or 7.* Second semester.

Ger. 13. Lessing, Goethe, and Schiller (3)

Prerequisite: Ger. 10. First semester.

Ger. 14. Lessing, Goethe, and Schiller (3)

Continuation of Ger. 13. *Prerequisite: Ger. 10.* Second semester.

Ger. 21. Conversation and Composition (3)

Brief review of the more difficult portions of German grammar; oral and written composition based on selected topics. *Prerequisites: Ger. 4 or*

HISTORY AND GOVERNMENT

high standing in Ger. 3 or three units of entrance German; consent of head of the department. First semester.

Ger. 22. Conversation and Composition (3)

Continuation of Ger. 21. *Prerequisites: Ger. 9 or Ger. 21 or high standing in Ger. 4; consent of head of the department.* Second semester.

For Advanced Undergraduates and Graduates

Ger. 211. Nineteenth Century German Drama (3)

Lectures, reading, reports on assigned work. *Prerequisite: Ger. 10.* First semester. Mr. Tremper

Ger. 212. Nineteenth Century German Drama (3)

Continuation of Ger. 211. *Prerequisite: Ger. 10.* Second semester. Mr. Tremper

Ger. 215. The German Short Story (3)

Origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. *Prerequisite: Ger. 10.* First semester. Mr. Lazenby

Ger. 216. The German Short Story (3)

Continuation of Ger. 215. *Prerequisite: Ger. 10.* Second semester. Mr. Lazenby

GOVERNMENT

See History and Government

HISTORY AND GOVERNMENT

Professors Harmon, Schulz, Aiken

Associate Professors Kyte, Cowherd, Tresolini

Assistant Professors Haight, Yates

Messrs. Brewer, Duzen, Lantz

HISTORY

Hist. 11. Development of Western Civilization (3)

The roots of Western civilization; the evolution of economic, social, and political institutions; the impact of scientific and technological developments; the influence of major trends of thought. Required of all freshman engineering students. First semester.

Hist. 12. Development of Western Civilization (3)

The modern Western world; the rise of the nation-state; the occident and the orient; the rise and decay of the older imperialisms; the role of science and idealism in both peace and war in the twentieth century. Required of all freshman engineering students. Second semester.

Hist. 13. United States History (3)

The era of constitution-making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester.

Hist. 14. United States History (3)

The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester.

Hist. 25. European History (3)

A rapid survey of some of the major historic forces from the collapse of the Roman Empire to the end of the seventeenth century. First semester.

Hist. 26. European History (3)

Continuation of Hist. 25. A survey of major developments in European history from about the year 1700 to the middle of the twentieth century. Second semester.

Hist. 27. European Expansion and Empire Building (3)

A study of the impact of European ideas and actions upon the peoples of India and Southeast Asia. First semester.

Hist. 28. European Expansion and Empire Building (3)

A study of the impact of European ideas and actions upon the peoples of China and Japan. Second semester.

Hist. 29. Modern Europe (3)

The study of revolution and reaction in western Europe between 1789 and 1870. Emphasis is laid upon the birth, growth, and spread of nineteenth-century liberal doctrines as well as upon the attempts made to stifle that growth by every political and diplomatic means available. First semester.

Hist. 30. Modern Europe (3)

A study of contemporary Europe; the origins and consequences of two World Wars; the rise of revolutionary governments in Italy, Germany, and Russia. Second semester.

Attention is called also to the following courses in history offered by other departments: Eco. 1, Industrial Evolution; Gk. 21,

Ancient History; Lat. 22, Ancient History; Gk. 183, The Economic and Social Life of the Greeks; Lat. 184, The Economic and Social Life of the Romans.

For Advanced Undergraduates and Graduates

Hist. 315. Political and Social History of England (3)

The history of the rise and growth of English political and social institutions prior to 1603. First semester. Mr. Cowherd

Hist. 316. Political and Social History of England (3)

The history of the development of English political and social institutions from the death of Elizabeth to the present. Emphasis is placed upon the political and intellectual legacy bequeathed to the modern world as a result of this development. Second semester. Mr. Cowherd

Hist. 317. The Middle East in World History (3)

A survey of the rise of civilization in the Middle East from the times of earliest recorded history until the capture of Constantinople by the Turks in 1453, with special emphasis upon the legacy of Egypt, Persia, and the Hebrew people; oriental and western ideas during Hellenistic and Roman times; rise of Byzantium; rise of Islam and the development of Islamic civilization; Crusades and final triumph of the Ottoman Turks. First semester. Mr. Aiken

Hist. 318. The Middle East in World History (3)

Continuation of Hist. 317. The relations between Europe, America, and the Middle East during the heyday and decline of Ottoman power; western imperialism in the Middle East; Zionism; the strategic importance of this great land bridge between the three continents in modern times to the present day, including the struggle for the control of communication by land, sea, and air, and the control of the vast petroleum reserves in this area. Second semester. Mr. Aiken

Hist. 319. Eighteenth Century European Civilization (3)

This course is concerned with eighteenth-century European civilization. The constitutional, political, economic and social developments within, and institutions of the more dynamic European states of Great Britain, France, Prussia, and Russia will be contrasted and compared. First semester.

Mr. Kyte

Hist. 320. Eighteenth Century European Imperialism (3)

This course is concerned with eighteenth-century imperialism. The constitutional, political, economic and social development within, and institution of the New World empires of Great Britain, France, Spain, and Portugal when at the height of their power will be contrasted and compared. Second semester. Mr. Kyte

Hist. 327. Development of American Institutions (3)

The colonial origin and national expansion of social, cultural, religious and economic institutions to 1865. First semester. Mr. Cowherd

Hist. 328. Development of American Institutions (3)

A continuation of History 327. Developments from the Civil War to the present, with emphasis on industrialization, urbanization, the populist and progressive movements, and social changes as factors in institutional development. Second semester. Mr. Cowherd

Hist. 329. American Foreign Policy (3)

The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain, Oregon and Texas; the Mexican War. First semester. Mr. Harmon

Hist. 330. American Foreign Policy (3)

The Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War of 1914-1918 and its aftermath; diplomatic events preceding Pearl Harbor; outbreak and prosecution of the war; plans for peace. Second semester. Mr. Harmon

Hist. 331. The Intellectual Expansion of Modern Europe, 1300 to 1789 (3)

A study of the heritage bequeathed to modern Europe by the cultural achievements and traditions of the Renaissance, Reformation, and the 17th century. Special attention will be paid to scientific and technological development and to the growth of political thought and theory during these centuries. First semester. Mr. Haight

Hist. 332. The Intellectual Expansion of Modern Europe, 1789 to the Present (3)

A continuation of the preceding course, the enlightenment to the present, with special attention paid to the effect upon modern thought of the industrial revolution and the rapid advancement in technology. Second semester. Mr. Haight

Hist. 341. Expansion of the English-speaking Peoples, 1100 to 1775 (3)

A study of the political, economic, and social implications of the expansion of the English-speaking peoples throughout the world from the time of the Crusades to the time of the American Revolution. First semester. Mr. Aiken

Hist. 342. Expansion of the English-speaking Peoples, 1775 to the Present (3)

A study of the political, economic, and social growth of the English-speaking communities throughout the world from the time of the American Revolution to the outbreak of World War. II. Second semester. Mr. Cowherd

Hist. 343. Tudor England (3)

Political, institutional, social and cultural history of England from 1485 to 1603. First semester. Mr. Aiken

Hist. 344. Stuart England (3)

Political, institutional, social and cultural development in England from 1603-1715. Second semester. Mr. Aiken

Hist. 349. Hispanic America in the Nineteenth Century (3)

Successful movements for independence and recognition; types of governments formed in South, Central, and Caribbean America; wars and revolutions; problems pertinent to foreign trade; application of the Monroe Doctrine and its acceptance. First semester. Mr. Kyte

Hist. 350. Hispanic America in the Twentieth Century (3)

Continuation of Hist. 349. Results of the Spanish American War; Theodore Roosevelt and "big stick" diplomacy; Panama Canal and world trade; debts and interventions; Pan-Americanism; World War I and its influence; recent United States relations with Latin America. Second semester. Mr. Kyte

Hist. 351. Special Topics in History (3)

Intensive study in an area of history not adequately covered in currently listed offerings. The field of research may be varied from time to time and the course may be administered as a reading program or otherwise as may best seem fit to meet the needs of students of unusual ability and adequate preparation. *Prerequisite: Consent of the head of department.*

Hist. 352. Special Topics in History (3)

Continuation of Hist. 351. *Prerequisite: Consent of the head of department.*

Hist. 360. History of American Political Parties (3)

Evolution of major and minor political parties, including the Federalist and Anti-Federalist, the Democratic and Republican, the Populist and Progressive; party organization and functions; the economic and sectional basis of politics; nomination and election methods; the conduct of campaigns. Summer session. Mr. Harmon

Hist. 361. A Proseminar in United States and Pennsylvania History for Teachers (3)

This course is designed to meet the certification requirements of the Pennsylvania State Council of Education, that all teachers in the public schools should have a course in United States history in which particular emphasis is placed upon the history of Pennsylvania. The following topics will be stressed in the proseminar: American colonization; racial origins; the beginnings of agriculture, industry and commerce; the expansion of the frontiers; the movement for independence; constitution-framing; the party system of government; cultural tendencies and progress toward social bet-

terment; the problem of states' versus national rights; the era of great industry. Summer session. Mr. Harmon

For Graduates

Graduate students desiring to major in history should have had at least twelve semester hours of undergraduate work that bear upon this field or in other ways should satisfy the department that they are in a position to undertake profitably the required program of study.

Candidates for the master's degree may qualify either by completing successfully thirty hours of approved course work and passing an examination covering the entire field or by completing twenty-four hours in approved courses and submitting a satisfactory thesis. Each candidate will select, upon the advice and with the approval of the head of the department, the plan better suited to his needs and abilities.

All graduate students majoring in history are expected to take Hist. 401 and 402, Research Methods in the Social Sciences.

Hist. 401. Research Methods in the Social Sciences (3)

Technique of research along the lines of historical method; training in the critical handling of documentary materials, in measuring the value of evidence, and in formal presentation of the results of research. Required of all graduate students in history and government. First semester. Mr. Kyte

Hist. 402. Research Methods in the Social Sciences (3)

In this course the emphasis will be placed upon historiography. Second semester. Mr. Kyte

Hist. 403. Modern Europe, 1789-1870 (3)

Era of Metternich; Congress of Vienna and reconstruction of Europe; industrial revolution and subsequent social reforms; France and Germany; democracy and nationalism; Second French Empire; unification of Italy and Germany. First semester. Mr. Haight

Hist. 404. Modern Europe since 1870 (3)

Latin and Teutonic Europe; Great Britain and Ireland; Russia and the Dardanelles; Turkey and Europe; nationalism and the new imperialism; World War I and the Treaty of Versailles; League of Nations; national socialism vs. democracy; thirst for power; World War II and its aftermath. Second semester. Mr. Haight

Hist. 411. England under the Tudors (3)

An intensive study of political, institutional and social history during the period 1485-1603. First semester. Mr. Aiken

Hist. 412. England under the Stuarts (3)

An intensive study of religious, political, institutional and social history during the period 1603-1760. Second semester. Mr. Aiken

Hist. 413. Modern England—The Age of Reform, 1760-1890 (3)

A study of industrial England, liberal and humanitarian reforms, and the growth of colonial self-government. First semester. Mr. Cowherd

Hist. 414. Modern England—The Age of Conflict, 1890—to the present (3)

The growth of socialism, the rise of the Labor Party, the expansion of empire, formation of the Commonwealth, and the origins and consequences of two World Wars will be studied. Second semester. Mr. Cowherd

Hist. 421. English Colonization in North America in the Seventeenth Century (3)

The activities of the overseas trading companies, proprietors, and royal governors, and the founding and development of the English colonies in the West Indies and along the shores of North America. First semester. Mr. Kyte

Hist. 422. America in the Eighteenth Century (3)

A continuation of Hist. 421, with emphasis upon the workings of the mercantile system, the evolution of colonial institutions, the development of imperial administration, and the causes, events, and results of the wars with France and the War for American Independence. Second semester. Mr. Kyte

Hist. 423. American Constitutional History (3)

The major problems involved in the growth of the powers of the national government. Summer session. Mr. Harmon

Hist. 424. American Constitutional History (3)

Continuation of Hist. 423. Summer session. Mr. Harmon

Hist. 425. The United States, 1776-1800 (3)

Revolutionary movement and the Revolution; patriots and loyalists; diplomats and diplomacy; early state constitutions and the Articles of Confederation; Constitutional Convention of 1787 and the Constitution; Federalists in control; plots and conspiracies; rise of the Republican party; downfall of the Federalists. First semester. Mr. Harmon

Hist. 426. The United States, 1800-1850 (3)

Jeffersonian democracy; territorial expansion; War of 1812; new nationalism; sectionalism; protective tariffs; slavery and expansion; Texas; Mexican War; compromise measures of 1850. Second semester.

Mr. Harmon

Hist. 427. The United States, 1850-1898 (3)

Background of the Civil War; rise of the Republican party; Buchanan's policy; election of 1860; Lincoln's attitude; views of Northern and Southern leaders; war powers of the President; downfall of the Confederacy; reconstruction; Grant's administration; big business; organized labor; granger movement; Bryan and silver; Cuba and Spain. (Not offered in 1957-58.)

Mr. Harmon

Hist. 428. The United States Since 1898 (3)

Causes and results of the Spanish-American War; insular possessions; Theodore Roosevelt's policies; Progressive movement; Wilson and reform; World War I; speculative 1920's; the great depression; Democrats in control; Franklin D. Roosevelt's domestic and foreign policies; aftermath of World War II. (Not offered 1958.)

Mr. Harmon

Hist. 431. America as a World Power (3)

The results of the Spanish-American War; the United States' Pacific possessions; Theodore Roosevelt and world affairs; Knox and "Dollar Diplomacy"; World War I; American neutrality; the United States as a belligerent; the Treaty of Versailles. First semester.

Messrs. Cowherd and Harmon

Hist. 432. America as a World Power (3)

The United States and the League; the reconstruction of Europe; the rise of Hitler; World War II and its aftermath; the Monroe Doctrine; the Good Neighbor Policy; the problems of the Pacific; China and Japan; Japan and the United States; the War with Japan; Red China and the Korean crisis. Second semester.

Messrs. Cowherd and Harmon

GOVERNMENT

Govt. 1. The Foundations of Government (3)

A survey of the basic principles and problems of government organization and operation, with emphasis on controversial issues and on the relevant political institutions and practices, both contemporary and past, of American, European, and Asiatic peoples. First and second semesters.

Govt. 2. American Political Ideas (3)

A survey of the ideas underlying and associated with the political institutions and practices of the United States. Second semester.

Govt. 3. Foreign Governments (3)

The governmental systems of foreign countries: the parliamentary systems of Great Britain and France; authoritarian government in the U.S.S.R.; democratic and authoritarian regimes in various other countries of Europe and the Americas. *Prerequisite: Sophomore standing.* First semester.

Govt. 4. Political Parties and Electoral Problems (3)

The organization, functions, and techniques of political parties; pressure groups and pressure politics; nomination and election methods. Second semester.

Govt. 6. Democracy (3)

An analysis of the theory and the practice of democratic government in selected countries. *Prerequisite: Sophomore standing.* Second semester.

Govt. 51. American National Government (3)

Constitutional principles; organization and operation of the national government; the party system; citizenship and civil rights. *Prerequisite: sophomore standing.* First semester.

Govt. 52. American State and Local Government (3)

The position of the states in the union; machinery and functions of state governments; nominations and elections; the various systems of local government. *Prerequisite: sophomore standing.* Second semester.

Govt. 101. History of Political Thought (3)

History of leading political ideas. Analysis of the views of representative ancient, medieval, and modern political philosophers of the western world. First semester.

For Advanced Undergraduates and Graduates

Govt. 351. Constitutional Law (3)

The law of the Constitution as expounded by the Supreme Court of the United States. First semester. Messrs. Schulz, Tresolini

Govt. 352. Civil Rights (3)

A study of constitutional guarantees designed to protect the individual against arbitrary, unreasonable, and oppressive government. Freedom of speech and of the press, religious freedom, freedom of assembly, property rights. Constitutional problems concerning crime and its punishment. Second semester. Messrs. Schulz, Tresolini

Govt. 354. Administrative Law (3)

Consideration of the authority, procedures, and methods, utilized by executive agencies in the administration of public policy. Analysis of the general problem of adjusting the administrative process to traditional constitutional principles. Second semester. Mr. Tresolini

Govt. 357. City Government (3)

The machinery and processes of city government in the United States; city-state and federal-city relations; the problems of metropolitan areas; forms of city government, with special emphasis on the operation of the council-manager plan. First semester. Mr. Schulz

Govt. 359. Law-making (3)

Organization and procedure of legislative and constituent assemblies. Legislative leadership. Role of administrative and judicial agencies in law-making. Pressure groups, parties, and policy determination. Direct legislation. First semester.

Mr. Tresolini

Govt. 360. Public Administration (3)

The nature of administration; problems of organization and management; public personnel policies; budgeting and budgetary systems; forms of administrative responsibility. Second semester.

Messrs. Schulz, Tresolini

Govt. 363. Contemporary Political Thought (3)

Analysis of the fundamental concepts of political science. The nature of the state, nationalism, sovereignty, law, and liberty. Constitutions; unitary and federal systems of government; authoritarianism and democracy. First semester.

Mr. Schulz

Govt. 364. Contemporary Political Thought (3)

Recent thought concerning the ethical basis of political authority and the proper role of the state in society. Analysis and appraisal of anarchism, individualism, socialism, communism, syndicalism, fascism, and other doctrines. Second semester.

Mr. Schulz

For Graduates

Graduate students desiring to major in political science should have had at least twelve semester hours of undergraduate work bearing on this field or should satisfy the department in other ways that they are qualified to pursue the required program of study.

Candidates for the master's degree in political science may qualify by completing thirty hours of approved course work and passing an examination covering the entire field or by completing twenty-four hours of approved courses and submitting a satisfactory thesis. The choice between these plans shall be made by each candidate upon the advice and with the approval of the head of the department.

All graduate students seeking the master's degree in political science shall enroll for a minimum of eighteen hours of courses in the political science field. International relations courses fall in the political science category. At least twelve hours are to be selected from the following courses, *viz.*, Govt. 451 and 452, American Political Institutions, Govt. 463 and 464, Seminar in Political Theory, and Govt. 471 and 472, Foreign Governments. Approp-

riate courses in other fields, among them economics, history, philosophy, social psychology, and sociology, may be selected to meet the total of hours required for the master's degree. Candidates for the master's degree in political science are required to take Hist. 401, Research Methods in the Social Sciences, unless the head of the department considers a waiver of this requirement justifiable in individual cases.

Govt. 451. American Political Institutions (3)

The federal and state constitutions; Congress and the state legislatures; the presidency; state governors; the judicial system; political parties; nomination and election methods; local government; the council-manager plan. First semester. (*Offered 1959-60.*)

Mr. Tresolini

Govt. 452. American Political Institutions (3)

Continuation of Govt. 451. Second semester.

Mr. Tresolini

Govt. 463. Seminar in Political Theory (3)

Theories pertaining to the nature of the state, its organization, and its functions. Authority, law, and liberty; the issue of state sovereignty; doctrines respecting the legitimate objectives of government and the proper sphere of political authority. First semester. (*Offered 1958-59.*)

Mr. Schulz

Govt. 464. Seminar in Political Theory (3)

Continuation of Govt. 463. Second semester. (*Offered 1958-59.*)

Mr. Schulz

Govt. 471. Foreign Governments (3)

The theory and development of constitutions, governments, and parties in Great Britain and the Commonwealth countries. First semester. (*Offered 1957-58.*)

Mr. Yates

Govt. 472. Foreign Governments (3)

The nature and development of governmental systems in France, Italy, Germany, the U.S.S.R., and countries of Central Europe. Second semester. (*Offered 1957-58.*)

Mr. Yates

HONORS SEMINARS

Honors Seminars are open only to students admitted to the College Honors Program (see pp. 64-66), or, in unusual circumstances, to special students approved by the Honors Council. Enrollment is limited.

Seminars are conducted with a combination of lectures, student reports, and discussion. Emphasis is placed on the development of the student's ability to conduct, report on, and defend

independent research. In addition to the scheduled seminar hours, there will be personal conferences with the instructor.

Course titles indicate only the general area in which a seminar will be conducted. The particular concepts to be considered and the material to be studied will be determined by the instructor with the concurrence of the Honors Council.

Creative Concepts 101. The Humanities (3)

A study of concepts significant in man's attempts to understand himself as an individual, his place in, and his relation to the universe, the meaning of his existence, and the way in which he should live. Material is drawn chiefly from literature, philosophy, religion, and the fine arts and music.

Creative Concepts 102. The Life Sciences (3)

A study of concepts significant in man's efforts to understand and to control the living world of which he is a part. Material is drawn primarily from biology, psychology, and geology, but also, because of the ultimate inseparability of the natural sciences, from chemistry, and physics.

Creative Concepts 103. The Physical Sciences (3)

A study of concepts significant in man's efforts to understand and use the physical universe in which he lives. Material is drawn primarily from chemistry, physics, mathematics, and astronomy, but also, because of the ultimate inseparability of the natural sciences, from biology and geology.

Creative Concepts 104. The Social Sciences (3)

A study of concepts significant in man's attempts to understand himself as a social being, his beliefs as to how men should live together and the means he has used to achieve social order. Material is drawn, depending on the orientation of individual seminars, from the political and social sciences.

INDUSTRIAL ENGINEERING

Professor Gould

Associate Professor Richardson

Assistant Professors Heiland, Kane, Brennan

Mr. Smith

I.E. 100. Industrial Employment

Following the junior year, students in the industrial and mechanical engineering curriculum are required to do a minimum of eight weeks of practical work, preferably in the work they plan to follow after graduation. A report is required. *Prerequisite: sophomore standing.*

I.E. 105. Thesis (3)

Candidates for the bachelor's degree in industrial engineering may, with the approval of the department staff, undertake a thesis as a portion of the work of the senior year. *Prerequisite: senior standing.*

I.E. 110. Engineering Economy (3)

Quantitative analysis of engineering proposals with emphasis on economic factors including recovery of first cost with a rate of return, depreciation, incremental costs and breakeven point costs; operations economy including optimum order size, crew size, and performance ratios. *Prerequisites: Eco. 3, 4. First semester.*

I.E. 114. Plant Administration (3)

The manufacturing plant, its organization, and operation. Lectures, problem exercises, trips, and collateral reading. First semester. *Prerequisite: Math. 233, previously or concurrently, or consent of instructor.*

I.E. 115. Personnel Administration (3)

Industrial personnel, their selection, training, care, and reward. Lectures, problem exercises, and collateral reading. Second semester. *Prerequisite: Math. 233 or consent of instructor.*

I.E. 116. Plant Administration (3)

Continuation of I.E. 114. *Prerequisites: I.E. 114, Math. 233. Second semester.*

I.E. 162. Industrial Management (3)

A course in the essential problems of organization and management of industrial enterprises. Planned for students other than those in engineering. *Prerequisites: Eco. 3, 4. First semester.*

I.E. 164. Industrial Management (3)

An abridgment of I.E. 114 and I.E. 116. Planned primarily for engineering students other than those in industrial engineering. *Prerequisites: Eco. 3, 4. Second semester.*

For Advanced Undergraduates and Graduates

I.E. 321. Experimental Industrial Engineering (3)

Experimental projects in selected fields of industrial engineering, approved by the instructor. A written report is required. *Prerequisites: senior standing in industrial engineering and consent of instructor.* Staff

I.E. 322. Experimental Industrial Engineering (3)

Continuation of I.E. 321. *Prerequisites: senior standing in industrial engineering and consent of instructor.* Staff

I.E. 325. Production Control (3)

The coordination of an industry's activities to produce its commodities in sufficient quantity, of proper quality, and at the right time, for the least possible cost. Lectures, problem exercises, trips, and term projects. *Prerequisites: I.E. 110, 116.* First and second semester. Mr. Heiland

I.E. 326. Quality Control (3)

Industrial inspection methods; interpretation of results, based upon statistical techniques for improvement of product quality, for better coordination between design, production, and inspection, and for reduction of cost. Lectures, problem exercises, trips, and term project. *Prerequisites: I.E. 116, Math. 234.* Second semester. Messrs. Heiland, Kane

I.E. 327. Product Engineering (3)

The relationship and application of modern industrial processes, materials, and machines to product design for improvement of production, efficiency, product life, and consumer acceptance. Lectures, problem exercises, trips, and term project. *Prerequisites: I.E. 110, 116, M.E. 102; Met. 63.* First semester. Mr. Kane

I.E. 328. Work Simplification (3)

Process and product simplification, involving method study, time study and other analysis techniques. Lectures, problem exercises, trips, and term project. *Prerequisites: I.E. 114 and 115.* First and second semesters.

Mr. Richardson

I.E. 329. Wage and Salary Administration (3)

The theory and practice of job evaluation, employee merit rating, and community wage surveys for the purpose of establishing salary levels which provide proper payment for various jobs, reward individual effort and merit, and meet competition. Lectures, problem exercises, and trips. *Prerequisite: I.E. 115.* First semester. Mr. Brennan

I.E. 330. Industrial Relations (3)

The policies, organization, and operation of an industrial relations department, based upon existing governmental regulations and current policies of organized labor. Lectures, problem exercises, and term project. *Prerequisite: I.E. 115.* Second semester. Mr. Gould

I.E. 350. Industrial Engineering Problems (1)

Comprehensive study of problems encountered in manufacturing with special attention to organizational relationships and the inter-dependence of the various functions such as quality control, production control, product engineering, labor relations and cost control. *Prerequisite: Senior standing in Industrial Engineering.* Second semester. Staff

For Graduates

The prerequisite for graduate work in industrial engineering is a course of study equivalent to that required for the B.S. in I.E. at Lehigh University. Graduates of other engineering curricula may be required to devote additional time to prerequisite and basic courses. Subject to proper approval, a graduate major may include a maximum of nine hours from the following two groups with no more than six hours from each group: (1) "400" level courses in other branches of engineering; (2) Psych. 422, Industrial Fatigue; Eco. 431, Managerial Economics; Eco. 433, Labor Management Economics.

I.E. 400. Management Policies (3)

Analysis of the factors entering into the determination of management policies; discussion of case material bearing upon the organization, location, growth, size, socialization, and control of types of industries. First semester. Mr. Richardson

I.E. 402. Personnel Policies (3)

Analysis of the factors entering into the determination of personnel policies; discussion of case material bearing on the worker and his relation to industry. Second semester. Mr. Gould

I.E. 405. Special Topics in Industrial Engineering (3)

An intensive study of some special field of industrial engineering. Staff

I.E. 406. Advanced Methods and Time Study (3)

A critical evaluation of methods and time study procedures and research techniques including systems analysis, motion picture techniques, ratio delay studies, predetermined standard times, and the construction of standard data. Mr. Richardson

I.E. 407. Operations Analysis and Control (3)

A study of planning and control activities in a manufacturing organization with emphasis on quantitative techniques of analysis. Mr. Gould

INTERNATIONAL RELATIONS

Associate Professor Joynt

Assistant Professors Dunlap, Braddick

Mr. Lapitan

I.R. 1. Diplomacy (3)

Elements of international politics; scrutiny of the methods and objectives of diplomacy, with particular emphasis upon illustrative examples drawn from contemporary affairs, portraying the forces and ideas molding the actions of statesmen, acting within and outside the established national and international institutions.

I.R. 2. Diplomacy (3)

Continuation of Int. Rel. 1. Second semester.

I.R. 11. The Diplomacy of Europe 1815-1919 (3)

The development of alliances and other associations of nations, with resultant tensions and frictions; the causes of successive wars; the character of peace settlements; the formation of international institutions. First semester.

I.R. 12. The Diplomacy of Europe Since 1919 (3)

Continuation of I.R. 11. Second semester.

I.R. 21. The Diplomacy of the Far East to 1919 (3)

The opening of China and Japan; the transformation of Japan; the partition of China; international rivalries in Korea, Manchuria, the Philippines, Southeastern Asia and the Indies; economic and territorial imperialism. First semester.

I.R. 22. The Diplomacy of the Far East Since 1919 (3)

An analysis of recent and contemporary political and economic problems confronting not only the countries of the Orient but the Western powers with interests in that region; Japan's aspirations to establish a New Order in Greater East Asia; frustration and remotivation of Japan; the spread of communism and its consequences; prerequisites for peace and security in the Far East and the Pacific region. Second semester.

I.R. 133. The Diplomacy of Russia and the Middle East to 1917 (3)

Development and expansion of the Russian Empire; principles of Russian foreign policy and their specific applications under the Tsarist and Provisional Governments, treated partially as backgrounds of Soviet policy; interaction between Russian domestic and foreign affairs. First semester.

I.R. 134. The Diplomacy of Russia and the Middle East Since 1917 (3)

A topical and chronological survey of Russian foreign relations in the Soviet period; philosophical, psychological, economic, social and other

factors, influencing the formulation and execution of foreign policy; interaction between Soviet domestic and foreign affairs. First and second semesters.

For Advanced Undergraduates and Graduates

I.R. 312. World Affairs Since 1919 (3)

The peace treaties of 1919; ideals and realities of the League of Nations, efforts to effect disarmament; resurgence of power politics as displayed by the German-Italian-Japanese Axis; appeasement; frustration; the war of 1939-1945; post-war occupation of Axis countries; problems of reconciliation of conflicting objectives and interest among the victors. (Offered Summer 1957) Mr. Joynt

I.R. 322. The Far East in World Affairs (3)

Japanese and other quests for hegemony through extension of influence and control; decline of Western prestige and power; nationalist movements; Communist China as a contestant for Power status. (Offered Summer 1957) Mr. Joynt

I.R. 334. The Soviet Union in World Affairs (3)

An appraisal of the objectives and tactics of Soviet diplomacy, with particular emphasis upon Russian status as one of the great powers and upon contemporary Soviet-American relations and their background. (Offered Summer 1958) Mr. Dunlap

I.R. 341. International Relations (3)

Pro-seminar. Basic concepts in World politics; elements in international cooperation in dealing with historic and current issues of international politics. *Prerequisite: Consent of the head of the department.* First semester. Mr. Joynt

I.R. 342. International Relations (3)

Continuation of I.R. 341. *Prerequisite: Consent of the head of the department.* Second semester. Mr. Joynt

I.R. 351. International Organization (3)

Constitutional and political character of successive agencies of international organizations, with emphasis upon the League of Nations. First semester. Mr. Braddick

I.R. 352. International Organization (3)

Continuation of Int. Rel. 351, with emphasis upon the United Nations. Second semester. Mr. Braddick

I.R. 361. International Law (3)

Consideration of the principles and rules generally recognized as binding upon the community of nations in time of peace; recognition of the exis-

tence and termination of states; nationality and protection of persons; acquisition and loss of territory; control over territorial waters; piracy; asylum, state responsibility and international claims, human rights. First semester. Mr. Dunlap

I.R. 362. International Law (3)

Settlement of disputes; principles applicable to the conduct of hostilities in wartime, rules of war; treatment of prisoners; transfer of property; establishment and disposition of "war guilt"; recognition of governments instituted by force; problems of neutrality. Second semester. Mr. Dunlap

I.R. 371. Readings in International Relations (3)

Directed studies and readings in the several fields of international relations, designed for the student who has a special competence or interest in some area not covered by regularly rostered courses. *Prerequisite: Consent of the head of the department.* First semester. Staff

I.R. 372. Readings in International Relations (3)

Continuation of I.R. 371. *Prerequisite: Consent of the head of the department.* Second semester. Staff

For Graduates

Candidates for the master's degree may qualify either by completing successfully thirty hours of approved course work and passing an examination covering the entire field or by completing twenty-four hours in approved courses and submitting a satisfactory thesis. Each candidate will select the plan better suited to his needs and abilities, upon the advice and with the approval of the head of the department, and will be required to take a comprehensive oral examination. In addition, each candidate is normally expected to possess an adequate reading knowledge of one modern foreign language.

Subject to proper approval, a graduate major may include two "400" level courses chosen from history or government. Appropriate courses in economics, philosophy, psychology, and sociology are also recommended.

I.R. 441. Seminar in International Relations (3)

Intensive analysis of selected forces, problems and principles of world politics. First semester. (Offered 1957-58) Mr. Joynt

I.R. 442. Seminar in International Relations (3)

Continuation of I.R. 441. Second semester. (Offered 1957-58). Mr. Joynt

INTERNATIONAL RELATIONS

I.R. 451. Seminar in International Organization (3)

Intensive analysis of selected agencies and activities of the League of Nations and affiliated institutions. First semester. (Offered 1959-60.)
Mr. Joynt

I.R. 452. Seminar in International Organization (3)

Continuation of I.R. 451 with emphasis upon the United Nations. Second semester. (Offered 1959-60.)
Mr. Joynt

I.R. 461. Seminar in International Law (3)

Intensive analysis of the principal theories concerning the nature of international law and its fundamental conceptions, with special studies of their application and significance in contemporary international society. First semester. (Offered 1958-59)
Mr. Dunlap

I.R. 462. Seminar in International Law (3)

Continuation of I.R. 461. Second semester. (Offered 1958-59)
Mr. Dunlap

JOURNALISM

See English

LATIN

See Classical Languages

LAW

See Accounting

MATHEMATICS AND ASTRONOMY

Professors Raynor, Shook, Pitcher

Associate Professors E. H. Cutler, Latshaw, Beale,
Wilansky, Hailperin, Hsiung

Assistant Professors Van Arnam, Carson, Bourne

Messrs. Axt, Gulden, Kassimatis, Rayna, Wyse, Dorff,
Engle, Hilt, Hudak, Nassar, Oglesby, Scott, Sloyer

In the department of mathematics and astronomy undergraduate majors are offered in mathematics, in mathematics and astronomy, and in actuarial science. For details of the requirements see the outline of major sequences in the section describing the College of Arts and Science.

Students who offer for entrance elementary and intermediate algebra, plane geometry and plane trigonometry and whose proposed course of study requires Math. 11 are required to take a placement test in mathematics during Freshman Week. Those whose performance in the test is unsatisfactory must take and pass Math. 0 before being allowed to enroll in Math. 11.

MATHEMATICS

Math. 0. Mathematics Review (0)

A review of algebra and plane trigonometry. First semester.

Math. 1. Plane Trigonometry (3)

First semester.

Math. 3. Introduction to Mathematical Analysis (3)

A selection of the mathematics underlying natural processes. A study of logical processes and the concepts of number; function; with the emphasis on understanding rather than mastery of technique; but with the realization that understanding is impossible without some mastery of technique. Logic; groups and fields; the number system; function concept; algebraic, exponential and logarithmic functions. First and second semesters.

Students who have not completed a course in plane trigonometry and who plan to take Math. 4 should take Math. 1 concurrently with Math. 3.

Math. 4. Introduction to Mathematical Analysis (3)

Continuation of Math. 3. Analytic geometry and calculus; statistics and probability. *Prerequisites: Math. 1 or entrance credit in plane trigonometry, and Math. 3.* First and second semesters.

Math. 10. General Mathematics for Students of Business (3)

Review of elementary algebra; graphs and charts, the straight line law, the law of the parabola; logarithms; arithmetic and geometric progression; the exponential law; the power law; curve fitting, permutations, combinations, and probability. First and second semesters.

Math. 11. Analytic Geometry and Calculus I (3)

The straight line; functions and graphs; differentiation of algebraic functions and of the sine and cosine; velocity and acceleration; related rates; maxima and minima; indefinite and definite integrals; area. *Prerequisite: Math. 1 or entrance credit in plane trigonometry.* First and second semesters.

Math. 12. Analytic Geometry and Calculus II (3)

Volume; arc length; centers of gravity; moments of inertia; work; fluid pressure; the conic sections; polar coordinates; differentiation and integration of transcendental functions; hyperbolic functions. *Prerequisite: Math. 11.* First and second semesters.

Math. 13. Analytic Geometry and Calculus III (3)

Technique of integration; improper integrals; parametric equations; vectors in the plane; curvature; curvilinear motion; determinants and linear equations; vectors and analytic geometry in three dimensions. *Prerequisite: Math. 12.* First and second semesters.

Math. 14. Analytic Geometry and Calculus IV (3)

Partial differentiation; multiple integrals; infinite series; Taylor's series; indeterminate forms; complex variables; elementary differential equations. *Prerequisite: Math. 13.* First and second semesters.

Math. 15. Reading Course in Mathematics (1)

Credit not to exceed one hour per semester, total credit not to exceed three hours; approval of program and written report required. *Prerequisite: Consent of head of department.* First and second semesters.

Math. 16. Solid and Spherical Geometry and Spherical Trigonometry (3)

Open to all students, particularly advised for students of astronomy. Given when there is sufficient demand. *Prerequisite: Math. 1.* First semester.

Math. 23. General Mathematics for Students of Business-Second Course (3)

Fundamental ideas of analytic geometry and calculus, and selected topics of algebra, with numerous applications to problems of business and the social sciences. *Prerequisite: Math. 10.* Second semester.

Math. 40. Mathematics of Finance (3)

Compound interest, and elementary treatment of annuities, etc. *Prerequisite: Math. 10 or 11.* Second semester.

Math. 42. Introduction to Mathematics of Statistics (3)

Frequency tables; averages; probability; the normal curve; sampling theory; correlation theory in two-way space. *Prerequisite: Math. 10.* Second semester.

Math. 43. First Course in Mathematics of Life Insurance (3)

Mathematical theory of life contingencies; preparation of life and mortality tables; computation of premiums for various life insurance policies; valuation of policies to meet statutory requirements; mathematical theory of risk and cost of insurance; computation of items for annual reports;

valuation of life annuities. *Prerequisite: Math. 40.* First or second semester.

Math. 51. Advanced Algebra (3)

Number systems; properties of integers; theory of polynomial functions and equations; determinants and systems of linear equations; elimination theory. *Prerequisite: Math. 12.* First semester.

Math. 54. Higher Geometry (3)

An introductory course in projective geometry and non-euclidean geometry. *Prerequisite: Math. 12.* Second semester.

Math. 102. Finite Differences (3)

Definition of differences of various orders; the operators Δ and E ; interpolation formulas for both equal and unequal intervals; central difference interpolation formulas; inverse interpolation; finite summation; differences of zero; relations between the operator Δ and D ; differences of a product; finite summation by parts; some modern extensions and special devise for interpolation and summation; numerous examples illustrating the use of the theory. *Prerequisite: Math. 14.* First or second semester.

Mr. Beale

Math. 123. Probability (3)

A course designed primarily for students majoring in actuarial science. *Prerequisite: Math. 14.* First semester.

Mr. Beale

For Advanced Undergraduates and Graduates

Math. 206. Applied Mathematics I (3)

Determinants and the solution of linear equations; simultaneous ordinary differential equations; Fourier series; series solutions of differential equations; Bessel functions; vector algebra and calculus; line and surface integrals; divergence theorem; Green's theorems; Stokes' theorem; geometrical and physical applications. *Prerequisite: Math. 14.* First and second semesters.

Staff

Math. 208. Applied Mathematics II (3)

Continuation of Math. 206. The Laplace transformation with applications to differential equations; partial differential equations and boundary value problems; functions of a complex variable, including conformal mapping and applications to physical problems. *Prerequisite: Math. 206.* Second semester.

Mr. Gulden

Math. 219. Principles of Analysis (3)

The real number system; limits; continuous and discontinuous functions; differentiation; integration; infinite series; absolute and uniform convergence; functions of more than one variable; implicit functions; Fourier series. Required of majors in mathematics. *Prerequisite: Math. 14.* First semester.

Messrs. Hailperin, Wilansky

Math. 220. Principles of Analysis (3)

Continuation of Math. 219. Required of majors in mathematics except majors in actuarial science. *Prerequisite: Math. 219.* Second semester.

Messrs. Hailperin, Wilansky

Math. 221. Differential Equations (3)

Special solvable non-linear equations, linear equations, transformations, and symbolic methods, solutions in series; Riccati's, Bessel's and Legendre's equations. *Prerequisite: Math. 14.* First semester.

Messrs. Cutler, Shook

Math. 233. Mathematical Statistics (3)

Moments; moment generating function; normal distribution function; Poisson distribution function; large sample theory of a single variable; linear regression and linear correlation; distribution functions of two variables; small sample distributions; the chi square distribution; Student's *t* distribution; analysis of variance. *Prerequisite: Math. 13.* First semester.

Messrs. Carson, Latshaw

Math. 234. Mathematical Statistics (3)

Continuation of Math. 233. *Prerequisite: Math. 233.* Second semester.

Messrs. Carson, Latshaw

Math. 301. Vector Analysis (3)

The theory and method of vector analysis as applied in physics and pure mathematics, with an introduction to tensor analysis. *Prerequisite: Math. 14.* First and second semesters.

Messrs. Cutler, Shook

Math. 303. Mathematical Logic (3)

An introductory course in symbolic logic designed primarily to acquaint the student with the principles of reasoning used in mathematics and with symbolic logic as a mathematical theory. Applications to relay-circuit design and programming of high speed electronic computers are discussed. First or second semester.

Mr. Hailperin

Math. 309. Theory of Probability (3)

Discrete and continuous sample spaces; random variables; conditional probability and statistical independence; binomial, Poisson and normal distribution; limit theorems; random walk problems; Markov chains; time-dependent stochastic processes. The theory will be applied to problems in statistics; physics and biology. *Prerequisite: Math. 14.* First or second semester.

Mr. Latshaw

Math. 315. Theory of Functions of a Complex Variable (3)

Algebra of complex numbers; analytic functions. Cauchy-Riemann equations; Laplace's equation; conformal mapping; integrals of complex functions; Cauchy's theorem; power series; Taylor's theorem; Laurent's theorem, residues; applications to physical and geometrical problems. *Prerequisite: Math. 206, or Math. 219.* First and second semesters.

Mr. Carson

Math. 322. Differential Equations and Harmonic Analysis (3)

Continuation of Math. 221. Partial differential equations, Fourier series, cylindrical and spherical harmonics. *Prerequisite: Math. 221 or consent of the instructor.* Second semester. Messrs. Cutler, Shook

Math. 324. Theory of Errors and Least Squares, Empirical Formulas (3)

Probability; least squares and its application in the study of errors; formation of empirical formulas; numerical methods. Designed for students engaged in experimental or observational work. *Prerequisite: Math. 14.* First and second semesters. Mr. Latshaw

Math. 340. Higher Algebra (3)

Theory of matrices and linear transformations; linear spaces; bilinear and quadratic forms. *Prerequisite: consent of instructor.* First semester. Mr. Wyse

Math. 341. Higher Algebra (3)

Some basic concepts of higher algebra; groups, rings, fields, lattices; algebra of classes; Boolean algebra. *Prerequisite: Math. 340.* Second semester. Mr. Wyse

Math. 350. Special Topics (3)

A course covering special topics not sufficiently covered in the general courses. *Prerequisite: consent of the instructor.* First or second semester. Staff

For Graduates

Math. 401. Elementary Theory of Functions of Real Variables (3)

Classes, functions and relations; postulational development of positive integers; construction of real number systems; elementary inequalities; convergence of infinite series and infinite products; real functions of real variables; derivatives; Riemann integral; existence theorems. *Prerequisite: Math. 443 or consent of the instructor.* First semester.

Messrs. Pitcher, Wilansky

Math. 402. Theory of Functions of Real Variables (3)

Lebesgue measure and the Lebesgue integral; functions of bounded variation; absolute continuity; differentiation and integration as inverse processes; multiple and iterated integrals; Fourier series; convergence in the mean; Riesz-Fischer theorem. *Prerequisite: Math. 401.* Second semester.

Messrs. Pitcher, Wilansky

Math. 405. Partial Differential Equations (3)

Classification and transformation of equations; theory of characteristics; initial and boundary value problems; Cauchy's problem for hyperbolic equations; Dirichlet's problem for elliptic equations; potential theory; Green's function; harmonic and sub-harmonic function; difference equa-

tions; applications to equations of physics. *Prerequisites: Math. 206, Math. 221.* First semester. Mr. Shook

Math. 406. Partial Differential Equations (3)

Continuation of Math. 405. *Prerequisite: Math. 405.* Second semester. Mr. Shook

Math. 409. Mathematics Seminar (3)

An intensive study of some field of mathematics such as differential equations; integral equations; mathematical logic; advanced topics in complex variable theory; etc. *Prerequisite: Consent of instructor.* First semester. Staff

Math. 410. Mathematics Seminar (3)

Continuation of Math. 409. *Prerequisite: Consent of instructor.* Second semester. Staff

Math. 416. Theory of Functions of a Complex Variable (3)

More detailed and more rigorous treatment of the theory of analytic functions than in Math. 315, with more advanced topics such as: polygenic functions, theory of conformal mapping, bilinear transformations, uniform convergence of series, analytic continuation, summability of series, multiple-valued functions. Riemann surfaces, infinite products, Weierstrass' factor theorem, Mittag-Leffler's theorem, periodic functions, elliptic functions, Gamma functions, theory of linear differential equations, Bessel functions. *Prerequisite: Math. 315.* Second semester. Mr. Carson

Math. 423. Differential Geometry (3)

The differential geometry of curves and surfaces in Euclidean space, including problems in the large. First semester. Messrs. Cutler, Hsiung

Math. 424. Differential Geometry (3)

Continuation of Math. 423. Riemannian geometry and geometry of differentiable manifolds. *Prerequisite: Math. 423.* Second semester.

Messrs. Cutler, Hsiung

Math. 431. Calculus of Variations (3)

Fundamental existence theorems of analysis; the classical theory of necessary and of sufficient conditions for relative minima of single integrals; fields of extremals and the Hamilton-Jacobi theory; numerous physical and mechanical applications and extensions, to be chosen according to the special interest of the students. Second semester. Mr. Pitcher

Math. 435. Functional Analysis I (3)

Transfinite induction; linear space: convex sets, separation theorems; linear topology; Frechet, Banach, Hilbert and Minkowski spaces, and Banach algebra; ordered spaces; reflexivity, weak and product topologies; open mapping, uniform boundedness; basis and orthogonal series; representation theorems; applications to classical analysis. Desirable preparation: Math. 401, and Math. 443. First semester. Mr. Wilansky

Math. 436. Functional Analysis II (3)

Continuation of Math. 435. *Prerequisite: Math. 435.* Second semester.
Mr. Wilansky

Math. 443. General Topology (3)

Elementary set theory; functions; order filters; concept of a topology; topological products; separation axioms; connectedness; metric spaces; metrizability; completeness; compactness; paracompactness; function spaces; selected topics from dimension theory; topology of Euclidean spaces; topological groups. First semester. Messrs. Gulden, Pitcher

Math. 444. Algebraic Topology (3)

Elementary commutative groups; simplicial complexes; homology theories; Euler-Poincare characteristic; degree of a map; combinatorial manifolds; local homology groups; Poincare duality theorem. *Prerequisite: Math. 443.* Second semester. Messrs. Gulden, Pitcher

Math. 450. Modern Algebra (3)

The development of a topic from the field of modern algebra, e.g. linear algebra, rings with minimal conditions, Galois theory of equations, valuation theory, lattice theory. Second semester.

Math. 453. Modern Methods in the Theory of Functions of a Complex Variable (3)

Analytic continuation; principle of maximum modulus; conformal representation; Taylor series analysis; integral function; Dirichlet series. *Prerequisite: Math. 416.* First semester. Mr. Carson

ASTRONOMY

Astr. 1. Descriptive Astronomy (3)

The earth as an astronomical body; the solar system; a brief introduction to sidereal astronomy. First and second semesters.

Astr. 2. General Astronomy (3)

The solar system; the sidereal system, with an introduction to celestial mechanics and astrophysics. *Prerequisite: Math. 12.* First or second semester.

Astr. 103. Practical Astronomy (3)

Instruments used; methods of taking and reducing observations to determine times, latitude, and azimuth; observatory work in which each student makes his own observations and computations in illustration of the theory studied. *Prerequisite: Astr. 2.* Second semester.

Mr. Van Arnam

Astr. 104. Stellar Astronomy and Astrophysics (3)

Introduction to astrophysics; the sun considered as a star; physical characteristics of the stars; stellar motions; binary stars; theory of binary star orbits; stellar aggregations; cosmogony. *Prerequisites: Math. 13, and Physics 16 or Physics 23.* First or second semester. Mr. Van Arnam

MECHANICAL ENGINEERING

Professor Hartman

Associate Professors Jackson, Eppes, Kreith

Assistant Professor Saad

Messrs. Benner, Adams, Terry, Yatsko, Chong,
Harmes, Hatfield, Wall

M.E. 1. Machine Shop Practice (3)

This course is given for three weeks at the local technical high school during the summer session following the sophomore year. Work on the various machine tools, use of hand tools, and the various methods of welding. Summer session.

M.E. 101. Elementary Machine Design (3)

Application of the principles of mechanics to the design of machine elements. Introduction to kinematic principles in mechanisms. *Prerequisites: C.E. 61; Mech. 11; Mech. 102 previously or concurrently.*

M.E. 102. Machine Design (3)

Continuation of M.E. 101. *Prerequisite: M.E. 101.*

M.E. 103. Advanced Machine Design (3)

Consideration of dynamic loading on design of machines; includes vibration and balancing of machines. *Prerequisites: M.E. 102; Math. 206. First semester.*

M.E. 104. Thermodynamics (3)

Energy; steady flow and nonflow equations and applications; reversible cycles; Carnot principle; fundamental temperature scale; entropy; properties of liquids; vapors, gases, and mixtures. *Prerequisites: Math. 13; Phys. 23.*

M.E. 105. Thermodynamics (3)

Flow of elastic fluids through nozzles and orifices; cycles; the steam power plant; internal combustion engines; compressors; refrigeration. *Prerequisite: M.E. 104.*

M.E. 108. Mechanical Engineering Laboratory (3)

Lectures and laboratory exercises relating to various phases of engineering laboratory technique and procedures. Includes planning, execution and analysis of tests and writing of reports. *Prerequisite: M.E. 105.*

M.E. 109. Mechanical Engineering Laboratory (3)

Continuation of M.E. 108 with emphasis on project investigations.

M.E. 110. Thesis (3)

Candidates for the degree of B.S. in M.E. may, with the approval of the director of the curriculum, undertake a thesis as a portion of the work during the senior year.

M.E. 160. Heat Power (3)

Fuels; combustion; principles of engineering thermodynamics; properties of steam; steam power plant equipment and cycles; internal combustion engines. *Prerequisites: Math. 13; Phys. 23.*

M.E. 161. Mechanical Engineering Laboratory (1)

Testing of mechanical engineering equipment. *Prerequisite: M.E. 160.*

M.E. 162. Mechanical Engineering Laboratory (1)

Instruments, fluid flow, heat transfer. *Prerequisite: M.E. 104.* First semester.

M.E. 163. Mechanical Engineering Laboratory (1)

Tests on steam engines, turbines, compressors, refrigeration equipment, internal combustion engines. *Prerequisite: M.E. 162.* Second semester.

M.E. 166. Procedures for Mechanical Design (2)

Studies of the functions of basic machine elements and their combinations. Types of loading imposed by service conditions. Static and dynamic loads. Stress analysis applied to the design of typical machine elements. *Prerequisite: Mech. 11.*

For Advanced Undergraduates and Graduates

M.E. 320. Advanced Thermodynamics (3)

Advanced topics in the field of thermodynamics. *Prerequisite: M.E. 105.*
Messrs. Eppes, Jackson, Saad

M.E. 321. Heat Transfer (3)

Conduction, free and forced convection, radiation, evaporation and condensation, mass transfer. Application to design of heat exchangers in power plant, air conditioning and refrigeration apparatus. *Prerequisites: Math. 206; C.E. 121; M.E. 105.*
Messrs. Eppes, Kreith, Saad

M.E. 322. Mechanics of Compressible Fluids (3)

Study of the behavior of compressible fluids; laminar and turbulent flow with boundary layer considerations; thermodynamic and dynamic analysis of flow of fluids. *Prerequisites: C.E. 121; M.E. 105.*
Messrs. Jackson, Kreith

M.E. 330. Air Conditioning and Refrigeration (3)

Psychrometric processes; heating and cooling load calculations; fluid flow and heat transfer principles applied to typical steam, hot water and air circulation systems; furnaces and heat transfer equipment, properties of refrigerants, analysis of refrigeration cycles and processes, applications; instrumentation. *Prerequisite: M.E. 105.*
Mr. Eppes

M.E. 333. Power Plants (3)

Study of the relation of the various pieces of power plant equipment to each other; calculations for the design of power plant elements; comparison of different types of plants driven by both steam and internal combustion engines; utilization of exhaust heat. *Prerequisite: M.E. 105 or Ch.E. 200.*
Messrs. Eppes, Jackson, Saad

M.E. 334. Internal Combustion Engines (3)

Thermodynamics of internal combustion engine cycles; theory of spark ignition engines, Diesel engines, gas turbines and jet-propulsion; carburetion, fuel injection, supercharging. *Prerequisite: M.E. 105 or Ch.E. 200.*

Messrs. Eppes, Jackson

M.E. 340. Advanced Machine Design (3)

Project work on the design of a complete machine including a study of adaptability of design for particular environmental and manufacturing considerations. *Prerequisite: M.E. 102. Second semester.* Mr. Hartman

M.E. 341. Stress Analysis for Design (3)

Analytical and experimental methods of stress analysis applied to complex machine elements; experimental determination of proper distribution of material in highly stressed parts. *Prerequisites: M.E. 102; Math. 206. First semester.* Mr. Hartman

M.E. 342. Elementary Mechanical Vibration Analysis (3)

Analysis of physical systems and setting up equations; development of significant engineering relationships. Emphasis on engineering application. *Prerequisite: Math. 206. Second semester.* Mr. Hartman

M.E. 343. Instrumentation and Automatic Control (3)

Selection, design and operation of measuring instruments. Analysis of automatic control systems for thermal, hydraulic and mechanical processes. Stability and response criteria. *Prerequisite: Math. 206.*

Messrs. Eppes, Hartman, Jackson, Kreith

For Graduates

Subject to proper approval, a graduate major in mechanical engineering may include "400" level courses in mechanics and C.E. 400 Research Methods.

M.E. 403. Advanced Mechanical Engineering Laboratory (3)

The planning, design, execution and reporting of experimental tests and investigations in mechanical engineering. Mr. Jackson

M.E. 404. Advanced Mechanical Engineering Laboratory (3)

Continuation of M.E. 403. Mr. Jackson

M.E. 420. Advanced Thermodynamics (3)

Critical review of first and second laws, entropy, and general thermodynamic equations and relations; applications to current problems in technology and research, including properties of fluids, combustion, stable and metastable states, availability, and flow processes.

M.E. 421. Advanced Thermodynamics (3)

Continuation of M.E. 420.

M.E. 423. Boundary Layer Analysis (3)

Navier-Stokes equations, laminar boundary layer theory, analysis of friction drag, heat transfer and separation; transition from laminar to turbulent flow. Turbulent boundary layer theory. Karman integral equations, Prandtl mixing length, turbulent friction drag, heat transfer and layer thickness. Flow in ducts, wakes and jets. Messrs. Eppes, Kreith

M.E. 431. Compressors and Pumps (3)

Study of centrifugal, axial flow, reciprocating and rotary compressors and pumps. Theory, design and application. Mr. Hartman

M.E. 432. Steam Turbines (3)

Theory of the steam turbine; discussion of types; design and calculation of parts; application to stationary and marine service.

M.E. 433. Steam Power Plants (3)

Design and analysis of steam power cycles. Application of regenerative and reheat principles. Feed water heating and extraction calculations. Boiler, superheater, economizer and air heater performances. Principles of heat transfer as applied to the various elements of power plant equipment. Economics of plant location, fuel selection, operating conditions.

Mr. Jackson

M.E. 434. Internal Combustion Engines (3)

History; laws of mixing, carburetion, atomization, combustion, and chemical equilibrium; heat losses; friction losses; governing; gas engine cycles; engine types. Messrs. Eppes, Jackson

M.E. 435. Internal Combustion Engines (3)

Continuation of M.E. 434. Messrs. Eppes, Jackson

M.E. 436. Gas Turbines and Jet Engines (3)

Theory of the gas turbine; discussion of types of cycles; application to stationary, marine, and aircraft installation; jet-propulsion.

Messrs. Eppes, Kreith

M.E. 440. Dynamics of Machinery (3)

Analysis of dynamic loads and the resulting stresses in machinery. Balancing of rotors. Force analysis of internal combustion engines. Dynamics of control mechanisms. Mr. Hartman

M.E. 441. Experimental Stress Analysis (3)

The application of certain experimental methods to problems of mechanical design involving static, dynamic and residual stresses. Laboratory use of brittle lacquers, strain gages, photoelasticity and analogies.

Mr. Hartman

M.E. 450. Special Topics in Mechanical Engineering (3)

An intensive study of some field of Mechanical Engineering not covered in more general courses. Staff

M.E. 451. Seminar in Mechanical Engineering (1 to 3)

Critical discussion of recent advances in Mechanical Engineering. Staff

DIVISION OF MECHANICS

Professor Beer

Associate Professor E. R. Johnston

Assistant Professors deNeufville, Osborn, Parke

Messrs. Paris, Murthy, Meynen, Wilson

Mech. 1. Statics (3)

Composition and resolutions of forces; equivalent force systems; equilibrium of particles and rigid bodies; centroids and centers of gravity; analysis of simple structures; internal forces in beams; friction; moments and products of inertia; method of virtual work. *Prerequisites: Math. 12 and Phys. 22.* First semester.

Mech. 11. Mechanics of Materials (3)

Strength and elasticity of materials; theory of stresses and strains; deflection of beams and shafts; torsion; buckling of struts. *Prerequisites: Mech. 1; Math. 13 previously or concurrently.* Second semester.

Mech. 13. Materials Testing Laboratory (1)

Experiments on wood, iron, and steel to determine the action of materials under stress and to study the physical properties of materials of construction. *Prerequisite: Mech. 11 preferably concurrently or previously.* First and second semesters.

Mech. 102. Dynamics (3)

Kinematics and kinetics of particles and rigid bodies; relative motion; dynamic equilibrium; work and energy; impulse and momentum; mechanical vibrations. *Prerequisites: Mech. 1; Math. 14.* First and second semesters.

For Advanced Undergraduates and Graduates

Mech. 301. (Mech. X) Advanced Mechanics of Materials (3)

Introduction to two-dimensional theory of elasticity; theories of failure; bending and torsion of prismatic bars; principles of indeterminate analysis; instability. *Prerequisites: Mech. 11; Math. 206 or 221, previously or concurrently.* Mt. Johnston

Mech. 302. Advanced Dynamics (3)

Elements of vector analysis; application to equilibrium and motion of a point and a rigid body; fundamental dynamical theorems and their application to engineering problems, moving frames of reference, impulsive forces, gyroscopic motion; introduction to generalized coordinates; Lagrange's equations. *Prerequisites: Mech. 102; Math. 206, or 301.* Second semester. Messrs. Beer, Osborn

Mech. 303. Mechanics of Continua I (3)

Fundamental principles of the mechanics of deformable bodies; equilibrium and compatibility equations; energy principle; potential function; conformal representation; applications to the solution of problems in elasticity, hydrodynamics, and plasticity. First semester. *Prerequisites: Mech. 301, Math. 206 or 221, C.E. 121.* Messrs. Beer, Parke

Mech. 304. Mechanics of Continua II (3)

Continuation of Mech. 303. *Prerequisite: Mech. 303.* Second semester. Messrs. Beer, Parke

Mech. 325. Aerodynamics (3)

Fundamentals of fluid mechanics applied to wing and propeller theory and to the drag of airplane parts; the Prandtl theory of lift and drag; principles of similitude, with application to wind tunnel tests. *Prerequisites: C.E. 121; Math. 206 or 301.* First semester.

Messrs. Beer, deNeufville

Mech. 326. Aerodynamics (3)

Dynamics of the airplane; performance calculations; climbing, gliding, and other types of flight; theory of stability and control. *Prerequisite: Mech. 325.* Second semester. Messrs. Beer, deNeufville

For Graduates

A graduate student majoring in Applied Mechanics is expected to possess a thorough knowledge of undergraduate mathematics and mechanics. Math. 301, 315, and 322, and Mech. 302, or their equivalents, are considered as prerequisites for graduate work in Applied Mechanics. Any of these courses which have not been taken by the student as an undergraduate should be included in his graduate program. He may then be required to present a larger number of credits than the minimum required for graduation.

Mech. 402. Advanced Analytical Mechanics (3)

Fundamental theorems and their applications; generalized coordinates, Lagrange's equations, holonomic and non-holonomic systems. Hamilton's principle; canonical equations; transformation theory; integrals of the dynamical equations. First semester. Mr. Beer

Mech. 404. Advanced Vibrations Analysis (3)

A study of the theory of vibrating systems and of the applications of this theory to mechanical and structural design. Second semester.

Messrs. Hartman, Johnston

Mech. 411. Theory of Elasticity

Theory of stress and strain; generalized Hooke's Law; equations of

equilibrium and compatibility; strain-energy function; applications to bending and torsion. *Prerequisite: Math. 206.* First semester. Mr. Raynor

Mech. 412. Theory of Elasticity and Plasticity (3)

Continuation of Mech. 411, with an introduction to the theory of plasticity. *Prerequisite: Mech. 411.* Second semester. Mr. Raynor

Mech. 415. Structural Mechanics and Elastic Stability (3)

Elastic behavior of structures and their components; problems in stability, torsion, and bending; numerical and finite difference procedures. First semester. Mr. Johnston

Mech. 416. Theory of Plates and Shells (3)

Analysis and design; applications to both reinforced concrete and steel construction. *Desirable preparation: Math. 221.* First semester.

Mr. Thurlimann

Mech. 421. Hydrodynamics (3)

Mathematical theory of incompressible fluids. Two-dimensional and three-dimensional flows of an ideal fluid in ducts and around immersed bodies; potential, conformal representation, free streamlines, vortex motion. Introduction to the study of incompressible viscous fluids. First semester. Messrs. Beer, deNeufville

Mech. 422. Advanced Mechanics of Compressible Fluids (3)

Study of subsonic and supersonic flows of compressible fluids by analytical methods. Steady and unsteady flows in ducts and around immersed bodies. Second semester. Mr. Jahn

Mech. 450. Special Problems in Applied Mechanics (3)

An intensive study of some field of Applied Mechanics not covered in more general courses. First or second semester.

Messrs. Beer, deNeufville, Johnston, Osborn, Parke

METALLURGICAL ENGINEERING

Professors Stout, Butts, Libsch

Associate Professor Conard

Assistant Professors J. H. Gross, Laxar, Murphy

Messrs. Suprinick, Proebstle

Met. 1. Introduction to Metallurgy (3)

Preliminary study of metal structure and behavior, materials and apparatus used in the metallurgical industry. Unit processes in metallurgy. Roasting, smelting, refining, furnaces, refractories, pyrometry, welding. *Prerequisites: Chem. 5, Phys. 22.* Second semester.

Met. 61. Engineering Metallurgy (2)

An abridgment of Met. 1, 102, 103, especially adapted to the viewpoint of users of metals. *Prerequisites: Chem. 5 or 16; Phys. 12 or 22.* First and second semesters.

Met. 63. Engineering Materials and Processes (3)

A study of engineering properties and materials. Methods and effect of fabrication and treatment. Application and use of materials in engineering. Primarily metals, but including plastics, ceramics, and other engineering materials. *Prerequisites: Chem. 5 or 16; Phys. 12 or 22.* First and second semesters.

Met. 64. Engineering Materials and Processes (3)

Similar to Met. 63; modified for those who will subsequently take Met. 67. *Prerequisites: Chem. 5 or 16; Phys. 12 or 22.* Second semester.

Met. 67. Metallurgical Laboratory (2)

Laboratory study of the structure, properties, and processing of metals and alloys. Microscopic examination, temperature measurement, hardness testing, equilibrium diagrams, cold deformation and annealing, age hardening, casting, heat treatment of steel, hardenability, effect of heat treatment on tensile properties and notch toughness of steel. Laboratory exercises with accompanying lectures; emphasis on report writing. *Prerequisites: Met. 61, 63, or 64; Phys. 23 and 24.* First semester.

Met. 68. Metallurgical Engineering Problems (1)

An abridgment of the problem work of Met. 112. *Prerequisites: Chem. 5, Phys. 22; Met. 1, or 61, or 63 previously or concurrently.* First and second semesters.

Met. 100. Industrial Employment

At the end of the junior year students in the curriculum of metallurgical engineering are required to secure in industrial plants at least eight weeks practical experience.

Met. 102. Ferrous Metallurgy I (2)

Study of the processes employed in the production of iron and steel. Lectures and plant visits. *Prerequisites: Met. 1, 61, 63, or 64.* Second semester.

Met. 103. Nonferrous Metallurgy (3)

Production processes and properties of copper, brass and bronze, nickel, aluminum, magnesium, titanium, zinc, lead, and other nonferrous metals and alloys. Met. 231 is desirable preparation. *Prerequisites: Met. 1, 61, 63, or 64; Met. 105.* A two or three-day inspection trip (expense about \$25.00) is required. First semester.

Met. 105. Electrochemistry and Electrometallurgy (3)

Lectures, recitations, and laboratory work concerning current and voltage in electrolysis, energy relations, electrode reactions, primary cells and storage batteries, electric furnaces, and practical applications of electricity to metallurgical processes. Desirable preparation: Met. 1, 61, or 63. *Prerequisites: Chem. 5, Phys. 24.* Second semester.

Met. 112. Problems in Iron and Steel Metallurgy (2)

A course of problems, involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships and physical chemistry of the processes. *Prerequisite: Met. 102 previously or concurrently.* Second semester.

Met. 191. Experimental Metallurgy (3)

Application of research techniques to a project in metallurgy selected in consultation with the curriculum director. *Prerequisite: Met. 340.* Second semester.

For Advanced Undergraduates and Graduates

Met. 230. Physical Metallurgy I (4)

Structure, metallic bonding, and properties of metals. Solidification, alloying, and constitution diagrams. Metallography. Deformation and annealing. Shaping. Atomic mobility and kinetics and mechanics of transformation. Lectures, laboratory, and plant visits. *Prerequisites: Met. 1, 61, 63, or 64; Phys. 23 and 24.* Mr. Libsch

Met. 231. Physical Metallurgy II (3)

Heat treatment. Corrosion. Surface treatment. Mechanical behavior. Properties and uses of metal and alloys. Sources of metallurgical failures. Lectures, laboratory, and plant visits. *Prerequisite: Met. 230.* Mr. Libsch

Met. 278. Metallurgical Reports (3)

An opportunity for the advanced student to develop the ability to collect available published information on a metallurgical subject and digest it in order to present oral reports and a comprehensive written survey. *Prerequisite: Senior standing.* Messrs. Libsch, Stout

Met. 308. Electrometallurgy (3)

The practical application of electricity to metallurgical processes; metal finishing; electroplating and electric furnaces. Lectures and laboratory work. *Prerequisite: Met. 105 or consent of instructor.* Second semester. Not offered every year. Mr. Butts

Met. 318. Theoretical Physical Metallurgy (3)

Atomic structure. Diffusion. Theories of alloying and transformation.

Dislocations. *Prerequisites: Met. 230 and 231 or the equivalent.* First semester. Mr. Conard

Met. 323. Mechanical Metallurgy (2)

Deformation and fracture of metals. Theoretical considerations and their application to service processes. Lectures and laboratory exercises. *Prerequisites: Mech. 11 and Met. 231; Met. 352 previously or concurrently.* First semester. Messrs. Gross, Stout

Met. 325. Metallurgical Practice (8)

This course is restricted to a small group of seniors selected by the department from those who apply. Three full days per week are spent at the plant of the Bethlehem Steel Company. Application of metallurgical research methods to full-scale plant operations. Application for admission to this course must be made prior to March 1 of the Junior year. Second semester. Messrs. Gross, Laxar

Met. 338. Metallurgical Colloquium (2)

An opportunity for the student to develop (1) an acquaintance with the current metallurgical literature, (2) the ability to interpret it clearly, and (3) skill in presenting oral engineering reports. *Prerequisites: Met. 105; Met. 103 and 231 previously or concurrently; senior standing in metallurgical engineering.* Messrs. Libsch, Stout

Met. 340. Research Techniques (2)

Study, analysis, and application of experimental techniques in metallurgical research. Analysis of experimental data and methods of presentation. Design of experimental programs. Recitations and laboratory. *Prerequisite: Senior standing.* First semester. Staff

Met. 352. Ferrous Metallurgy II (3)

Structure and properties of ferrous alloys as related to heat treatment and fabrication. Alloy and special-purpose steels. Lectures and laboratory. *Prerequisite: Met. 231.* First semester. Mr. Stout

Met. 358. Industrial Metallurgy (3)

An opportunity for the advanced student to integrate basic metallurgical engineering course material and to apply what he has learned in the solution of problems relating to (1) design and service requirements of metal components, (2) failure of metal components, and (3) selection of materials and processes. Discussion of specific problems to develop approach to and judgment of engineering problems involving metallurgy. Lectures, problems, and laboratory. *Prerequisites: Met. 103, 323, and 352.* Second semester. Mr. Libsch

Met. 363. Nonferrous Metallurgical Problems (2)

Principles utilized in the production of nonferrous metals. Heat balances. Thermodynamics of chemical reactions. Lectures and problem periods.

Prerequisites: Met. 68 or 112; Met. 103 or the equivalent previously or concurrently. First semester. Mr. Butts

P.D. 101. Professional Development (1)

Conference hours with the department staff for the purpose of developing the professional outlook of the engineering student. Required reading, oral reports and term papers. *Prerequisite: Senior standing.* First semester.

For Graduates

NOTE. Not all of the courses listed below will be given in any one year. Those to be given will be determined by the number of applicants at the beginning of the semester; if the number is less than six, the course may be omitted.

Chem. 334, 335, 344 and 345, Radiation Methods; Chem. 436 and 437, X-ray Research, and Phys. 363, The Physics of Solids may be included in a graduate major in metallurgy.

School of Metallurgical Engineering Practice

Lehigh University, in cooperation with the Bethlehem Steel Company, offers this graduate curriculum. It leads to the degree of Master of Science in Metallurgical Engineering Practice.

In addition to facilities at the University, a field station is maintained in the local plant of the Bethlehem Steel Company.

Work performed at the field station consists essentially of original investigations of a development and plant test nature.

The curriculum consists of twenty-four weeks practice in applying research processes to plant methods in the field station at the Bethlehem Steel Company. Requirements for the degree are completed by fifteen hours of further graduate study at the University.

Admission to the curriculum is limited to ten students. (Not offered in 1957-1958.)

Met. 401. Metallurgical Investigation and Thesis (4-6)

Investigation of some special metallurgical problems, such as an improvement or innovation in some metallurgical process, the establishment of an equilibrium diagram, the effect of heat treatment on a metal or alloy; study of the literature. The study and investigation must be embodied in a written report. *Prerequisite: undergraduate metallurgical courses in the field of the investigation.* First and second semesters.

Messrs. Butts, Conard, Libsch, Stout

Met. 402. Metallurgical Investigation and Thesis (3)

Continuation of Met. 401. First and second semesters.

Messrs. Butts, Conard, Libsch, Stout

Met. 403. Advanced Electrometallurgy (3)

Specialized study in some particular field of electrochemistry or electrometallurgy selected by the student, such as electrode reactions, thermodynamics of electrolysis, electroplating, electrolytic refining, electrothermics, electrothermal efficiencies, industrial processes. *Prerequisite: Met. 105 or the equivalent.* First or second semester.

Mr. Butts

Met. 405. Nonferrous Metallurgy (3)

Study of the metallurgy of any one or more of the nonferrous metals. Comparative properties, extractive processes and mechanical treatments. Reading of references on modern practices, and theoretical consideration of the possibilities of future development in manufacture or use. Both chemical and physical metallurgy of the metals and their alloys may be included. *Prerequisite: a course in nonferrous metallurgy.* First or second semester.

Mr. Butts

Met. 408. Advanced Physical Metallurgy I (3)

Advanced study of phase diagrams, diffusion, and phase transformations with emphasis on physical and thermodynamic aspects. Mechanism of deformation and annealing. Dislocation theory. Preferred orientation. Related topics. *Prerequisites: Met. 230, 231, and 352; Chem. 190; or the equivalent.* First or second semester.

Mr. Conard

Met. 409. Recent Developments in the Theory of Metals (3)

Current topics and new developments in theoretical physical metallurgy. The topics will vary from year to year. There will be included for example, such subjects as diffusion, magnetism, theories of alloying and equilibrium diagrams, recovery and recrystallization, grain boundaries, dislocations, and internal friction. *Prerequisite: Met. 408.* This course may be repeated for credit with consent of the instructor. Second semester.

Mr. Conard

Met. 410. The Physical Chemistry of the Metals (3)

The principal fields of physical chemistry in their relation to the extraction of metals from their ores; the refining, alloying, heat treatment, welding, and corrosion of metal systems. *Prerequisites: one undergraduate course in physical chemistry; elementary ferrous or nonferrous metallurgy or Met. 230 and 231.* First or second semester.

Mr. Stout

Met. 411. The Principles of Modern Welding (3)

The foundations in scientific principle upon which the welding processes rest; the present limitations of the various processes; the trends in new developments. the engineering, industrial, and commercial aspects of welding. *Prerequisites: Met. 230 and 231.* First or second semester.

Mr. Stout

Met. 418. Advanced Physical Metallurgy II (3)

Continuation of Met. 408. *Prerequisite: Met. 408 or permission of the instructor.* First or second semester. Mr. Conard

Met. 419. Alloy Steels (3)

The effects of alloying elements on the metallography, heat treatment, and physical properties of steel. Engineering characteristics of constructional, tool, stainless, and other alloy steels. *Prerequisites: ferrous metallurgy; Met. 231, and 352.* First or second semester. Mr. Stout

Met. 421. Surface Treatment of Metals (3)

Study of metallic surfaces, primarily steel; preparation of surfaces by machining, grinding, polishing; methods of surface hardening; corrosion and surface protection of metals; analysis of surface stresses as related to fatigue life. *Prerequisites: Met. 103, 323, 352 or equivalents.* First semester. Mr. Libsch

Met. 423. Powder Metallurgy (3)

A study of the powder metallurgy processes for forming metal parts. Discussion of metal powder production and characteristics, plastic deformation and bonding associated with pressing, the mechanism of sintering, and the nature of the sintered product; preparation of sintered alloy compacts; application of the process to special industries. *Prerequisites: Met. 102, 103, 231, 352 or equivalents.* First or second semester. Mr. Libsch

Met. 425. Metallurgical Field Station (15)

This course is restricted to those who are enrolled in the School of Metallurgical Engineering Practice. A period of approximately 24 weeks is spent in the plant of the Bethlehem Steel Company. Application of metallurgical research methods to full scale plant operations.

Messrs. Stout, Gross

MINING ENGINEERING

Professor Gallagher

Assistant Professors Brune, Adler

MINING ENGINEERING

Min. 1. Mine Surveying (1)

Methods of underground surveying; note forms; determination of true meridian and latitude; methods of carrying meridian underground through tunnels, slopes, and shafts. *Prerequisite: C.E. 40.* First semester.

Min. 2. Mineral Land Surveying (1)

Field methods and office practice on obtaining U.S. patent to mineral

lands; public land; mining claims; triangulation; aerial surveying; radio position location. *Prerequisite: C.E. 40.* Second semester.

Min. 4. Mine Surveying, Field Work (2)

Practice in surface and underground surveying; calculation of field notes; preparation of mine maps. Eight hours of field and laboratory work at an operating mine each week day for two weeks. *Prerequisite: Min. 1, which it must follow immediately.* Summer session.

Min. 100. Industrial Employment

Industrial employment in mining or a related field for eight weeks, usually in the summer following the junior year. A written report is required.

Min. 101. Mining Fundamentals (3)

Methods of prospecting; drilling, explosives, and blasting; tunneling, slope and shaft-sinking; support of workings; machines for cutting and loading. Visits to mines. *Prerequisites: Geol. 1; Phys. 24.* First semester.

Min. 161. Mining Engineering (3)

A survey of the elements of mining engineering for students in curricula other than mining engineering. Prospecting, drilling, excavation, support, mining methods, mineral preparation. *Prerequisites: Geol. 1, 4 or 6.* First semester.

For Advanced Undergraduates and Graduates

Min. 202. Methods of Mining (3)

The methods of working bedded and vein deposits, with special attention to principles involved in the selection of a mining method and to mechanization. *Prerequisites: Mech. 11, previously or concurrently; Min. 101.* Second semester. Mr. Adler

Min. 203. Mine Ventilation (3)

A study of mine atmospheres and of gases produced or encountered in mining operations; distribution and control of the ventilating current to meet requirements of safe and efficient operation; mine fires and explosions. *Prerequisites: C.E. 121, previously or concurrently; Min. 202.* First semester. Mr. Brune

Min. 204. Haulage, Hoisting, and Pumping (3)

The fundamentals of basic design, selection, and application of equipment for transportation of mineral products from working face to surface plant; sources, control and disposal of mine water. *Prerequisites: Min. 202, E.E. 160.* Second semester. Mr. Brune

Min. 205. Mining Economics (3)

Systematic exploration and examination; theory and methods of sampling; reserves; mine taxation; depreciation and depletion; valuation and reports. Visits to mines. *Prerequisites: Acctg. 104, previously or concurrently; Min. 202.* First semester. Mr. Gallagher

Min. 206. Mine Administration (2)

Mining law; mine organization and management; wage systems and trade agreements; mine safety organization and regulation; special aspects of workmen's compensation laws; personnel administration. *Prerequisite: Min. 202.* Second semester. Mr. Gallagher

Min. X. Technology of Small Particles (3)

Action and characteristics of small particles; comminution, particle measurement, dynamics, size distributions, packing arrangements, physical properties. Laboratory exercises; crushing, sizing, classification, density separation, flotation. *Prerequisite: Mech. 102, previously or concurrently.* Mr. Brune

Min. 207. Mineral Preparation (3)

Recovery of minerals from ores; machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; methods of concentration, including gravity and magnetic methods, flotation, etc.; principles of concentration applied to the preparation of coal. Visits to mills and coal washing plants. *Prerequisites: C.E. 121, previously or concurrently; Geol. 31, Chem. 38.* First semester. Mr. Brune

Min. 208. Mining Laboratory (1)

Preparation of three-dimensional drawings of mining methods. *Prerequisite: Min. 202 concurrently.* Second semester. Mr. Adler

Min. 252. Fuel Technology (3)

Solid fuels: sampling; proximate and ultimate composition of coals, calorific values, fusibility of ash; classification of coal; carbonization and gasification of fuel. Coal and gas analysis, calorimetry. *Prerequisite: Chem. 38 or equivalent.* Second semester. Mr. Gallagher

Min. 254. Advanced Mineral Preparation (3)

An extension of the study of fundamental theories of mineral preparation begun in Min. 207, with special reference to flotation of metallic and non-metallic minerals; design of flow sheets based on results of laboratory tests. *Prerequisite: Min. 207.* Second semester. Mr. Brune

For Graduates

Students desiring to do graduate work in mining engineering should consult with the head of the department with regard to their classification.

Min. 411. Mining Research (2-6)

Investigation of a problem in one of the fields of mining engineering:
(a) Mining Methods; (b) Mineral Preparation; (c) Mine Ventilation;
(d) Mining Economics. First or second semester.

Messrs. Gallagher, Brune

Min. 412. Mining Research (2-6)

A continuation of Min. 411. First or second semester.

Messrs. Gallagher, Brune

Min. 413. Advanced Mining Practice (3-9)

A continuation and amplification of undergraduate work in the major fields of mining engineering. A student may register for one, two or three of the fields in any one semester; (a) Mining Methods; (b) Mineral Preparation; (c) Mine Ventilation; (d) Mining Economics. First or second semester.

Messrs. Gallagher, Brune

Min. 414. Advanced Mining Practice (319)

A continuation of Min. 413. First or second semester.

Messrs. Gallagher, Brune

ENGINEERING GEOPHYSICS

For Advanced Undergraduates and Graduates

E.G. 201. Geophysical Methods (3)

A treatment of the fundamental principles underlying all geophysical methods; elements of theory and physical principles of instruments; physical properties of rocks and formations and methods of their determination. *Prerequisites: Geol. 1, previously or concurrently; Phys. 24.* First semester.

Mr. Gallagher

E.G. 202. Geophysical Applications (3)

A detailed study of the applications of geophysical prospecting to the fields of mining geology, and engineering. *Prerequisite: E.G. 201.* Second semester.

Mr. Gallagher

E.G. 301. Seismic and Magnetic Prospecting (3)

Seismic: elements of the theory of elastic deformations and wave propagation; a detailed study of the methods (fan shooting, refraction, and reflection); theory and description of seismographs. Magnetic: magnetic properties of rocks and minerals; theory and description of magnetic instruments; corrections, representations, and results. *Prerequisites: E.G. 202, Phys. 32.* First semester.

Mr. Gallagher

E.G. 302. Electrical and Gravitational Prospecting (3)

Electrical: the fundamental principles of the electrical prospecting methods—self potential, AC and DC equipotential, resistivity, potential-drop ratio, electromagnetic, and radio; the electrical properties of rocks and

minerals; theory and description of equipment and interpretation of results. Gravitational: a treatment of the gravitational principles and methods; pendulum, gravimeter, and torsion balance; the theory and description of gravitational instruments; corrections, interpretation, and results. *Prerequisites: E.G. 202, Phys. 32.* Second semester. Mr. Gallagher

MUSJC

Associate Professor Schempf

Assistant Professor R. B. Cutler

Band 1-8. Lehigh University Band (2)

Mus. 11. Introduction to Music (1)

A course designed for students with little or no experience in music, to stimulate intelligent listening and to develop the ability of recognizing the principal styles, forms, and materials. First semester.

Mus. 12. Introduction to Music (1)

Continuation of Mus. 11. Second semester.

Mus. 13. Introduction to Music Literature (3)

A study of the development of music from the Dark Ages to the early nineteenth century, with emphasis on the significant examples of several styles and composers. This course and its continuation, Mus. 14, are designed for students interested in learning the importance of music in Western civilization. Two one-hour periods each week will be devoted to lectures and one two-hour period to supervised listening to recordings and studying available music. The ability to read music will be an asset, but is not required for admission to this course. First semester.

Mus. 14. Introduction to Music Literature (3)

Continuation of Mus. 13. A study of music in the nineteenth and twentieth centuries, including contemporary American music. Second semester.

Mus. 15. The Symphony after Haydn (2)

A study of the representative works for symphony orchestra from Haydn to the present with emphasis on Mozart, Beethoven, Brahms, and Schumann. First semester.

Mus. 16. The Age of Handel and Bach (2)

A study and comparison of the instrumental and vocal works of Bach and Handel and their contemporaries. Second semester.

Mus. 17. Basic Musicianship (3)

Review of the fundamentals of music, including keys, clefs, scales, intervals, rhythmic and melodic notation; sight singing, ear training, and composition of melodies with simple harmonization. Emphasis will be placed upon training the ear. *Prerequisite: familiarity with bass and treble clefs.* First semester.

Mus. 18. Basic Musicianship (3)

Continuation of Mus. 17. Development of ability to write and harmonize simple chorale melodies in the style of Johann Sebastian Bach and to write simple two- and three-part forms. *Prerequisite: Mus. 17 or consent of instructor.* Second semester.

Mus. 20. Instrumentation (2)

Study of the instruments of the band and orchestra; practical work in arranging various instrumental combinations. *Prerequisite: consent of instructor.* First or second semester.

THE LEHIGH UNIVERSITY BAND

Band may be elected by suitably qualified freshmen and sophomores in place of, or in addition to without credit, military or air science and tactics. It may be carried as an optional subject by suitably qualified juniors and seniors without credit.

The Band will consist of a marching, concert, and varsity band and will provide music, as specified by the director, for convocations, athletic events, campus and radio programs and military ceremonies; during the latter to be considered an integral part of the R.O.T.C. regiment.

Except during the fall season rehearsals will be twice weekly but, in addition, provisions will be made for sectional rehearsals and individual instruction to be required of all members.

Coat, cap, trousers, and belt of uniform, musical instruments and music are furnished by the University. A deposit of \$25.00 is required from each member of the band for an instrument or uniform.

Students serving in the band receive the following awards: a charm for one year of satisfactory service; for two years of service, a sweater; three years, \$20.00 in cash; and four years, an additional \$20.00 in cash.

PHILOSOPHY

Professors Ziegler, Grünbaum
Assistant Professors Haynes, Rescher

Phil 3. Introduction to Philosophy (3)

An introductory survey of the basic problems in the theory of knowledge, explanation, causality and aesthetic theory. These problems are treated in the context of contributions by the major philosophers of the past and present. First and second semesters.

Phil. 14. Logic and Scientific Method (3)

An introductory study of the methods used in clear thinking and in the detection of fallacies. Examination of the principles used in testing scientific hypotheses and in the discovery of causes. Illustrations are drawn from the problems of everyday life. First and second semesters.

Phil. 15. Ethics: The Theory of Conduct (3)

A critical comparison of value judgments with judgments of fact; means and ends. The meaning of good, right, and justice; the bearing of ethical theory on the resolution of ideological conflicts. Consideration of the views of the classical thinkers. First or second semester.

Phil. 100. Philosophy of Contemporary Civilization (3)

A philosophical analysis of the theoretical foundations of our culture, providing a useful method for formulating policies in private and public life. Special attention is given to the nature and integration of ideals of family, industry, education, art, science, law and politics. First and second semesters.

Phil. 151. Philosophy of Art (3)

The meaning of aesthetic terms and the problem of validating aesthetic judgments in the light of past and contemporary philosophies of art. The analysis is carried out in the context of various forms of art such as painting, literature and music. First or second semester.

Phil. 171. Readings in Philosophy (2 or 3)

A course of readings in any of the various fields of philosophy; designed for the student who has a special interest in work not covered by the regularly rostered courses. *Prerequisites: senior standing and consent of instructor.* First semester.

Phil. 172. Readings in Philosophy (2 or 3)

Continuation of Phil. 171. *Prerequisites: senior standing and consent of instructor.* Second semester.

For Advanced Undergraduates and Graduates

Phil. 231. Ancient and Medieval Philosophy (3)

A history of philosophy from the beginnings of scientific and philosophical reflection in Ionia to the Renaissance. Textbook, selected dialogues of Plato, selections from Aristotle, and other collateral reading. First semester.

Messrs. Rescher, Ziegler

Phil. 232. Modern Philosophy (3)

An historical treatment of the teachings of the major philosophers from the Renaissance through Hegel, with special reference to Locke, Hume, Descartes, Spinoza, Leibniz and Kant. Textbook; selected readings in the works of the philosophers studied. Second semester.

Messrs. Rescher, Ziegler

Phil. 237. Nineteenth Century Philosophy (3)

A study of major philosophers—Hegel, Marx, Schopenhauer, Comte, Spencer and Nietzsche—on central issues of the century such as evolution, theory of knowledge and scientific method, and the philosophy of history. Readings in the works of the philosophers considered. First semester.

Mr. Rescher

Phil. 238. Twentieth Century Philosophy (3)

Major contemporary philosophic movements in America and Europe, including pragmatism, logical empiricism, idealism, realism and existentialism. Selected readings from primary and secondary sources. Second semester.

Mr. Rescher

Phil. 261. Philosophy of the Natural Sciences (3)

An analysis of the logical structure and significance of modern scientific knowledge. Critical comparison of rival theories of explanation in the physical and biological sciences. The logical structure of the Special Theory of Relativity. Fact, theory and causality. The nature of mathematical truth and the status of geometry. *Prerequisite: consent of instructor.* First and second semesters.

Mr. Grünbaum

Phil. 263. Special Topics in the Philosophy of Physics and Mathematics (3)

Consideration of philosophical issues selected from among the following topics: the theory of relativity, time and entropy, foundations of mechanics, the development of the non-Euclidean geometries, epistemological foundations of quantum theory, the principle of the conservation of energy, and foundations of the theory of probability. Not restricted to majors in physics and mathematics, and may be taken independently of any other philosophy course. *Prerequisite: consent of instructor.* First or second semester.

Mr. Grünbaum

Phil. 281. Philosophy of the Social Sciences (3)

A critical analysis of the program of achieving scientific knowledge of man, his development and his culture. Explanatory procedures and predic-

tive power in historical knowledge, the validation of psychoanalytic propositions, and the formulation of methods for analyzing social facts. *Prerequisite: consent of instructor.* First or second semesters. Mr. Haynes

PHYSICS

Professors F. E. Myers, C. W. Curtis, Emrich, Havas

Associate Professors Cheney, Hyatt, Sawyer, Spatz

Assistant Professors Jahn, McLennan, Wheeler

Messrs. Chatelain, Chivian, Craft, Dawson, Elrick, Elser, Foley, Folk, Fontheim, Goldstein, Grosse, Hardy, Johannes, Kriebel, Long, Muhl, Peterson, Ridge, Smith, Swenson, Swider, Thompson

Phys. 12. Introduction to Physics (3)

A survey course of students in the Colleges of Arts and Science and of Business Administration. A brief introduction to principal fields of physics. Lecture demonstrations, recitations, and laboratory. First semester.

Phys. 16. General Physics (3)

A continuation of Phys. 12. Lecture demonstrations and recitations. *Prerequisite: Phys. 12.* Second semester.

Phys. 17. General Physics Laboratory (2)

A laboratory course in general physics to accompany Phys. 16. *Prerequisite: Phys. 16, preferably concurrently.* Second semester.

Phys. 22. Mechanics and Properties of Matter (4)

Introduction to mechanics of solids and fluids; dynamics of point masses and rigid bodies; properties of matter. Two recitations, one lecture, and one laboratory period per week. A knowledge of trigonometry is assumed. *Prerequisite: Math. 11, previously or concurrently.* First and second semesters.

Phys. 23. Heat, Sound, and Light (4)

Wave-motion and sound; heat, introductory kinetic theory and thermodynamics; optics, with emphasis on those portions of interest to technical students. Two recitations, one lecture, and one laboratory period per week. The calculus is employed in this course. *Prerequisites: Math. 12, Phys. 22.* First and second semesters.

Phys. 24. Electricity and Magnetism (4)

Ohm's law, electric and magnetic fields, electromagnetism, induced electromotive forces, etc. Two recitations, one lecture and one laboratory period per week. The calculus is employed in this course. *Prerequisites: Math. 13, previously or concurrently; Phys. 22.* First and second semesters.

Phys. 32. Electricity and Electronics (3)

Intermediate electrical theory and introductory electronics. *Prerequisites: Phys. 24; Math. 14, previously or concurrently.* Second semester.

Phys. 100. Industrial Employment

Eight weeks industrial employment during the summer following the junior year, with submission of a written report.

Phys. 110. Electrical Laboratory (1)

Precise measurements. *Prerequisite: Phys. 24.* First semester.

Phys. 111. Electrical Laboratory (1)

Precise measurements. Continuation of Phys. 110. *Prerequisite: Phys. 24.* Second semester.

Phys. 171. Physics Proseminar (1)

Discussion of current problems in physics. Intended for seniors majoring in the field. Second semester. Mr. Spatz

Phys. 191. Laboratory Techniques (1)

Laboratory practices and glass blowing. *Prerequisites: Phys. 17 or 23 and 24.*

Phys. 192. Advanced Physics Laboratory (1 or 2)

Laboratory work of research type. Special problems assigned and the student placed largely on his own initiative. Intended for seniors majoring in the field. First semester. Messrs. Curtis, Emrich, Jahn, Sawyer

Phys. 193. Advanced Physics Laboratory (1 or 2)

Continuation of Phys. 192. Intended for seniors majoring in the field. Second semester. Messrs. Curtis, Emrich, Jahn, Sawyer

For Advanced Undergraduates and Graduates

Phys. 213. Theory of Electricity and Magnetism (3)

A continuation of Phys. 32. *Prerequisites: Phys. 32; Math. 206, previously or concurrently.* First semester. Mr. Emrich

Phys. 252. Geometrical and Physical Optics (4)

Geometrical optics and the wave theory of light, interference, diffraction, polarization, etc. One laboratory and three class periods a week. *Prerequisites: Math. 14; Phys. 23 and 24 or 16.* Second semester.

Messrs. Cheney, Hyatt

Phys. 266. Atomic and Nuclear Physics (3)

General foundations of quantum theory, special theory of relativity, atomic theory of origin of spectra, wave mechanics, atomic and nuclear structure, interaction of particles with matter, radioactivity, nuclear reactions, fission phenomena. *Prerequisites: Math. 14, Phys. 23 and 24.* First semester. Mr. Spatz

Phys. 268. Introduction to Modern Physical Theories (3)

Recent developments, Maxwell's field equations, photoelectricity, radiation, the quantum theory, X-rays, relativity, atomic and nuclear structure, and cosmic rays. Some training in physics or physical chemistry beyond the elementary level is desirable. *Prerequisites: Math. 14; Phys. 16, or 23 and 24. First semester.*

Messrs. Havas, Spatz

Phys. 269. Introduction to Modern Physical Theories (3)

Continuation of Phys. 268. *Prerequisite: Phys. 268. Second semester.*

Mr. Spatz

Phys. 270. Atomic and Nuclear Physics Laboratory (1)

Selected experiments in atomic and nuclear physics. Intended for physics and engineering physics majors. *Prerequisite: Phys. 269; preferably concurrently.*

Messrs. Jahn, Spatz

Phys. 314. The Physics of Electronics (4)

Electron and ion ballistics, electrons in metals and electron emission, electrical discharge in gases, vacuum tube characteristics and an introduction to electronic circuits. One laboratory, and three class periods a week. Some training in electrical theory beyond the level of general physics is desirable. *Prerequisites: Math. 14; Phys. 16, or 23 and 24. First semester.*

Mr. Wheeler

Phys. 315. Electric Oscillations and Electric Waves (4)

Electric oscillations and waves and high frequency phenomena. One laboratory and three class periods a week. Some knowledge of vacuum tube characteristics and circuit theory is assumed. *Prerequisites: Math. 206, Phys. 16, or 23 and 24. Second semester.*

Mr. Wheeler

Phys. 340. Heat, Thermodynamics, and Pyrometry (4)

Basic principles of heat, thermodynamics, and kinetic theory of gases with emphasis on physical systems, supplemented by practical exercises in the use of thermocouples, resistance thermometers, pyrometers, and similar instruments. One laboratory and three class periods a week. *Prerequisites: Math. 14, Phys. 16 and 17 or Phys. 23 and 24. First semester.*

Messrs. Sawyer, McLennan

Phys. X. Thermodynamics X

Basic thermodynamics in science and engineering. Work, heat, and properties of matter, and their correlation by the zeroth, first and second laws of thermodynamics. Illustrating mechanical, chemical, and electrical systems and practice. Applications are generally deferred for subsequent courses.

Phys. 362. Spectroscopy (2 or 3)

The interpretation of the findings of modern spectroscopy with particular emphasis on the theory and applications of atomic spectra. The method of obtaining data will be illustrated in laboratory problems. Two class periods per week and one optional laboratory period per week. Students desiring the laboratory work will register for three credits. Some training

beyond the elementary level in physics or physical chemistry is desirable. *Prerequisites: Math. 14, Phys. 16 and 17 or Phys. 23 and 24.* Second semester. Mr. Curtis

Phys. 363. Modern Theory of Solids (3)

Recent developments in the theory of solids with particular reference to the physics of metals. *Prerequisite: Phys. 268.* Second semester. Mr. Curtis

Phys. 367. Nuclear Reactor Physics (3)

Slowing down and diffusion of neutrons, chain reaction requirements, critical size, types of reactors, physical principles of the operation of reactors, radiation damage and radiation protection, instrumentation. *Prerequisite: Phys. 266, or Chem. 303.* Second semester. Mr. Spatz

Phys. 372. Special Topics in Physics (1-3)

A course covering selected topics not sufficiently covered in the general courses. Lectures and recitations or conferences. *Prerequisites: Math. 14, Phys. 23 and 24 or Phys. 16.* First and second semesters. Staff

For Graduates

The election of purely graduate courses in physics should ordinarily be preceded by such study of the particular field as that presented in courses in the "200" and "300" groups. A thorough knowledge of the differential and integral calculus is presupposed, and further accompanying study of mathematics is generally advisable.

E.E. 433, 434, 441, and 442, and Mech. 402 may be included in a graduate major in physics. Attention is also invited to Phil. 263.

Phys. 420. Theoretical Physics (3)

The fundamental principles of theoretical physics. The subject matter covered in this course and in Phys. 421, 422, and 423 is that generally considered necessary for more detailed work in special fields. First semester. Mr. Jahn

Phys. 421. Theoretical Physics (3)

Continuation of Phys. 420. *Prerequisite: Phys. 420.* Second semester. Mr. Emrich

Phys. 422. Advanced Theoretical Physics (3)

A continuation of Phys. 420 and 421. *Prerequisite: Phys. 421 or equivalent.* First semester. Mr. Havas

Phys. 423. Advanced Theoretical Physics (3)

Continuation of Phys. 422. *Prerequisite: Phys. 422.* Second semester. Mr. Havas

Phys. 424. Quantum Mechanics (3)

General principles of the present theory; applications to simple problems; perturbation methods; calculation of energy levels and spectral intensities; quantum theory of collision processes and of radiation; nuclear quantum mechanics. Second semester. Mr. McLennan

Phys. 425. Quantum Mechanics (3)

A continuation of Phys. 424. First or second semester. Mr. Havas

Phys. 428. Methods of Mathematical Physics (3)

The equations of theoretical physics and the methods of their solution. First semester. Mr. Wheeler

Phys. 429. Methods of Mathematical Physics (3)

Continuation of Phys. 428. Second semester. Mr. Wheeler

Phys. 440. Thermodynamics (3)

Classical and quantum thermodynamics, including the treatment of non-equilibrium systems. Second semester. Mr. McLennan

Phys. 441. Kinetic Theory (3)

The classical and quantum considerations of the kinetic theory of gases, and of statistical mechanics, with additional applications to electrical phenomena. Mr. McLennan

Phys. 452. Theory of Light (3)

The propagation of light; interference, diffraction; the measurement of wave-length; crystal optics; introduction to quantum theories of the interpretation of spectra. First or second semester.

Phys. 464. Atomic and Molecular Physics (3)

Studies of the extra-nuclear properties of atoms and molecules and the foundations of quantum theory. Mr. McLennan

Phys. 465. Nuclear Physics (3)

Studies of stable and unstable nuclei, fundamental nuclear particles, nuclear reactions, and methods of producing them. Second semester. Mr. Sawyer

Phys. 467. Nuclear Physics (3)

Continuation of Phys. 465, dealing particularly with nuclear theory. First or second semester. Mr. Havas

Phys. 472. Special Topics in Physics (1-3)

Selected topics not sufficiently covered in the more general courses. First or second semester. Staff

Phys. 474. Seminar in Modern Physics (3)

A discussion of important advances in experimental physics. First or second semester. Staff

Phys. 475. Seminar in Modern Physics (3)

A discussion of important advances in theoretical physics. First or second semester. Mr. Havas

Phys. 491. Research (3)

Research problems in experimental or theoretical physics. May be repeated for credit. First semester. Staff

Phys. 492. Research (3)

Continuation of Phys. 491. May be repeated for credit. Second semester. Staff

PSYCHOLOGY

Professor W. L. Jenkins

Associate Professor N. B. Gross

Assistant Professors Small, Millon, Weinstock, Harris, Stewart

Psych. 1. Elementary Psychology (3)

The principles of human behavior and the methods of investigation. A foundation course for all students taking further work in psychology. First and second semesters.

Psych. 12. Introduction to Psychology (3)

A survey course giving brief demonstrations and descriptions of the principal fields of psychology for students who will take but one course in psychology. This course cannot be used as a prerequisite for any other course in psychology. First and second semesters.

Psych. 16. Psychology in Business (3)

Psychological problems involved in advertising and selling; sales personnel; psychology from the standpoint of the consumer. *Prerequisite: Psych. 1.* Second semester.

Psych. 24. Elementary Tests and Measurements (3)

Basic principles of psychological tests; elementary statistics associated with testing. *Prerequisite: Psych. 1 previously or concurrently.* Second semester.

Psych. 100. Readings in Psychology (2 or 3)

Readings on organized topics selected after consultation with staff members. *Prerequisite: Psych. 1 and consent of instructor.* First and second semesters.

Psych. 111. Minor Research (2 or 3)

Assigned problems for investigation. *Prerequisites: Psych. 1 and consent of head of department.* First and second semesters.

For Advanced Undergraduates and Graduates

Psych. 303. Introduction to Clinical Psychology (3)

A critical review of clinical, diagnostic and therapeutic techniques. Theories, and concepts of intelligence, personality, and the major syndromes of psychopathology. *Prerequisite: Psych. 1.* First semester.

Psych. 304. Social Psychology (3)

A systematic survey of contemporary theoretical positions, methods of investigation, and research relating to the social determination of behavior. Attitude formation, prejudice, need and perception, national character, and personality in primitive culture. *Prerequisite: Psych. 1.* Second semester.

Psych. 308. Developmental Psychology (3)

Contemporary theories, outstanding research contributions, and methods of analysis concerning the sequential and interrelated patterns of physiological and social development. Opportunities for field work are available. *Prerequisite: Psych. 1.* Second semester.

Psych. 309. Abnormal Psychology (3)

Basic concepts employed in the analysis of behavior disorders. Experimental and clinical evidence concerning the etiology of the major psychopathological syndromes. Critical evaluation of current physiologic therapies. Lectures and observations at State Hospital. *Prerequisite: Psych. 1, and the consent of the instructor.* Second semester.

Psych. 313. Practice in Applied Psychology (3)

Individual problems and programs involving field applications of psychology will be assigned. The objective will be the development of skills and competence in using psychological materials. *Prerequisite: Consent of the head of the department.* First and second semesters.

Psych. 324. Intermediate Tests and Measurements (3)

A study of current research on psychological testing; intermediate psychological statistics. *Prerequisite: Psych. 1.* First semester.

Psych. 327. Group Testing Techniques (3)

Two recitations and three hours of practice in the principal types of group psychological tests. *Prerequisite: Psych. 1.* First semester.

Psych. 329. Physiological Psychology (3)

The physiological basis for psychological processes. Two hours of discussion and two hours of laboratory work per week. *Prerequisite: Psych. 1.* Second semester.

Psych. 335. Experimental Psychology (3)

Laboratory work and discussions covering sensory processes, simple reactions, and the more elementary aspects of perception. Two hours of discussion and three hours of laboratory work per week. *Prerequisite: Psych. 1.* First semester.

Psych. 336. Experimental Psychology (3)

Continuation of Psych. 335. Discussions and laboratory work on selected phases of attention, perception, learning, motivation, emotion, and higher thought processes. Two hours of discussion and three hours of laboratory work per week. *Prerequisite: Psych. 1.* Second semester.

Psych. 351. Industrial Psychology (3)

The application of psychological techniques to industry with emphasis on job training, incentives, fatigue, work methods, human relations, supervision and morale. *Prerequisite: Psych. 1.* First semester.

Psych. 354. Human Engineering (3)

Experimental psychology as applied to the optimal design of equipment. Survey of the human operator's capabilities. Discussion of displays and controls with emphasis on the studies upon which the designs are based. *Prerequisite: Psych. 1.* Second semester.

For Graduates

Psych. 416. Advanced Topics (3)

Lecture and discussion led by various members of the staff, covering learning, personality, and social psychology. First semester.

Psych. 417. Advanced Topics (3)

Lectures and discussion led by various members of the staff, covering perception, emotion and motivation, and physiological psychology. Second semester.

Psych. 418. Individual Testing (3)

A basic practicum course illustrating the contribution of individual tests in the assessment of intelligence and personality. First semester.

Psych. 419. Projective Techniques (3)

Administration, scoring, and basic interpretive principles of the Rorschach and TAT. Critical examination of these and allied techniques, with a view toward improving diagnostic methods through research. Second semester.

Psych. 420. Psychotherapy (3)

Review of theoretical formulations underlying the major approaches to psychotherapy. Discussion and demonstration of principles and techniques of therapeutic interviewing, psychoanalysis, and group treatment methods. First semester.

Psych. 421. Clinical Field Work (1)

Observation of therapeutic techniques and participation in diagnostic testing under supervision; case conference groups and informal discussion at affiliated hospital and clinic centers. Both semesters. May be repeated for credit.

Psych. 422. Industrial Fatigue (3)

A study of the literature on fatigue and allied phenomena, and a consideration of pertinent research in the department's bio-electric laboratory. Second semester.

Psych. 423. Design of Experiments (3)

Manipulation and control of variables in psychological research. Advanced psychological statistics, including non-parametric tests and analysis of factorial, latin square, and combinational designs. Second semester.

Psych. 424. Human Factors in Industry (Seminar) (3)

A critical study of the literature dealing with psychological research related to morale, leadership, communication and group participation in simulated and actual industrial settings, with emphasis on techniques, research methodology and relations of research findings to general psychological theory. First semester.

Psych. 428. Thesis (3)

Original investigation for the master's thesis.

Psych. 429. Thesis (3)

Continuation of Psych. 428.

The following courses will be offered in either semester but only as required for students' programs.

Psych. 430. Learning (Seminar) (3)

Examination of the current theories of learning and the major issues dividing them, together with a study of recent pertinent research.

Psych. 431. Learning (Laboratory) (3)

The laboratory course corresponding to Psych. 430.

Psych. 432. Comparative (Seminar) (3)

The development of sensory, motor, and nervous systems through the phylogenetic series, with the correlated changes in discrimination, learning, and other aspects of behavior.

Psych. 433. Comparative (Laboratory) (3)

The laboratory course corresponding to Psych. 432.

Psych. 434. Vision (Seminar) (3)

An intensive examination of special topics drawn from psycho-physical, conditioning, evoked potential, and degeneration studies.

Psych. 435. Vision (Laboratory) (3)

The laboratory course corresponding to Psych. 434.

Psych. 436. Audition (Seminar) (3)

Special topics drawn broadly from the fields of speech and hearing.

Psych. 437. Audition (Laboratory) (3)

The laboratory course corresponding to Psych. 436.

Psych. 438. Somesthesia (Seminar) (3)

Study of the cutaneous senses, kinesthesia, and static sensitivity, with major emphasis on research findings.

Psych. 439. Somesthesia (Laboratory) (3)

The laboratory course corresponding to Psych. 438.

Psych. 440. Perception (Seminar) (3)

The determinants and properties of perception; current theories and attempts at generalizations applicable to all perceptual phenomena.

Psych. 441. Perception (Laboratory) (3)

The laboratory course corresponding to Psych. 440.

Psych. 442. Motivation-Emotion (Seminar) (3)

Consideration of research findings with animals and humans in relation to the major theoretical constructs in these areas.

Psych. 443. Motivation-Emotion (Laboratory) (3)

The laboratory course corresponding to Psych. 442.

Psych. 444. Social Behavior (Seminar) (3)

Analysis of recent research and theory regarding the operation of social variables in human behavior, including such topics as opinion formation, group interaction, leadership, and attitude change.

Psych. 445. Social Behavior (Laboratory) (3)

The laboratory course corresponding to Psych. 444.

Psych. 446. Personality (Seminar) (3)

Systematic evaluation of contemporary theories of personality development and structure based on clinical, experimental, and anthropological research. Critical examination of issues dividing the major schools of psychoanalysis.

Psych. 447. Personality (Laboratory) (3)

The laboratory course corresponding to Psych. 446.

Psych. 460. Special Study (3)

Study of some special topic not covered in the regular course offerings.

Psych. 461. Non-thesis Research (3)

Original research not connected with master's or doctoral thesis.

RELIGION

Professor Eckardt

Relig. 1. Introduction to Religion (3)

An elementary study covering the following areas: The nature of the religious enterprise. Survey of the major religious traditions. Introduction to the Old and New Testaments. The questions religion seeks to answer. The place of religion in society. First and second semesters.

Relig. 6. Old Testament (3)

Study of Old Testament writings, with emphasis on early religious traditions of the Hebrews; the history of Israel from the founding of the Kingdom through the post-exilic period; social, economic and political influences on Jewish religion; the prophetic movement; the Law; the Temple and its worship; and the importance of Jewish religion for Christianity and for mankind. First semester.

Relig. 7. New Testament (3)

Study of New Testament writings, with emphasis on the four Gospels, the Acts of the Apostles and the major Epistles. The life and teachings of Jesus and of St. Paul. The theological viewpoint of the primitive Church as reflected in the New Testament. Second semester.

Relig. 13. Great Living Religions (3)

Consideration of the major ways men around the world have manifested an "ultimate concern." Study of the major faiths of India, the Orient and the Near East. Similarities and differences between Eastern and Western religious traditions. Some attention to recent developments in world religions. First semester.

Relig. 14. Protestantism, Catholicism and Judaism (3)

Analysis of the traditions, beliefs and practices of the major faiths in America today. Some attention to recent trends in church and synagogue. Second semester.

Relig. 23. Christian Ethics (3)

Analysis of the basis in Biblical and Christian faith for personal and social morality. Application of Judeo-Christian ethical principles to problems of sex and marriage, vocation, interfaith relations, the race question, politico-economic life, and international relations. First or second semesters.

Relig. 101. Religion in Society and Culture (3)

This course considers the role of religion in different human societies and the ways in which religious interpretations of life are related to such forms of human creativity as science, technology, art, language, and education. First or second semester.

Relig. 116. Persistent Questions in Religion (3)

Consideration of the following questions: Why do we have religion? Can the existence of God be proved? What is faith? Does faith conflict with reason and science? How may religious knowledge and certainty be achieved? What is man? Why do men suffer? Why do men sin? What is prayer? Do miracles happen? Is there a life beyond this one? Second semester.

RESERVE OFFICERS TRAINING PROGRAM

The Reserve Officers' Training Program at Lehigh University consists of the Army Reserve Officers' Training Corps and the Air Force Reserve Officers' Training Corps. The activities of this program are conducted under the Department of Military Science and Tactics and the Department of Air Science.

A member of the University Administrative Staff, appointed by the President of Lehigh University, serves as Coordinator for the Reserve Officers' Training Program.

By action of the trustees and faculty of the University, the four-semester course of instruction in either Basic Military Science and Tactics or Air Science is required for graduation with a baccalaureate degree. Normally those students who have served three months or more in any branch of the Armed Forces of the United States are relieved of this requirement and are neither required nor expected to substitute academic work therefore. Eligibility to membership in the Basic Program is limited by law to students who are citizens of the United States between the ages of 14 and 23 years. Upon recommendation of the director of the Student's Health

Service, a student may be exempted by reason of physical disability. Members of the University band are relieved from one semester of Basic Program for each semester of satisfactory participation in the band. However this credit cannot be used for entrance into the Advanced Course. Students transferring from other institutions may be exempt from part or all of the required number of hours in the Reserve Officers' Training Program, depending upon the amount of credit allowed at the time of admission. Students pursuing Military or Air Science courses are eligible to be selected for deferment from induction under the Selective Service Law. The number of deferments which may be granted is limited by existing Department of Defense directives.

Qualified students may apply for and be accepted into the Advanced Program, with a commission as Second Lieutenant in the United States Army or Air Force Reserves as the objective. To be eligible for consideration and admission to the advanced program, a student must be a citizen of the United States between the ages of 14 and 25 for Air Force, and between the ages of 14 and 27 for Army, must be of good moral character, must have completed the Basic Course or received credit in lieu thereof and must successfully complete the prescribed physical examination and officer qualification tests. The approval of the respective department head and the President of the University is also required for admission to the advanced program. All students enrolled in the advanced program are required to attend Summer Camp for a period of four weeks for the Air Force and six weeks for the Army, normally between the Junior and Senior years.

Students selected for admission to the advanced program are required to sign a written agreement to fulfill certain conditions prescribed by law and regulations. The student, by signing the contract, does not become a member of the Armed Forces of the United States.

Uniforms, textbooks and equipment are furnished by the government to basic students. Advanced students are furnished textbooks and equipment and given a uniform and subsistence allowance. A cash deposit of \$25.00 is required of all students at the time of registration. The deposit is refunded to the student upon his return of all issued property.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS

Colonel Molter

Lt. Colonel Simmons

Majors Butch, Westfall, Rankin, Duggan

Captains Simpson, Kirkpatrick, Durst

Master Sergeants White, Podolsky, Mills, Walters, Webb

Sergeant First Class Krygier

Sergeants Brown, Bush

The Army Reserve Officers' Training Corps was established at Lehigh University in September 1919. The military courses are conducted under Department of the Army regulations as specified in their General Military Science Program.

The general objective of this course of instruction is to produce junior officers who by their education, training, and inherent qualities are suitable for continued development as officers in the United States Army. Instruction will cover military fundamentals common to all branches of the service. The aim is to provide a basic military education and to develop individual character and attributes essential to an officer.

Duration of the complete course of instruction comprises four years divided into Basic and Advanced.

BASIC COURSE. The basic course consists of the freshman and sophomore years. The uniform consists of a blouse, trousers, cap, shoes, socks, shirts, belt, and necktie, and is worn as required to drills and designated classes.

During his sophomore year, the cadet is given an opportunity to apply for the advanced program.

ADVANCED COURSE. Students selected to pursue the advance course receive training in subjects which will prepare him for a commission in the officer corps and is given the fundamentals of leadership. The instruction is supplemented by application of various functions and procedures involving student participation in the operation of the ROTC program and in allied extra curricular activities.

At the beginning of the second year of Advanced Military Science outstanding students are designated as Distinguished Military Students. If, upon graduation, these required standards are

maintained, he is designated as a Distinguished Military Graduate. Distinguished Military Graduates may apply and secure direct appointments in the Regular Army.

BASIC COURSES

M.S. 1. Basic Military Science (2)

Fundamental military training common to all branches of the Army to include an understanding of the organization of the Army, an orientation on ROTC, an introduction into the mechanical functioning and employment of individual weapons and marksmanship, an introduction into American military history. Leadership training provided through drill experience together with an indoctrination in military courtesy and customs of the service. Two recitations and two hours drill a week. First or Fall semester freshman year.

M.S. 2. Basic Military Science (2)

Continuation of M.S. 1. Second or Spring semester freshman year.

M.S. 3. Basic Military Science (2)

To make the student proficient in the use of maps and aerial photographs, to familiarize the student with all types of Infantry crew-served weapons, to provide him with a knowledge of firepower potential and gunnery principles. Leadership training is continued emphasizing the functions, duties and responsibilities of junior leaders. Two recitations and two hours drill a week. First or Fall semester sophomore year.

M.S. 4. Basic Military Science (2)

Continuation of M.S. 3. Second or Spring semester sophomore year.

ADVANCED COURSES

M.S. 101. Advanced Military Science (3)

To develop an understanding of the principles, methods, and techniques which are fundamental to military instruction; to show the student proven practices and devices which tend to make the leader effective; to supply sufficient background information on the various branches of the Army to assist the student in selecting the branch of service he desires; to provide the student with the principles and fundamentals of small unit tactics and communications; to further develop leadership potential by emphasizing the functions, duties and responsibilities of leaders of the first three non-commissioned and/or the junior officer grades. Four recitations and two hours drill a week. First or Fall semester junior year.

M.S. 102. Advanced Military Science (3)

Continuation of M.S. 101. Second or Spring semester junior year.

M.S. 103. Advanced Military Science (3)

To provide advanced military training to include the phases of Operations, Logistics, Military Administration and Personnel Management, Service Orientation, and School of the Soldier and Exercise of Command. Four recitations and two hours of drill a week. First or Fall semester senior year.

M.S. 104. Advanced Military Science (3)

Continuation of M.S. 103. Four recitations and two hours of drill a week. Second or Spring semester senior year.

DEPARTMENT OF AIR SCIENCE

Colonel Earl J. Berryhill

Lt. Colonel Dale E. Altman

Major Donald J. Glenn

Captains Poston, Fredrics, Willey

1st Lieutenant Thomas

Master Sergeants Rickenbach, Allen

Technical Sergeant Hale

Staff Sergeants Beagle, Fordyce, Ehrenberger, Rogers

An Air Force unit of the Reserve Officers' Training Corps was first established at Lehigh University in October, 1946. Upon implementation of the National Defense Act of 1947, the Air Force unit was organized and designated as the Air Force Reserve Officers' Training Corps. The Air Science courses are conducted under Department of the Air Force directives and consist of four semesters of Basic AFROTC instruction and four semesters of Advanced AFROTC instruction.

Qualified sophomore Air Science students, regardless of academic field of study, may submit applications for admission into the Advanced AFROTC course. Successful applicants pursue a generalized AFROTC course of study with emphasis being placed upon leadership training in Air Science academic classes, leadership laboratories, and AFROTC extra-curricular activities. During the two years of the Advanced AFROTC program, the cadet serves as a cadet officer and progresses in rank commensurate with demonstrated leadership ability.

ORIENTATION FLIGHTS. A comprehensive program of orientation flights in United States Air Force aircraft is offered during

each school year. It is not mandatory for students to participate in these flights and AFROTC cadets may participate only with the consent of their parents or guardians. During these flights, students become familiar with the characteristics of aircraft in flight and they observe Air Force procedures at first hand. These flights are conducted by thoroughly experienced Air Force pilots.

INSPECTION TRIPS. Inspection trips to Air Force Bases are required for the Juniors and Seniors in Air Force 101 and 102 and 103 or 104. There will be only one required inspection trip in each year's work.

EXTRA CURRICULAR ACTIVITIES. AFROTC cadets normally extend their academic and leadership laboratory associations into extra curricular activities. AFROTC cadet organizations include the AFROTC Cadet Corps, the Arnold Air Society, the Sabre Society (including a crack drill team), and the AFROTC Rifle Team. Some of the cadet sponsored activities include the Air Force Prom, the Air Force Tea, the Military Ball, the Awards and Decorations Ceremony and the Commissioning Ceremony.

The parents and friends of AFROTC cadets are cordially invited to attend these social and military activities as guests of the Air Science Department.

Basic Air Force ROTC Courses

A.S. 1. Freshman Air Science (2)

An introduction to AFROTC including a study of leadership traits and their development through self-discipline. A study of aviation to include the development of the airplane and airpower, aircraft types and nomenclature, elementary aerodynamics, supersonic flight characteristics, and aircraft propulsion systems. The organization and use of armed forces, with emphasis on Air Power, as military instruments of national security policy. The employment of Air Forces as a tool of war. Leadership laboratory—basic leadership training in military fundamentals. First semester.

A.S. 2. Freshman Air Science (2)

An introduction to political geography and international relations, to include fundamentals of global geography, factors of national power, survival and growth policies of political states, international tensions, and collective security organizations. A study of communism and the rise of the Soviet Union, the role of the United States as a world leader of nations, opposing ideologies and the threat to world peace, and the effects of airpower on the international scene. Leadership laboratory—basic leadership training in military fundamentals. Second semester.

A.S. 3. Sophomore Air Science (2)

A study of careers in the Air Force; the nature and techniques of aerial warfare; types of targets and air intelligence; conventional weapons, atomic weapons; guided missiles; biological weapons and psychological warfare. Leadership laboratory. First semester.

A.S. 4. Sophomore Air Science (2)

Continuation of A.S. 3. Factors governing the design and types of combat aircraft; problems associated with aerial combat operations, location of Air Bases and Air Base Systems. Leadership laboratory. *Prerequisite: A.S. 3.* Second semester.

Advanced AF ROTC Courses

A.S. 101. Junior Air Science (3)

The responsibility of command; the organization and functions of an Air Force staff; creative problem-solving; the study of communication media within the Air Force and instructing in the Air Force. Leadership laboratory. First semester.

A.S. 102. Junior Air Science (3)

A study of Military Justice Systems; aerial navigation utilizing dead reckoning, radio and radar; weather as related to aircraft operations; the organization and function of an Air Force Base. Leadership laboratory. Second semester.

A.S. 103. Senior Air Science (3)

Critique of Summer Camp; Principles of Leadership and Management, including responsibilities and requirements of a leader; Military Aviation and the Evolution of Warfare. Leadership laboratory. First semester.

A.S. 104. Senior Air Science (3)

Military Aspects of World Political Geography, including a study of strategic areas and changing patterns of world politics; Problems in world security; Career Guidance Program; Briefing for Commissioned Service. Leadership laboratory. Second semester.

ROMANCE LANGUAGES

Professor Barthold

Assistant Professors Farne, Isar

Mr. Stamm

FRENCH

Fr. 1. Elementary French (3)

Basic French grammar illustrated by oral and written exercises. Attention paid to correct pronunciation of simple spoken French. No previous study of French required. First and second semesters.

Fr. 2. Elementary French (3)

Continuation of Fr. 1, with the addition of the use of simple vocabulary-building texts. *Prerequisite: Fr. 1.* First and second semesters.

Fr. 11. Intermediate French (3)

Reading based on works of the nineteenth and twentieth century writers; formal review of French grammar; prose composition; outside reading. *Prerequisite: one year of college French or two units of entrance French.* First and second semesters.

Fr. 12. Intermediate French (3)

Continuation of Fr. 11. *Prerequisite: Fr. 11.* First and second semesters.

Fr. 13. Types of French Literature (3)

Training in the ability to read and understand representative works from the Middle-Ages to the twentieth century. Conducted in French. *Prerequisites: Two years of college French or 3 units of entrance French.* First semester.

Fr. 14. Types of French Literature (3)

Reading and discussion of representative works of the twentieth century. Outside reading and reports. Conducted in French. *Prerequisites: Two years of college French or 3 units of entrance French.* Second semester.

Fr. 21. Seventeenth Century French Literature (3)

The age of classicism. Lectures, study of texts, collateral readings, and reports. *Prerequisites: Two years of college French or 3 units of entrance French.* First semester.

Fr. 22. Eighteenth Century French Literature (3)

The rise of liberalism as reflected in the writings of Montesquieu, Diderot, Rousseau, and Voltaire. *Prerequisites: Two years of college French or 3 units of entrance French.* Second semester.

Fr. 31. Nineteenth Century French Literature (3)

Main literary currents of the nineteenth century; romanticism and realism: Lectures, reports, collateral readings. *Prerequisites: Two years of college French or 3 units of entrance French.* First semester.

Fr. 32. Nineteenth Century French Literature (3)

Continuation of Fr. 31. *Prerequisite: Fr. 31.* Second semester.

Fr. 41. French Oral and Written Composition (3)

For students who wish a greater opportunity for practice in the oral and written use of French than can be provided in the literature courses. *Prerequisites: Two years of college French or 3 units of entrance French.* First semester.

Fr. 42. French Oral and Written Composition (3)

Continuation of Fr. 41. *Prerequisite: Fr. 41.* Second semester.

For Advanced Undergraduates and Graduates

Fr. 221. French Literature before the Seventeenth Century (3)

Survey of French literature from its beginning through the sixteenth century. *Prerequisite: Fr. 42.* First semester. Mr. Barthold

Fr. 222. Contemporary French Literature (3)

Prerequisite: Fr. 42. Second semester Mr. Farne

Fr. 223. Proseminar (3)

Study of the works of some author or group of authors or of a period. *Prerequisite: Fr. 42.* First semester. Mr. Barthold

Fr. 224. Proseminar (3)

Continuation of Fr. 223. *Prerequisite: Fr. 223.* Second semester. Mr. Farne

ITALIAN

Ital. 1. Elementary Italian (3)

Grammar; composition; rapid reading of easy modern prose. No previous study of Italian required. First semester.

Ital. 2. Elementary Italian (3)

Continuation of Ital. 1. *Prerequisite: Ital. 1.* Second semester.

Ital. 11. Intermediate Italian (3)

The age of Dante. Lectures in English on Dante and his contemporaries; readings in the *Divina Commedia*. *Prerequisite: one year of college Italian or two units of entrance Italian.* First semester.

Ital. 12. Intermediate Italian (3)

The Romantic Period—lectures in English, and selected readings from the works of Manzoni and Leopardi. *Prerequisite: one year of college Italian or two units of entrance Italian.* Second semester.

PORTUGUESE

Port. 1. Elementary Portuguese (3)

A study of Portuguese grammar and forms; practice in writing and speaking Portuguese. *Prerequisite: consent of instructor.* First semester.

Port. 2. Elementary Portuguese (3)

Continuation of Port. 1. *Prerequisite: Port. 1.* Second semester.

SPANISH

Span. 1. Elementary Spanish (3)

Basic Spanish grammar illustrated by oral and written exercises. Attention paid to correct pronunciation of simple spoken Spanish. No previous study of Spanish required. First and second semesters.

Span. 2. Elementary Spanish (3)

Continuation of Span. 1, with the addition of the use of simple vocabulary-building and reading texts. *Prerequisite: Span. 1.* First and second semesters.

Span. 11. Intermediate Spanish (3)

Reading of modern Spanish prose, with a view to acquiring exactness and speed in reading; rapid review of grammar with prose composition. *Prerequisite: one year of college Spanish or two units of entrance Spanish.* First and second semesters.

Span. 12. Intermediate Spanish (3)

Continuation of Span. 11. *Prerequisite: Span. 11.* First and second semesters.

Span. 21. Introduction to Spanish Fiction (3)

Readings and discussion of selected novels and short stories; outside reading and reports. Conducted in Spanish. *Prerequisite: two years of college Spanish or three units of entrance Spanish.* First semester.

Span. 22. Introduction to Spanish Drama (3)

Reading and discussion of selected plays; outside reading and reports. *Prerequisite: two years of college Spanish or three units of entrance Spanish.* Second semester.

Span. 31. Spanish Conversation and Composition (3)

For students who wish a greater opportunity for practice in the oral and written use of Spanish than can be provided in the literature courses. Conducted in Spanish. *Prerequisite: two years of college Spanish or three units of entrance Spanish.* First semester.

Span. 32. Spanish Conversation and Composition (3)

Continuation of Span. 31, with special attention given to Latin-American area studies. Conducted in Spanish. *Prerequisite: Span. 31.* Second semester.

For Advanced Undergraduates and Graduates

Span. 221. Spanish Fiction of the Golden Age (3)

The Spanish novel of the sixteenth and seventeenth centuries, with special attention to Cervantes' *Don Quixote*. Lectures, collateral readings, and reports. *Prerequisite: Span. 22 or 32.* First semester.

Span. 222. Spanish Drama of the Golden Age (3)

Selected plays by Lope de Vega, Tirso de Molina, Ruiz de Alarcon and Calderon. Lectures, collateral readings, and reports. *Prerequisite: Span. 22 or 32.* Second semester.

Span. 223. Proseminar (3)

A study of the works of some author or group of authors or of a period. *Prerequisite: Span. 221 or 222.* First semester.

Span. 224. Proseminar (3)

Continuation of Span. 223. *Prerequisite: Span. 223.* Second semester.

Span. 231. Spanish American Literature (3)

Brief survey of the whole field of Spanish American literature, with emphasis on works of modern writers. *Prerequisite: Span. 22 or 32.* First semester.

Span. 232. Spanish American Literature (3)

Continuation of Span. 231. *Prerequisite: Span. 231.* Second semester.

Sociology

See Economics and Sociology

**Division of Athletics and
Physical Education**

P. L. Sadler, *Director*

P. E. Short, *Assistant Director and Business Manager*

J. S. Steckbeck, *Assistant Director of Physical Education*

The Division consists of the Department of Intercollegiate Athletics and the Department of Physical Education and Intramural Sports. It has supervision over the entire field of intercollegiate athletics and physical education. Its activities consist of intercollegiate athletics, intramural athletics, required physical education, including corrective exercises.

Experience indicates that it is essential that the physical education program emphasize the physical fitness and efficiency benefits to be derived from a well-rounded and athletic phase of the program. The purpose of the athletic, physical education, and intramural sports program is designed to:

- a. Raise and maintain the physical standards of the University.
- b. Develop and maintain a high level of all-around physical

fitness so that the undergraduate student may more readily assimilate instruction.

- c. Encourage regular and healthful exercise by the development of skills, techniques, and attitudes.
- d. Foster an aggressive and cooperative team spirit, to increase the confidence of the individual, to develop sportsmanship, and to increase University pride through participation in vigorous competitive athletics.

Facilities for accomplishing this aim and purpose are afforded in Taylor Gymnasium, Grace Hall, the field house, the two playing levels of Taylor Field, and Lehigh Field.

DEPARTMENT OF INTERCOLLEGIATE ATHLETICS

Director Sadler

Assistant Director Short

Messrs. Leckonby, Packer, Cooley, Leeman, Christian,
Chiodi, Shreve, Maze, Steckbeck, Reno, Havach

The Department of Intercollegiate Athletics offers opportunity to the undergraduate student body to participate in intercollegiate competition both at home and away with institutions which are Lehigh's natural rivals and also other institutions which are at some distance.

The intercollegiate program consists of varsity teams in football, cross country, soccer, wrestling, basketball, swimming, tennis, track, baseball, golf, lacrosse, and fencing, junior varsity teams in football, wrestling, basketball, swimming, and baseball, as well as freshman teams in most of the above sports.

DEPARTMENT OF PHYSICAL EDUCATION AND INTRA-MURAL SPORTS

Professor Sadler

Assistant Professors Christian, Leeman, Maze, Packer, Steckbeck
Instructors Chiodi, Cooley, Shreve

The Department of Physical Education and Intramural Sports has supervision and control of the required recreational physical activities of the student body. The aim of the department is to insure the health and physical development of every student of the University.

Through its program in physical education and intramural sports the University endeavors to maintain among its students a high degree of physical fitness, to establish habits of regular and healthful exercise, to foster the development of such valuable by-products as self-confidence, good sportsmanship, and a spirit of cooperation, and to provide each student with ample opportunity for acquiring an adequate degree of skill in sports of the type in which participation can be continued after graduation.

Freshman and sophomore students are required to register for and engage in some form of activity under departmental supervision. This requirement calls for three hours a week in the gymnasium or participation in an organized sport. Junior and senior students are encouraged to continue their physical activities and participation in intramural sports.

Prior to his arrival on campus, each new or transfer student must submit to the Health Service a Record of Physical Examination Form filled in and signed by a physician, and a completed Health History Form. All such forms are carefully checked by the Health Service and each student thereby classified for activities in the Department of Physical Education in accordance with his current health status.

All freshmen are required to take a physical efficiency test for the purpose of classification and development. All freshmen are required to take a swimming test during the first week of regularly scheduled classes. In the gymnasium, opportunity is offered in the following activities: physical development, recreational swimming, beginners' swimming, boxing, fencing, apparatus exercises, life-saving, badminton and sports fundamentals. All undergraduate students must swim 75 feet before graduation. Students are encouraged to change their activities whenever it is thought best for their all-around development.

A comprehensive program in intramural sports is sponsored for the student body including fraternity, dormitory, interclass, town, and independent groups in touch football, tennis, soccer, badminton, handball, individual athletics, basketball, swimming, wrestling, track, softball, volleyball, and recreational games. Students are encouraged to participate in these sports, and awards are given for excellence in performance.

Individual exercises are prescribed for the correction of physical

and functional defects. Students of this group are carefully examined and individually guided.

The University maintains a well-equipped dispensary for medical treatment. If a student is injured while engaged in any sport he must report as soon as possible to the First-Aid Room or to the Students' Health Service.

The following physical education courses are required of all physically qualified students:

P.E. 1. Physical Education

Freshman first semester. Three hours per week.

P.E. 2. Physical Education

Freshman second semester. Three hours per week.

P.E. 3. Physical Education

Sophomore first semester. Three hours per week.

P.E. 4. Physical Education

Sophomore second semester. Three hours per week.

General Information

General Regulations

Eligibility for Degree

In order to be graduated, a candidate for a baccalaureate degree must achieve a minimum cumulative average of 1.50.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but also he must have paid all University fees, and in addition all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University. It is understood, however, that this regulation does not apply to any indebtedness for scholarship loans or for loans from trust funds administered by the University which are protected by properly executed notes approved by the treasurer.

Unless exempted by the Faculty for some special reason such as poor health, a student must satisfy all physical education requirements and must complete four semesters of basic R.O.T.C. training, or its approved equivalent, in order to qualify for graduation.

Final Date for Completion of Requirements

For graduation all requirements, scholastic and financial, must have been met by 12 o'clock noon on the Friday preceding the graduation exercises.

Notice of Candidacy for Degree

Candidates for graduation on University Day file with the registrar on or before April 15 a written notice of candidacy for the degree; candidates for graduation in February file a notice of candidacy on or before January 10; candidates for graduation on Founder's Day file a notice of candidacy on or before September 10. Failure to file such notice by the dates mentioned debars the candidate from receiving the degree at the ensuing graduation exercises.

Graduating Theses

Undergraduate theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference; but copies may be retained by students and may be published, provided permission has first been obtained from the faculty.

Credit and Grades

A semester hour of college work consists of one hour a week of lectures or class work, or two or three hours of laboratory work (or laboratory work combined with class work) a week for one semester. The normal assumption is that the student will be expected to do at least two hours of study in preparation for each hour of class work.

Final grades in courses are A, B, C, D, and F. A, B, C, and D are passing. F indicates failure. Physical education is marked P (passing) or F (failure) without hour credit.

A student who withdraws from a course during the first three weeks of instruction will receive grade of "W." A student who withdraws from a course after the first three weeks of instruction will receive "WF" unless the committee on standing of students, for cause, allows a grade of "W" to be recorded.

A student officially withdrawn from the University after the third week of instruction shall receive from each instructor a "WP" or "WF."

The letters "Abs." (absent) are used to indicate absence from a final examination in a course. The grade of "Abs." is reported with a letter grade in parentheses, such letter grade representing the department's estimate of the student's work up to the close of instruction with the provision that in cases where a department does not feel justified in reporting an estimated grade, a report of "Abs. (X)" will be returned.

The letters "Inc." are used to indicate that the work in a course is incomplete. The grade is accompanied by a letter grade. A student who incurs an "incomplete" in any course and fails to remove the "incomplete" within one calendar year, loses all equity in the course.

HONORS

Honors are of four kinds: class honors, graduation honors, special graduation honors, and college honors. (For college honors see page 64.)

Class Honors

Upon completion of the work of the freshman and sophomore years, on recommendation of the registrar and by vote of the faculty, class honors are awarded to those individuals who have made an average of 3.00 or better during the preceding year.

The names of these students are announced at the Founder's Day exercises and published in the Founder's Day program.

Graduation Honors

Degrees "with honors" are awarded by vote of the faculty to those students who have attained an average of not less than 3.00 in their last two years' work at the University.

Degrees "with high honors" are awarded by vote of the faculty to those students who have attained an average of not less than 3.50 in their last two years' work at the University.

Degrees "with highest honors" are awarded by vote of the faculty to those students who have attained 3.75 in their last two years' work at the University.

Candidates for graduation who have been in residence at the University for less than two years are not eligible for graduation honors.

Graduation honors are announced at the graduation exercises.

In computing the averages of candidates for graduation honors, semester grades are weighed according to the number of credit hours in the course concerned on the basis: A equals 4, B equals 3, C equals 2, D equals 1, and F equals 0.

Special Honors

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate to the head of the department concerned and to the registrar during the junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned and the general proficiency of the candidate as evidenced either by a final examination or a thesis, as the head of the department involved may direct. Special honors are announced at the graduation exercises.

Latest Date for Registration

No registration is accepted later than the tenth day of instruction in any semester.

Financial Aid

UNDERGRADUATE SCHOLARSHIPS AND LOANS

General Statement

Lehigh University is desirous of extending tuition aid to deserving and promising students who otherwise would not be able to attend the university, to the extent that funds are available for such assistance. During the academic year 1956-1957, some 470 students were assisted financially to the amount of \$370,000 in loan scholarships and free scholarships.

Scholarship aid is awarded on the bases of established financial need, exceptional academic achievement and promise, commendable participation in activities outside of the classroom, and good citizenship.

Scholarships are awarded on a yearly basis and for an entire scholastic year. Renewal of the scholarship is anticipated upon re-application in the spring of the year. However, continuation of an award assumes that the recipient will continue to show scholastic excellence and leadership activity commensurate with the promise evidenced when the scholarship was originally awarded. Continuing need and good citizenship are also requirements for continuation of awards.

Tuition Scholarship Loans are provided for students who are deserving and in need of aid, but for whom adequate free tuition scholarship aid is not available. The loan may be for a part or, in some instances, for the entire tuition fee, or may be used to supplement a partial free tuition scholarship. Since these loans carry no interest while a student is in college, and are repaid into a revolving loan fund in monthly installments when the student leaves college, this plan enables many worthy and conscientious students to help finance their own way through college by deferment of the payment of part of their tuition. It is often better for a student to take out a partial tuition loan than to spend too many hours in outside work to support himself while in college.

Trustee Scholarships are scholarships covering part, or sometimes all of the tuition charge. These are authorized by the Board of Trustees to be paid from the general funds in order to supplement endowed tuition scholarships.

Leadership Awards, while still requiring evidences of genuine financial need, good scholarship, and good citizenship, place more emphasis on leadership attainments in non-academic activities. The available scholarships of this type include the Alumni Student Grants provided for good students with both aptitude and achievement in athletics; the Music Department Scholarships for students with demonstrated musical talent and ability to perform; and the Leonard Hall Scholarships for students who have evidenced both capacity and deep interest for the Christian ministry, with particular interest in the ministry of the Episcopal Church. These various scholarships are restricted in terms of the particular qualifications and interests of the applicants as indicated in each instance.

Endowed and Supported Scholarships are provided by individuals and by corporations either through endowments or by annual contributions. These scholarships, in many cases provide more than just the tuition, ranging as high as \$1200.00 to \$2000.00 a year in a few cases. Here the emphasis is placed on extraordinary financial need. These awards are intended for the very worthy students who otherwise would not be able to attend college but who are deserving of the opportunity to receive a college education. By dint of earning some money themselves during the summers and, to some extent, during the college year, such students can, with the aid of these scholarships, win a college education. (See page 309 and following.)

ELIGIBILITY.

New Students: Freshmen

Entering freshmen may apply for financial aid in accordance with the information made available in a special announcement which may be obtained from the Office of Admission.

New Students: Transfers

A student transferring from another four-year college, unless he has been graduated, is not eligible to apply for a tuition scholarship until he has completed one year of residence at Lehigh University.

A student entering from a recognized junior college with full transferred credits (junior standing) may be a candidate for a tuition scholarship on his junior college record.

Students currently enrolled

Students who are already enrolled at Lehigh and have been in residence for one college year or more are eligible to apply for any of the tuition scholarships or loan awards.

APPLICATION. Candidates for scholarships or loans must make application on forms provided by the committee on scholarships and loans. Candidates not previously enrolled in the University should write for the form to the Office of Admission; candidates who have been enrolled in the University one academic year or longer should apply in person to the Coordinator of Scholarships and Self-help. Dates for filing applications are:

1. For entering freshmen and junior college graduates, first consideration will be given to candidates whose applications are filed before January 15.
2. For resident students, May 30. It is preferred that application be made to the Coordinator of Scholarships and Self-help as early as possible.

Any application for scholarship aid not conforming to the above procedures can be given consideration only if funds are still available when a late application is received.

TUITION LOANS

New students must meet the same minimum qualifications to secure a tuition loan as to receive a tuition scholarship as described above. If an applicant does not receive a free tuition award adequate to cover his tuition needs, the supplementary tuition loan may still enable him to attend Lehigh University. Where it is deserved, this supplementary award generally will be made to the student without further application by him.

For students who have completed two or more semesters in residence at Lehigh, tuition loans are made on the basis of merit and need, at the discretion of the committee on scholarships and loans, and to the extent that loan funds are available.

No loan can be made to a student on scholastic or disciplinary probation. The maximum indebtedness to the University that any student may normally incur will generally not exceed one-half of his total tuition obligations up to and including the semester for which he is seeking tuition aid.

The student signs a note for any tuition loan, endorsed by his

parent or guardian, agreeing to start repayments within three months from the date of his leaving the University for whatever cause, and at the rate of at least \$25.00 per month until the full amount of the total indebtedness has been repaid.

Every student incurring indebtedness to the University is required to undertake to pay his debt in full as rapidly as possible. Prompt repayment of loans insures the availability of a continuing fund for other student needs as they arise.

Indebtedness incurred through tuition loans bears no interest so long as the student is in residence. From the date of graduation or withdrawal, such indebtedness bears interest on the unpaid balance at the rate of 3% for the first and second years, 4% the third and fourth years, and 5% thereafter.

DESCRIPTIONS OF ENDOWED SCHOLARSHIPS

Atlas Equipment Corporation Scholarship Fund

Through its president, Paul B. Reinhold, alumnus of the Class of 1913, the Atlas Equipment Corporation of Pittsburgh, Pennsylvania, has established this scholarship fund. The income from the Atlas Equipment Corporation Fund is used to provide scholarships covering tuition in such amounts as student need indicates, on the basis of character, intelligence, and leadership qualities.

The J. D. Berg Scholarship Fund

This fund was established by Mrs. J. D. Berg in memory of John Daniel Berg, M.E. '05, who devoted many years to Lehigh University as Alumnus and as Trustee. An annual scholarship of \$1000 shall be awarded to a student who is in financial need and has prerequisites of character and personality, high scholastic achievement and leadership qualities which merit the award. Preference shall be given to students residing in the West Pennsylvania District and who enroll in an Engineering Curriculum at Lehigh University.

Award of Bethlehem Fabricators, Inc.

Bethlehem Fabricators, Inc. have established a scholarship fund in honor of the late Ralph Parke Hutchinson, Class of 1904 at Lehigh University and in recognition of his forty years of service to the company and his devotion to his alma mater. It is hoped that these incentive scholarship awards from this fund will serve

"to spread and implement his belief in the American tradition of private industrial development and his interest in the education of worthy young men to carry forward that tradition." This scholarship will be awarded annually to the senior engineering student who "has shown the most improvement during his sophomore and junior years," and under the rules of the Committee on Scholarships and Loans.

The Bethlehem Fabricators' Scholarship Fund

This fund was established by Bethlehem Fabricators, Incorporated to provide tuition scholarships for students who are in need of assistance. Character and personality, high scholastic achievement and leadership qualities shall be given consideration when these awards are made. Other qualifications being equal, preference shall be given to candidates applying from the Counties of Lehigh or Northampton in Pennsylvania.

Frank Breckenridge Bell Memorial Scholarship Fund

This fund has been established by Mrs. Frank B. Bell as a memorial to Frank Breckenridge Bell, Alumnus of the Class of 1898 and Trustee of Lehigh University from 1936 to 1949. The income arising from the fund is to be used for the purpose of awarding annually a scholarship to a student attending or about to attend Lehigh University. Primary consideration is to be given to the following factors: financial need; character and integrity; capacity for creative or original thinking, preferably in the field of engineering.

The Harvey M. Burkey Scholarship Fund

Endowed by the American Metals Company, Limited

The American Metals Company, Limited established this fund in 1951. The income provides annual awards to be granted to students seeking a bachelor degree in Mining, Metallurgical or Chemical Engineering, on the basis of character, scholarship and the qualities which give promise of leadership.

Class of '04 Scholarship Fund

Members of the Class of '04, on the occasion of their Golden Anniversary in June '54, established this scholarship fund as a memorial to the class. The income from the fund is to be used to award a senior scholarship on the basis of character, scholarship, qualifications indicating promise of future leadership, and extra-

curricular activities. Financial need is not to be requisite for the award.

The William W. Coleman Fund

William W. Coleman, alumnus of the Class of 1895, established this fund in 1951. The income provides annual awards in general equal to the amount of tuition, for undergraduates, preferably seniors in metallurgical engineering, on the basis of financial need, high scholastic achievement, character, personality, and leadership qualities.

The William S. Cortright Memorial Scholarship

Mrs. William S. Cortright established in 1938 a fund, the income from which provides a scholarship annually in memory of her husband, who graduated from Lehigh University in 1872. By the terms of the bequest this money is to be used for the maintenance of a part-tuition scholarship, to be awarded to a student who is a resident of Bethlehem or the immediate vicinity and who is enrolled in the curriculum of mechanical engineering. The award is to be made by the committee on scholarships and loans under the regular requirements governing the award of other University scholarships.

The George C. Coutant Scholarship Fund

This scholarship fund was established by a bequest from Hedwig A. Coutant in memory of her husband, George C. Coutant, M.E. 1900, to provide scholarships for meritorious students in need of assistance. The awards are to be made by the University Committee on Scholarships and Loans under the established rules governing the award of University scholarships.

The John R. W. Davis Memorial Scholarship Fund

This fund was established by Mrs. John R. W. Davis of Seattle, Washington, in memory of her husband, John R. W. Davis, C.E., Class of 1891. The income is to provide for scholarships in civil engineering for meritorious students in need of financial assistance. Awards are to be made by the committee on scholarships and loans, under the regular requirements governing the awarding of other University scholarships.

The Alban and Eleanor Eavenson Scholarship Fund

This fund was established by Alban Eavenson, Class of '99, as an expression of his interest in helping young men obtain a Le-

high education. The income from the fund is to be used to award scholarships with preference to students enrolled in either the chemistry or chemical engineering curriculum.

The John T. Fuller Memorial Fund

This fund was established by Esther Fuller Warwick in memory of her father, John T. Fuller, Class of 1903. The income from the fund is to be used to provide scholarships in the school of Mining Engineering which are to be awarded to deserving Pennsylvania boys working their way through Lehigh University.

The Alfred R. Glancy Fund

General Alfred R. Glancy of the Class of 1903 established this fund in 1949. The income provides for undergraduate scholarship awards made by the Committee on Scholarships and Loans, in addition to the Alfred Noble Robinson Award of \$1,000 annually to a selected Faculty member in memory of General Glancy's grandfather.

The Granite City Steel Company Scholarship Fund

The Granite City Steel Company, Granite City, Illinois, established this fund in 1951. The income provides annual awards for undergraduates in the College of Engineering, on the basis of financial need, character and personality, scholastic achievement and leadership qualities.

The Henry S. Haines Memorial Scholarship

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of \$100.00 as a memorial to her son, Henry Stevens Haines, M.E., '87. By the terms of the bequest this scholarship is awarded to a student in the curriculum in mechanical engineering. The requirements governing the award of University scholarships apply likewise to this scholarship.

James Clark Haydon Memorial Scholarship Fund

Mary Haydon Hansen bequeathed the residue of her estate to Lehigh University as a memorial to her father, James Clark Haydon. The gift is to be used for the purpose of providing scholarships for needy and deserving persons. A substantial portion of the gift is to be used for providing scholarships in the Mining Division of the University, otherwise the scholarship fund is without restrictions.

Albert George Isaacs '04 Endowed Scholarship Fund

This fund has been established by Kenneth L. Isaacs, alumnus of the Class of 1925, as a memorial to his father, Albert George Isaacs, alumnus of the Class of 1904. The award covering tuition and an allowance for books and supplies will be made to a student selected by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

The Bernard H. Jacobson Fund

This fund was established by Mr. Bernard H. Jacobson, a graduate from Lehigh University in Electro-Metallurgy, in the Class of 1917. The income is to be used to provide financial aid, usually to the amount of the tuition, for one or more students as the income may provide, who shall show financial need, good character and personality, high scholastic achievement and qualities of leadership.

The Henry Kemmerling Memorial Scholarships

Three scholarships, provided through the gifts of Henry Kemmerling of the class of 1891, are to be awarded, one each year, to graduates of the public senior high schools of Scranton, Pennsylvania, of which there are now two, viz: Central High School and Technical High School. The scholarship is to cover the tuition fee of the holder thereof.

A scholarship award is to be renewed yearly to the initial holder thereof until he graduates, provided he remains in school and maintains a grade at least equal to the average of his class during the preceding year.

The following qualifications only are to be the basis of the award of the scholarships: (a) a good character; (b) need of financial assistance; (c) high scholastic ability. The awarding of these scholarships will be administered through the committee on scholarships and loans.

At the discretion of the president, each full scholarship may be divided into two or more partial scholarships so that two or more may benefit by any annual award.

If at any time the income from the funds should warrant, two scholarships may be awarded in one year. If at any time the accumulated income is not sufficient to pay the full amount of the tuition fee, the scholarship shall be awarded nevertheless, the balance being taken from the principal of the fund.

The Jacob B. Krause Scholarship Foundation

The Jacob B. Krause Scholarship Foundation was established under the will of Jacob B. Krause, Class of 1898, for the purpose of assisting needy students in the College of Arts and Science. Scholarships are to be awarded only to male students who maintain good scholastic standing and are in need of financial help. The awards are to be made by the committee on scholarships and loans under the regular requirements governing the award of other university scholarships.

The Lehigh Portland Cement Company Scholarship Fund

The Lehigh Portland Cement Company established this fund in 1952. The income from the fund is to be used for the purpose of awarding scholarships to undergraduate students on the basis of financial need, character and well adjusted personality, intelligence, and above average potential for leadership.

Alvin Macauley Scholarship Fund

This fund was established by Mrs. Alvin Macauley in honor of her husband, Alvin Macauley, Class of '92, who was Chairman of the Board of the Packard Motor Car Company. The income from this fund is to be used to award scholarships to worthy students in need of financial assistance.

The Mart-Hammonton Scholarship

Leon T. Mart, alumnus of the Class of 1913, and president of the Marley Company of Kansas City, Missouri, established this scholarship fund in 1953. The income from the Mart-Hammonton Scholarship Fund is to support one continuous tuition scholarship in the College of Engineering at Lehigh University. Preference shall be given to graduates of Hammonton High School, Hammonton, New Jersey, or graduates of any of the public or private secondary schools of the greater Kansas City area—this shall include schools of Jackson County, Missouri, and Johnson County, Kansas. In the event that no suitable candidates from these areas are available the scholarship can be awarded at large. The award is made by the University Committee on Scholarships and Loans under the established rules governing the award of University scholarships.

Alexander and Clara Maysels Scholarship Fund

Dr. Alexander Maysels of Bethlehem has established the Alexander and Clara Maysels Scholarship Fund as a memorial to his wife, Clara Maysels. The awarding of the scholarship or scholarships shall be accomplished by the regular agency as determined by the Board of Trustees of Lehigh University. The basis of award shall be financial need, character and personality, high scholastic achievement and leadership qualities regardless of race, creed or color.

The amount of each award will in general be the amount of the annual tuition but the appropriate University agency in its discretion may award a lesser or greater amount where circumstances warrant such action. The scholarship, once awarded, may continue in force for the period of the student's residence at Lehigh University subject to the maintenance of a satisfactory scholastic average and qualifications of a good citizen and to the discretion of the appropriate University agency.

The Fred. Mercur Memorial Fund Scholarship

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the trustees of the University a fund called the Fred. Mercur Memorial Fund. The income from this fund is awarded to students of the University. The requirements governing the award of University scholarships apply likewise to this scholarship.

The Mansfield Merriman Scholarship Fund

This fund was established under the will of Bazena T. D. Merriman to provide a scholarship in Civil Engineering in memory of her husband. Dr. Merriman served as Professor of Civil Engineering at Lehigh University from 1878 to 1907, during which time his textbooks were widely adopted by engineering schools in the country and translated into many foreign languages.

The Natt Morrill Emery Scholarship

Established in memory of the late Natt Morrill Emery, vice-president and controller of Lehigh University, by an alumnus and former student of Dr. Emery's, the Natt Morrill Emery Scholarship covers the full tuition fee. It will be awarded by Lehigh Uni-

versity every four years (or whenever it becomes vacant) to that graduate of the high schools of Richmond, Virginia, selected by the Richmond school authorities, who during his scholastic career has exemplified in character and conduct the qualities of loyalty and ability which marked the services of Dr. Emery to Lehigh University.

The Theophil H. Mueller Class of 1918 Scholarship Fund

This fund was established by Theophil H. Mueller, a corporate trustee of the University. The income is to be used to assist in defraying the expenses of some worthy student or students who are in need of financial assistance, provided, however, that if it is possible and advisable the student or students selected to receive such financial assistance shall be of the Moravian faith and preferably from Bethlehem, Pennsylvania, or its environs. Awards are to be made by the committee on scholarships and loans, under the regular requirements governing the awarding of other University scholarships.

The Ray Sands Nostrand Memorial Scholarship

The Ray Sands Nostrand Memorial Scholarship was established by the late Benjamin Nostrand, Jr., M.E. '78, in memory of his son, Ray Sands Nostrand, '17. The income from this fund is awarded to students of the University. The requirements governing the awards of University scholarships apply likewise to this scholarship.

The Murtha P. Quinn Scholarship

Mr. Murtha P. Quinn left one-thirtieth of his residual estate to Lehigh University for the purpose of establishing a free tuition scholarship in the amount of \$400.00 annually. Preference is to be given to students whose homes are in South Bethlehem.

Isadore Raiff Memorial Fund Scholarship

The fund was established by the Raylass Department Stores, New York City, in honor and in memory of their late President, Isadore Raiff. The income from the fund is to be used to award a scholarship to worthy students in the College of Business Administration. Preference will be given to candidates from the states of Georgia, New York, North Carolina, South Carolina, Tennessee, and Virginia. The award is to be made by the Committee on Scholarships and Loans under the regular requirements governing the award of other university scholarships.

The Rust Engineering Company Fund

The Rust Engineering Company established this fund in memory of two of its co-founders, E. M. Rust, and E. J. Lee Rust, for the purpose of awarding scholarships to students of the engineering college of Lehigh University on the basis of financial need, character and well adjusted personality, intelligence, and above average potential for leadership.

Frederick C. Seeman, Jr., Scholarship Fund

This scholarship fund was established by a bequest from Aringdale D. Seeman of Baltimore, Maryland, in memory of his son, Frederick C. Seeman, Jr., a member of the Class of '27, who was killed in an automobile accident in 1927. Income from the fund is to be used to award scholarships to worthy students from the State of Maryland who are in need of financial assistance.

Donald B. and Dorothy L. Stabler Scholarship Fund

Donald B. Stabler, an alumnus of the Class of 1930, established this fund in 1953. The fund is to be used to provide full tuition scholarships on the basis of character, intelligence, leadership qualities, and financial need. All factors being equal, preference is to be given first to candidates for the Civil Engineering curriculum; and secondly, to candidates for the other engineering curricula.

Lehigh Alumni of Tau Delta Phi Scholarship Fund

The Lehigh Alumni of Tau Delta Phi Foundation has established this fund for the purpose of awarding a part tuition scholarship on the basis of financial need, character and personality, scholastic achievement and leadership qualities, preference to be given to an undergraduate member of Tau Chapter of Tau Delta Phi. The awards are to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

The David R. Thomas Memorial Fund

This fund was established by Professor and Mrs. Harold P. Thomas after their son's death in a plane crash on South Mountain in June, 1950. Donations from friends and family have been included in the fund. The income is to be used for tuition scholarships for one or more students who have completed at least one year at Lehigh University and are in need of financial assist-

ance to complete their education. The award or awards will be made to students who exemplify in their lives the high ideals which were characteristic of David up to his untimely death.

The Treadwell Engineering Company Scholarship

The Treadwell Engineering Company of Easton, Pennsylvania, has established at Lehigh University The Treadwell Engineering Company Scholarship Fund for annual tuition scholarships in such number and amounts as the income will support. The scholarships are for students in mechanical engineering, with preference given to candidates from Lehigh and Northampton Counties in the State of Pennsylvania. The awards are made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

The Samuel Foster York Memorial Scholarship Fund

This fund was established by Warren W. York, of the Class of 1924, as a memorial to his father, Samuel Foster York. The income is to be applied towards tuition scholarships for needy and worthy graduates of Allentown, Pennsylvania, secondary schools who desire to pursue business administration courses at Lehigh University. The award is to be made by the committee on scholarships and loans under the regular requirements governing the award of other University scholarships.

York-Shipley Fund

This fund was established by York-Shipley Inc. of York, Pa., through its president, S. H. Shipley, Class of 1922. The income is to be used to provide scholarships to worthy students in need of financial assistance enrolling in the College of Engineering, with preference being given to students from the County of York in Pennsylvania enrolling in the Mechanical Engineering curriculum.

The Luther Rees Zollinger Memorial Fund

The sister of Luther Rees Zollinger left the residue of her estate to Lehigh University to establish this memorial fund to provide tuition scholarships for worthy students who are in need of financial assistance. The awards are to be made by the committee on scholarships and loans, under the regular requirements governing the award of other University scholarships.

ENDOWMENT OF SCHOLARSHIP

Undergraduate or graduate scholarships named to honor an individual or corporation may be established in perpetuity by arrangement with the board of trustees of Lehigh University. The income from this donation will be paid to the holder of the scholarship to be applied toward the payment of University fees. The University does not, however, guarantee that this income will be forever sufficient to pay such fees in full.

DESCRIPTION OF SUPPORTED SCHOLARSHIPS**Air Products, Incorporated, Scholarships**

Air Products, Incorporated, of Emmaus, Pennsylvania, desiring to make it possible for deserving young men needing full scholarship assistance to obtain an engineering education, has established two \$1500 scholarship awards at Lehigh University. It is the hope of the Company that these scholarships will help solve the present shortage of engineering graduates, thereby benefiting both industry and the young men of the country.

Alcoa Foundation Scholarships

The Aluminum Corporation of America supports at Lehigh University several undergraduate scholarships. The University also receives a grant-in-aid to the amount of \$125 per student recipient. The awards are to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

The Allied Chemicals National Aniline Scholarship

The National Aniline Division of the Allied Chemical and Dye Corporation supports a \$900 scholarship at Lehigh University for students in Chemistry or Chemical Engineering. The award is to be made by the Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

American Cyanamid Company Scholarship

This scholarship was established by the American Cyanamid Company to support the training of undergraduate students working for the bachelor's degree in chemistry and chemical engineering. The scholarship is to be alternated year by year between the Departments of Chemistry and Chemical Engineering. A recipient

will be chosen from among students about to enter either their junior or senior year. The scholarship recipient will receive a stipend of \$600 per year and the University will receive an amount of \$300 for use of the Department of Chemistry or Chemical Engineering.

**The American Society for Metals Foundation for Education
and Research Scholarship**

The American Society for Metals Foundation for Education and Research offers annually an undergraduate scholarship of \$400. The scholarship is awarded on recommendation of the Head of the Department of Metallurgical Engineering and approval of the Committee on Scholarships and Loans, to a student entering his Sophomore or Junior year in that curriculum. High scholastic ability and financial need are considered in making the award.

The American Viscose Scholarship

The American Viscose Corporation of Philadelphia supports an annual award at Lehigh University of \$500 for a junior-year student in chemistry or chemical engineering. The award will be renewed for the student's senior year provided his scholarship is satisfactory. The University Committee on Scholarships and Loans makes the award under the established rules governing the award of university scholarships, but subject to the approval of the College Relations Committee of the American Viscose Corporation.

Armstrong Cork Company Scholarship

The Armstrong Cork Company Scholarship will be awarded to a freshman with no restriction as to curriculum choice. Each scholarship will cover the cost of tuition, required fees and books for a full school year and will amount to a maximum of \$1,100 per school year. The company will also provide a "cost-of-education" grant of \$500 a year to the University.

The Bell Aircraft Foundation Scholarships

The Bell Aircraft Foundation, Incorporated, of Bell Aircraft Corporation has provided a \$1000 freshman scholarship in engineering. The scholarship will be awarded by the University Committee on Scholarships and Loans and may be renewed annually providing the recipient meets the requirements set forth by the Committee. The Foundation also provides an unrestricted grant of \$500 annually to the University.

Bethlehem Globe-Times Scholarship Fund

The Globe-Times Foundation, Incorporated, has established at Lehigh University a full tuition scholarship to be awarded to a candidate for admission to any one of the three colleges of the University, who resides within the circulation area of the Globe-Times. Where such factors as financial need, character, personality, and scholastic achievement are equal, preference shall be given to candidates employed by the Bethlehem Globe-Times Publishing Company or whose parents are employed by the Company.

The Black and Decker Manufacturing Company Scholarship

The Black and Decker Manufacturing Company scholarship is to be awarded to a freshman who is planning to major in either the mechanical, electrical or industrial engineering curriculum. The recipient must be a resident of the State of Maryland. Other qualifications being equal, preference is to be given to a graduate from Baltimore Polytechnical Institute, Baltimore, Maryland. Also preference is to be given to the son of a Black and Decker employee. The amount of the scholarship is \$940 per year.

Blaw-Knox Company Scholarship

The Blaw-Knox Scholarship will be awarded to the son of a regular employee of the company. It will include an award to the recipient of \$1,250 a year together with a grant-in-aid to the University of \$250 a year.

The Byron Scholarships

Through the president, Byron Roudabush, alumnus of the Class of 1929, Byron, Incorporated, Motion Pictures Studio and Laboratory in Washington, D.C., supports scholarships at Lehigh University for \$1000 to be awarded to a junior in chemistry, chemical engineering, mechanical engineering or engineering physics, with the expectation that the student will receive the award in his senior year also, provided his scholastic work continues satisfactory. A student membership in the Society of Motion Picture and Television Engineers, with which Society the Byron Corporation joins to encourage trained engineers to enter the industry, is granted the recipient. The scholarship award is made by the University Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

California Oil Company Scholarship

The California Oil Company has provided a \$750 undergraduate scholarship in the field of Chemical Engineering. The award is to be made by the University Committee on Scholarships and Loans under the established rules governing the award of University scholarships.

The Edward Campbell Company Scholarship

The Edward Campbell Company of Vineland, New Jersey, supports a \$400 scholarship to encourage graduates of the Vineland High Schools to attend Lehigh University. The award is to be made by the University Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

L. E. Carpenter and Company Scholarship

Through its chairman of the board, L. E. Carpenter, alumnus of the class of 1913, L. E. Carpenter and Company has provided a \$900 scholarship in Chemical engineering. Recipients are to be selected by the university Committee on Scholarships and loans on the basis of high academic standing, character and personality, financial need, and scoring in College Board tests.

The Clevite Scholarships

The Clevite Corporations of Cleveland, Ohio, through its Clevite Foundation, supports at Lehigh University scholarship awards for two or more senior engineers, to a total of \$500.00 annually. These awards are for seniors in chemistry (either electro-chemistry or inorganic) metallurgy (non-ferrous), mechanical engineering, or physics (preferably electronics). The awards are made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

The Dravo Corporation Scholarships

The Dravo Corporation of Pittsburgh, Pennsylvania, supports at Lehigh University, an annual scholarship award of \$1000 for a junior engineering student in civil, electrical or mechanical engineering. The recipient of the award will receive a renewal of this Scholarship in his senior year if his scholastic work continues to be satisfactory. The awards are made by the University Committee on Scholarships and Loans under the established rules gov-

erning the award of university scholarships, by submitting recommendations of students to the Dravo Corporation, from which nominees the Corporation selects the recipient.

Fort Pitt Bridge Works Scholarships

The Fort Pitt Bridge Works Scholarship is to be awarded to a junior enrolled in the civil engineering curriculum who will major in the structural option. The award will be in the amount of \$1,200 a year. Also in recognition of the fact that tuition does not cover the full cost of education of the student, the company will make an unrestricted gift to the University of \$300 each year.

General Electric

The General Electric Scholarship of \$650 is to be awarded to an outstanding junior in the field of Finance, Accounting, Commerce, or Business Administration. In addition, an unrestricted grant of \$350 is made to the University.

General Motors

The General Motors Corporation in its program of aiding private colleges has made available to Lehigh University several undergraduate scholarships. These scholarships will range up to \$2,000 annually depending upon "demonstrated need." In addition the University will receive a grant-in-aid equivalent on the average to some \$500 to \$800 annually per student.

Golden Gate Scholarship

The mother of a recent graduate from Lehigh University expresses her appreciation to the institution by making an annual contribution of \$300 to be used as a partial tuition scholarship for a student of undoubted loyalty to his country, and who is in need of financial assistance in order to complete his course at Lehigh University. The scholarship will be awarded by the Committee on Scholarships and Loans under the same rules as apply to other scholarships.

Interchemical Corporation Scholarships

The Interchemical Corporation will provide \$1,000 a year to be awarded to either juniors or seniors in the chemistry, chemical engineering and engineering physics curricula. The number of awards will be from two or four each year and accordingly, the stipend will vary from \$250 to \$500.

The International Nickel Company Scholarship

The International Nickel Company has provided a scholarship covering tuition and fees and an annual allowance of \$300 for books and a portion of living expenses. The scholarship may be renewed each year until the recipient thereof has graduated providing he continues to satisfy the University's requirements. The scholarship is restricted to engineering students and preference is given to those enrolled in mining, geology, and metallurgy. The Company also provides an unrestricted grant of \$500 annually to the University.

The Kift-Mullen Memorial Foundation Scholarship

The Kift-Mullen Memorial Foundation of Allentown, Pennsylvania, makes available to graduates of Allentown high schools four annual scholarships of \$200, to students of junior standing in various teacher training institutions, who are preparing to enter the secondary school teaching profession. The university Committee on Scholarships and Loans makes recommendations of qualified Lehigh University students to the Kift-Mullen Memorial Foundation, which passes such recommendation from various teacher training institutions on to a committee of the Allentown high schools' representatives who make the final selection.

Lehigh Valley Supply Company Scholarship

The Lehigh Valley Supply Company of Allentown, Pennsylvania, has annually provided a part tuition scholarship in the amount of \$500. In general, this award is to be used for either a Junior or Senior who must have financial assistance in order to complete his course at Lehigh University. The scholarship will be awarded by the Committee on Scholarships and Loans, under the same rules as apply to other scholarships.

Edward Magnuson Memorial Scholarship

In the interest of aiding both Lehigh University and a deserving undergraduate who is an initiated member of the local chapter of the Chi Phi Fraternity at Lehigh University, P. Edward Magnuson has established the Edward Magnuson Memorial Scholarship. The award is to be made by the University Committee on Scholarships and Loans under the established rules governing the award of University scholarships.

John N. Marshall Scholarship

John N. Marshall, Chairman of the Board and President, Granite City Steel Company, Granite City, Illinois and alumnus of the Class of 1920 has provided an annual gift of \$1,050 for scholarship purposes, preference to be given applicants from Granite City. The award is to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

Milton Roy Sheen Memorial Scholarship

Through its president, Robert T. Sheen, Lehigh Class of '31, the Milton Roy Company of Philadelphia, Pennsylvania, has established a scholarship as a memorial to the founder of the company, Milton Roy Sheen. The Milton Roy Sheen Memorial Scholarship provides an annual award of \$1200. The scholarship is to be awarded to employees, or sons of employees of the Milton Roy Company. If no candidates are available, the scholarship is to be awarded to either a Junior or Senior enrolled in the Mechanical or Electrical Engineering curriculum.

Modern Transfer Company Scholarship

The Modern Transfer Company of Allentown, Pennsylvania, through its President, Samuel L. Lebovitz, a graduate of the Class of 1923, has established a \$1000 a year scholarship at the University. The scholarship is awarded on the basis of high intelligence, financial need, and the qualities that give promise of leadership.

Pitcairn-Crabbe Christian Education Scholarship

These scholarships have been provided by the Pitcairn-Crabbe Foundation for students with strong Christian motivation, pre-ministerial students, or those who plan to enter the fields of social work, religious education, or eleemosynary activities. Preference will be given to the sons of clergymen or educators. The awards are to be made by the University Committee on Scholarships and Loans under the established rules governing the awards of University scholarships.

Pocahontas Fuel Company Incorporated Scholarships

The Board of Directors of the Pocahontas Fuel Company Incorporated has established two scholarships one effective September 1956 and the second September 1958 in the amount of \$1,500

a year to cover tuition, other University costs and a part of the living expenses for a candidate for admission to the College of Engineering. The bases of the awards are financial need, character, personality, leadership qualities and high scholastic achievement, with preference given to applicants with a background of interest in coal mining. Once awarded, the scholarships will continue in force for a four-year period subject to the scholar's maintenance of a satisfactory scholastic and personal record. The awarding and administration of the scholarships shall be accomplished by the regular agency of Lehigh University.

Procon Incorporated Scholarship

Procon Incorporated of Des Plaines, Illinois, supports a \$500 scholarship at Lehigh University for a senior in Civil Engineering. The award may be divided at the discretion of the Committee on Scholarships and Loans between two students, in which case one may be in the curriculum of Mechanical Engineering.

Proctor and Gamble Scholarships

The Proctor and Gamble Scholarship fund provides an annual scholarship covering full tuition, and an allowance for books and supplies. In addition the University receives a grant of \$600 for each recipient. The awards are to be made to a student in the field of science or engineering selected by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

Pyramid Foundation, Inc.

The Pyramid Foundation, Inc., through Mr. Eli B. Cohen of Woodmere, New York, provides a \$250 scholarship for a deserving student selected by the Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

Republic Steel Corporation Scholarships

In recognition of the need on the part of industry for more trained engineers, the Republic Steel Corporation has established at Lehigh University five scholarships providing a yearly award of \$1400 apiece. The Republic Steel Scholarships are to be awarded to candidates for admission to the Engineering College on the basis of character, intelligence, leadership qualities, and financial need, with special attention being given to the latter.

The George Sall Metals Company Scholarship

The George Sall Metals Company Scholarship will be awarded to a freshman by the University's Committee on Scholarships on recommendations submitted by the Golden Slipper Square Club of Philadelphia. The scholarship will be in the amount of \$1,000 a year. Also the company will make an annual grant-in-aid to the University of \$250 each year.

Sperry Gyroscope Company Scholarship

The Sperry Gyroscope Company of Great Neck, Long Island, supports two \$750 scholarships at Lehigh University for junior or senior students in Electrical or Mechanical Engineering. The awards are to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

Stonega Coke and Coal Company Scholarship

The Stonega Coke and Coal Company, through its President, E. P. Humphrey, alumnus of the Class of 1915, has provided a gift of \$500 for scholarship purposes in support of the University's educational program. The award is to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

Texaco Scholarship

The Texas Company has provided a four year undergraduate scholarship available to entering students in any of several fields which would prepare them for a career in the petroleum industry. The total grant to the University is \$1500 annually. Of this amount a sufficient sum to cover tuition, fees and textbooks has been allocated for the scholarship award, \$100 for the sole use of the department of the student's major course of study and the remainder as an unrestricted grant to the University. The scholarship is restricted to citizens of the United States who have been graduated in the upper third of their high school class and who give evidence of good health and financial need.

The Trane Scholarship

The Trane Scholarship will be awarded to a student for a senior year of study in the mechanical engineering curriculum. An exception can be made and an award can be given to a junior if, in

the opinion of the University, he is especially deserving. The amount of the scholarship is \$1,000.

The Union Carbide and Carbon Scholarships

The Union Carbide and Carbon Corporation, through the Union Carbide Educational Fund, has established at Lehigh University sixteen annual scholarships in the amount of full tuition plus \$100 for books and supplies, four to be awarded each year for four-year periods, to assist deserving students interested in a business or industrial career. The awards are to be made by the university Committee on Scholarships and Loans under the established rules governing the award of university scholarships.

John H. Ware, Jr., Scholarship Fund

John H. Ware, Jr., scholarships will be awarded by the University's Committee on Scholarships for a needy and worthy student. Scholastic attainment is not a primary requirement in benefiting from this fund.

Washington Steel Corporation

Washington Steel Corporation has provided a gift of \$500 for scholarship purposes. The award is to be made by the University Committee on Scholarships and Loans under the established rules governing the award of University scholarships.

Westinghouse Air Arm Division Engineering Scholarship

To provide recognition of achievement in undergraduate engineering education the Westinghouse Air Arm Division at Baltimore has established a series of scholarships at Lehigh University. Each award is to be granted to an outstanding student who has successfully completed his first year of a four-year program and who is enrolled in Electrical or Mechanical Engineering, Engineering Physics or Applied Mathematics. Only citizens of the United States will be considered. The minimum academic achievement record a student must attain for appointment or for continuation of the scholarship is an over-all B average.

DESCRIPTION OF LOAN FUNDS

The Eckley B. Coxe Memorial Fund

In memory of the late Eckley B. Coxe, trustee of the University, Mrs. Coxe established a fund, amounting to \$70,000.00, the

interest of which is used, under the direction of the trustees of the University and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

The Frazier and Ringer Memorial Fund

The Frazier and Ringer Memorial Fund was established in 1906 by the late Robert H. Sayre in memory of Benjamin West Frazier, A.M., ScD., former professor of mineralogy and metallurgy, and Severin Ringer, U.J.D., former professor of modern languages and literature and of history, each of whom served Lehigh University for one-third of a century. The income from the fund and payments made by the former borrowers are available for loans to cover the medical and surgical care of worthy students.

The Kenneth Hankinson, Jr., Memorial Fund

Mr. and Mrs. Kenneth Hankinson, established this Fund in memory of their late son who graduated from the College of Business Administration in the Class of 1950. The principal from this Fund shall be used to grant emergency loans to deserving students of Lehigh University. Administration of the Fund is at the discretion of the dean of students of the University.

The President's Fund

The President's Fund was established during the early years of the University for the help of deserving students. As payments are made by former beneficiaries, they are immediately available for the assistance of students of the University.

The Frank Williams Fund

Frank Williams, B.S. '87, E.M. '88, who died in October, 1900, bequeathed to the University the greater part of his estate to found a fund, now amounting to \$300,000.00, the income of which is loaned to deserving students.

GRADUATE SCHOLARSHIPS AND FELLOWSHIPS

University Scholarships and Graduate Tuition Grants

The Board of Trustees has authorized the annual award to graduate students, on the basis of superior qualifications and need, of twelve University Scholarships and twelve Graduate Tuition

Grants. The University Scholarships provide free tuition for a full program to graduate study; the Graduate Tuition Grants are awarded to accompany certain research fellowships and provide for the remission of graduate tuition.

The William C. Gotshall Scholarships

A bequest from the late William C. Gotshall provides funds for as many as six scholarships to be awarded annually to worthy graduate students in any branch of engineering offered at Lehigh University. Appointment is for one year, with an annual stipend of \$1000.00 or more, depending on the qualifications of the applicant, plus remission of tuition fees. No duties other than graduate study are required of the holders.

ENDOWED RESEARCH FELLOWSHIPS

Graduates in appropriate curricula of colleges, universities, and technical schools whose requirements for graduation are substantially the same as those of Lehigh University are eligible to apply for any of the following research fellowships as may be available, excepting only the Student Chemistry Foundation Fellowship, which is restricted to graduates of Lehigh University.

Appointment to these fellowships is for a period of two semesters and may be renewed, provided the work of the holder is of such quality as to justify continuation of financial aid. Holders of the fellowships devote half of their time to graduate study, and the other half to research work in the department to which they are assigned.

Annual stipends for most fellowships are \$1000 or more, depending upon the qualifications of the applicant, although a few are limited to less than this amount. Graduate fellows pay the regular tuition fees. However, the Committee on Graduate Scholarships and Fellowships, in awarding a fellowship, may award at the same time a Graduate Tuition Grant. This grant provides remission of all tuition fees during the period for which it is awarded.

New Jersey Zinc Company Research Fellowship

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as the New Jersey Zinc Company Research Fellowship. Half of the time of the holder of this

fellowship must be devoted to research work in the department to which he is assigned, the other half is to be devoted to graduate study.

The Henry Marison Byllesby Memorial Research Fellowships

In 1926, Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '78, President of the Byllesby Engineering and Manufacturing Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowships in Engineering. Half of the time of the holders of these fellowships must be devoted to research work on some problem in electrical, mechanical, or hydraulic engineering, proposed by the President of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half is to be devoted to graduate study leading to the degree of Master of Science. Usually two awards are made each year.

The James Ward Packard Research Fellowship

The income from a bequest made by James Ward Packard, M.E., '84, provides for a research fellowship in any field in which Lehigh University offers work for the doctorate.

The C. Kemble Baldwin Research Fellowship in Aeronautics

A fund established by Mrs. C. Kemble Baldwin as a memorial to her husband, C. Kemble Baldwin, M.E., '95, provides for the appointment of a research fellow in any branch of science having a bearing on the field of aeronautics. One or occasionally two appointments are available each year.

**The Lawrence Calvin Brink Research Fellowship
in Civil Engineering**

A fund established by the late Mrs. L. C. Brink as a memorial to her husband, Lawrence Calvin Brink, C.E., '94, provides for the occasional appointment of a research fellow in civil engineering.

The Student Chemistry Foundation Fellowship

In the spring of 1927, members of the class of 1930 established the Student Chemistry Foundation in honor of Harry Maas Ullmann, A.B., Ph.D., a member of the chemistry department from

1894 to 1938 and head of the department from 1912 until his retirement. Subsequent classes have contributed to this fund, which now provides an annual research fellowship in chemistry or chemical engineering. Only Lehigh graduates are eligible for this fellowship.

**The Garrett Linderman Hoppes Research Fellowship
in Civil Engineering**

A fund established by the late Mrs. Maria B. Hoppes in memory of her son, the late Garrett Linderman Hoppes, C.E., '83, provides for the occasional appointment of a research fellow in civil engineering.

The William L. Heim Research Fellowship in Chemistry

A research fellowship in chemistry was established by William L. Heim, B.S. in Chem., '02.

**The Roy R. Hornor Research Fellowship in Metallurgy
and Inorganic Chemistry**

The income from a bequest by Roy R. Hornor, B.S., '99, provides for a research fellowship in either metallurgy or inorganic chemistry, the holder of which devotes half his time to research under the direction of the faculty and half to graduate study. While the fellowship generally will be granted alternately to students in the two departments concerned, the appointment may be determined by the qualifications of available candidates.

The Katherine Comstock Thorne Fellowship in Biology

The late Gordon Comstock Thorne of the class of 1916 endowed, in memory of his mother, a fellowship in biology, to be known as the Katherine Comstock Thorne Fellowship.

The Charles W. Parkhurst Research Fellowship

A fund established by Mrs. C. W. Parkhurst as a memorial to her husband, Charles W. Parkhurst, E.E., '93, provides for the occasional appointment of a research fellow in any field in which the University offers a graduate major. The stipend has usually been \$750.00 per year.

ADDITIONAL FELLOWSHIPS

Certain fellowships are supported annually by various foundations, learned societies, and industrial organizations. For the most part these fellowships are reserved for applicants well along in the work towards the doctorate. Ordinarily the fellow devotes full time to academic work and receives a stipend ranging from \$1200.00 to \$2400.00, or occasionally more, plus remission of tuition fees. Appointments are for the academic year.

The following are currently available:

The Althouse Chemical Company Fellowship
in Chemistry.

The Allegheny-Ludlum Fellowship
in Metallurgy.

The Armstrong Cork Company Fellowship
in Chemistry.

The Curtiss-Wright Fellowship
in Mechanical Engineering.

The DuPont Company Fellowship
in Mechanical Engineering.

The Federal Telecommunication Laboratories Fellowship
in Communications.

The Howard Flint Fellowship
in Chemistry (for research relating to printing ink).

The Gordon Foundation Fellowship
in Metallurgy.

The George Gowen Hood Fellowship
(supported by the Catherwood Foundation) in any field leading to the doctorate.

The Linde Air Products Company Fellowship
in Metallurgy.

The Pure Oil Company Fellowship
in Chemistry.

The Quaker Oats Company Fellowship
in Organic Chemistry.

The Francis McD. Sinclair Fellowship
in Chemistry (for research relating to printing ink).

The Socony-Mobil Oil Company Fellowship
in Analytical Chemistry.

The Socony-Mobil Oil Company Fellowship
in Chemical Engineering (for study of agitation effectiveness).

The Squibb Institute for Medical Research Fellowship
in Colloid Chemistry.

The Texas Company Fellowship
in Chemical Engineering.

The Union Carbide and Carbon Corporation Fellowship
in Chemistry.

The United States Steel Foundation Fellowship
in Chemistry.

The Weirton Steel Company Fellowship
in Chemistry or Chemical Engineering.

The Westinghouse Electric Corp. Fellowship
in Mechanical Engineering.

ENDOWMENT OF FELLOWSHIPS

Research fellowships named in honor of an individual or a corporation offering opportunities for graduate work and training in research in any designated field of study may be established in perpetuity through the payment to the Board of Trustees of \$30,000.00. The income from this fund will be paid to the holder of the fellowship after the deduction of his tuition and laboratory fees. If the donor of funds for the establishment of a fellowship provides that the holder devote half his time as a research assistant in the Institute of Research, the remaining time to be devoted to graduate study, the University will remit the tuition fee and make only such charges against the fund as are necessary to cover the cost of materials, supplies, and apparatus that need to be provided for the work of the fellow.

Prizes and Awards

Prizes and awards are announced at commencement exercises on Founder's Day the second Sunday afternoon in October and on University Day in June.

Alumni Prizes

Funds are provided by the Alumni Association for the annual award of four prizes of \$25.00 each. Two prizes are awarded to the highest ranking juniors in the College of Engineering, one to the highest ranking junior in the College of Arts and Science, and one to the highest ranking junior in the College of Business Administration.

American Society for Testing Materials Student Membership Prize

The American Society for Testing Materials awards each year four student memberships to students who in their junior year have demonstrated interest and meritorious work in the engineering courses which are related to the American Society for Testing Materials.

The Robert W. Blake Memorial Prize

The Robert W. Blake Memorial Prize is awarded annually at the Founder's Day exercises to a freshman, upon his completion of one year of studies in the College of Arts and Science, who is recommended by the faculty of the College of Arts and Science, as the most outstanding in high scholastic achievement and in promise of worthy leadership.

The John B. Carson Prize

An annual prize of \$50.00 was established by Mrs. Helen Carson Turner, of Philadelphia, Pennsylvania, in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the civil engineering curriculum of Lehigh University in 1876. It is awarded to that senior in civil engineering who shows the most marked excellence in the professional courses of his curriculum.

The William H. Chandler Prizes in Chemistry

Four annual prizes of \$25.00 each, one in each class, for excellence in the chemistry and chemical engineering curricula were established by Mrs. Mary E. Chandler, of Bethlehem, Pennsylvania, widow of Dr. William H. Chandler who was professor of chemistry at Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the faculty named the prizes the William H. Chandler Prizes in Chemistry.

The Choral Cup

THE CHORAL CUP. The Choral Cup provided by Richard K. Burr, I.E., 1953, John D. Kirkpatrick, Bus. Adm., 1955, Donald E. Richert, Bus. Adm., 1953, and Norman I. Stotz, Jr., Arts, 1952, is awarded to the outstanding senior participating in the vocal organizations of the Department of Music.

The Concert Cup

The Concert Cup provided by Richard K. Burr, I.E., 1953, John D. Kirkpatrick, Bus. Adm., 1955, Donald E. Rickert, Bus. Adm., 1953, and Norman I. Stotz, Jr., Arts, 1952, is awarded to the outstanding senior participating in the instrumental organizations of the Department of Music.

The Cornelius Prize

The Cornelius Prize of \$25.00, established by William A. Cornelius, M.E. '89 and endowed by a bequest by his widow, Mrs. Eleanor R. W. Cornelius, will be awarded annually to the senior student in mechanical engineering who is judged to have profited most by his opportunities at Lehigh University. The award will be based 70 per cent on scholarship, 20 per cent on attainment in general culture, and 10 per cent on development in personality. To be eligible for the award, a student's scholastic standing must be in the top quarter of the class in the College of Engineering.

The Philip Francis duPont Memorial Prize in Electrical Engineering

The Philip F. DuPont Memorial Prize Fund was established in 1929 by L. S. Horner, E.E., '98. The annual income of this fund is awarded each year in the way of prizes, two-thirds to the highest ranking senior and one-third to the second highest ranking senior in electrical engineering.

The Electrical Engineering Prize

An annual prize of \$25.00, established by an anonymous graduate of the curriculum in electrical engineering, is awarded to the member of the sophomore class in electrical engineering having made the best record in the work of the sophomore year.

Haskins and Sells Foundation Award

An annual award of \$500 is awarded to that accounting student in the College of Business Administration or the College of Arts and Science who after three years has demonstrated excellence in scholarship, professional potential, extra-curricular activities and moral character.

The Harold J. Horn Prizes

The heirs of Harold J. Horn, E.E., '98, established a fund, the

income of which is used in the award of a first and second prize of \$40.00 and \$20.00 respectively for the two highest ranking juniors in electrical engineering.

The McClain Award for Meritorious Painting

The McClain Award for Meritorious Painting, consisting of a trophy and a fifteen (\$15.00) dollar purchase prize, and provided by Mr. A. V. McClain, shall be presented the student of painting in the Department of Fine Arts studio classes who completes the most meritorious painting during the academic year.

The McClain Progress Award

The McClain Progress Award, consisting of a trophy and a fifteen (\$15.00) dollar purchase prize, and provided by Mr. A. V. McClain, shall be presented to that student whose progress in painting in the Department of Fine Arts studio classes during the year shall be most marked.

The Elizabeth Major Nevius Award

The Elizabeth Major Nevius Award was established by Walter I. Nevius, E.E., 1912, "in loving memory of his wife, who profoundly admired young men of diligence, intelligence, aggressiveness and sterling character." The award of \$500 shall be made annually to that senior enrolled in any five year combination curriculum leading to two baccalaureate degrees who, upon completion of his first four years at Lehigh University and upon graduation with his class, shall be adjudged the most outstanding of the seniors completing work for their first baccalaureate degree and continuing to a second baccalaureate degree at Lehigh University, judged upon the basis of leadership, citizenship, and scholarship.

The Pennsylvania Institute of Certified Public Accountants Prize

The Pennsylvania Institute of Certified Public Accountants awards each year an Accountants' Handbook to the senior in the College of Business Administration majoring in accounting who is outstanding in academic achievement and leadership.

Phi Sigma Kappa Scholarship Cup

PHI SIGMA KAPPA SCHOLARSHIP CUP. A scholarship cup, to be awarded for one year to the fraternity in the interfraternity council having the highest scholastic average for the preceding year and to become the permanent property of the fraternity win-

ning it for three successive years, was provided by an alumnus of the Nu Chapter of Phi Sigma Kappa social fraternity in 1923. This cup was retired upon presentation to the Tau Delta Phi fraternity on Founder's Day, 1947, the winning group having had the highest scholastic average among those eligible for the prize for three successive years.

A new cup, to be known also as the Phi Sigma Kappa Scholarship Cup and to be awarded on the same terms as the original, has been provided by the local chapter of Phi Sigma Kappa.

The Allen S. Quier Prize in Metallurgy

An annual prize of \$15.00 has been provided by the daughters of the late Allen S. Quier in memory of their father, to be awarded to the senior who has adjudged by the staff of the department of metallurgical engineering to have made the most progress in his work in that curriculum. While high scholastic standing is a requisite, the prize is awarded on the basis of progressive achievement in scholastic work, rather than an average rating.

The T. Edgar Shields Cup

The Shields Cup was established by the late Dr. T. Edgar Shields, former director of music at Lehigh. It is awarded annually to that student who is considered most outstanding in overall musical activities.

Trustee's Scholarship Cup

The trustees of the University have provided a scholarship cup which is awarded for one year to the living group having the highest scholarship average for the preceding year. The trustees' scholarship cup becomes the permanent property of any living group winning it for three successive years.

The Elisha P. Wilbur Prizes

A fund was established by the late E. P. Wilbur for distribution in prizes as the faculty might determine. The income from this fund beyond that necessary to award the Wilbur Scholarship Prize is used to provide awards as follows:

WILBUR MATHEMATICS PRIZES. A first prize of \$50.00 to be awarded annually to the highest ranking freshman engineer in the first year of freshman engineering mathematics completed at Lehigh University, as recommended by the Department of Mathematics.

A second prize of \$25.00 to be awarded annually to the second highest ranking freshman engineer in the first year of freshman engineering mathematics completed at Lehigh University, as recommended by the Department of Mathematics.

The Wilbur Scholarship Prize

The Wilbur Scholarship was founded in 1872 by Elisha P. Wilbur, Trustee of Lehigh University from 1871 until his death in 1910, the University's first treasurer, and also twice Secretary of the Board. It provides the sum of \$200.00 which is awarded annually to the sophomore with the best record for the sophomore year.

The Williams Prizes in English

The late Professor Edward H. Williams, Jr., an alumnus of the University of the Class of 1875, established prizes for excellence in English composition and public speaking. The freshman, sophomore, and junior prizes are awarded by the faculty on the recommendation of the department of English.

FRESHMAN COMPOSITION PRIZES. A first prize of \$75.00, a second prize of \$50.00, and a third prize of \$25.00 are awarded annually for the three best compositions submitted by freshmen of regular standing as required work in their English courses.

SOPHOMORE COMPOSITION PRIZES. A first prize of \$75.00, a second prize of \$50.00, and a third prize of \$25.00 are awarded annually for the three best compositions submitted by sophomores of regular standing as required work in their English courses.

JUNIOR COMPOSITION PRIZES. A first prize of \$75.00, a second prize of \$50.00, and a third prize of \$25.00 are awarded for the three best essays submitted by juniors as part of the required work in their courses in English.

The Williams Prizes in Extempore Speaking

A first prize of \$75.00 and a second prize of \$50.00 are awarded to freshmen of regular standing who excel in a contest in extempore speaking held in May of each year.

A first prize of \$75.00, a second prize of \$50.00, and a third prize of \$25.00 are awarded annually to the winners in a contest in extempore speaking for sophomores, juniors, and seniors. Winners of first prizes are not eligible to compete in subsequent years.

The Williams Prizes in Intramural Debating

Sums totaling \$250.00 are awarded annually as prizes in intramural debating. Students engaged in this activity are organized under the direction of the department of English into teams, which compete as units in a series of debates held throughout the year. The sum of \$150.00 is divided equally between the two members of the winning team, the sum of \$100.00 between the two members of the runner-up. Winners of first prizes may not compete in the next year.

The Williams Senior Prizes

The Williams Senior Prizes are awarded by the faculty on the recommendation of the committee on Williams Senior Prizes.

1. First prizes of \$150.00, second prizes of \$100.00, and third prizes of \$50.00 are awarded annually in each of the five fields of economics, English, philosophy, psychology, and history and government for dissertations submitted by regular members of the Senior class on or before April 15.

2. The committee on Williams Senior Prizes publishes, before the close of the academic year, a list of recommended subjects for dissertations; but a senior may submit a dissertation upon any other subject in the respective field if the subject has received the approval of the committee.

3. Each senior entering the competition shall submit to the committee his choice of subject and plan of work by November 15.

4. The awards are made by the faculty upon recommendation of the committee, but no award is made if in any case a dissertation does not meet the standards of merit established by the committee. This standard includes such points as excellence in thought, plan, development, argument, and composition.

Prizes Awarded by Student Organizations

In recognition of Professor Emeritus Alpha Albert Diefenderfer's long service as faculty adviser to the organization, the Lehigh University Chemical Society established in 1947 the Alpha A. Diefenderfer Award for the highest ranking sophomore in analytical chemistry. Each winner is presented with an engraved certificate, and his name is inscribed on a plaque given by the Society and displayed in the Chemistry Building.

ALPHA KAPPA PSI KEY. The Alpha Sigma Chapter of Alpha Kappa Psi, a professional fraternity in commerce, awards annually the Alpha Kappa Psi Scholarship Key to the senior student pursuing a degree in the College of Business Administration, who has attained the highest scholastic average for three years of collegiate work at Lehigh University.

AMERICAN CHEMICAL SOCIETY AWARD. The Lehigh Valley Section of the American Chemical Society awards a membership in the American Chemical Society and a subscription to a journal of this society to the highest ranking junior in chemistry or chemical engineering.

AMERICAN SOCIETY OF CIVIL ENGINEERS PRIZE. The Lehigh Valley Section of the American Society of Civil Engineers offers a prize of a junior membership in the American Society of Civil Engineers to the outstanding senior in civil engineering holding membership in the student chapter.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS JUNIOR MEMBERSHIP PRIZE. The Anthracite-Lehigh Valley Section of the American Society of Mechanical Engineers awards annually a prize of the value of \$10.00 to an outstanding member of the Lehigh Student Branch of the ASME. This prize takes the form of junior membership for one year in the parent society.

CHI EPSILON PRIZE. The Chi Epsilon national honorary fraternity in civil engineering offers annually a prize to the highest ranking freshman in Civil Engineering. The prize will consist of a Civil Engineering Handbook to be selected by the Fraternity.

ETA KAPPA NU PRIZE. The Eta Kappa Nu honorary fraternity in electrical engineering awards a handbook in electrical engineering to the highest ranking freshman in the curriculum in electrical engineering.

PHI ETA SIGMA AWARD. The Lehigh Chapter of this National freshman honor society for men offers an award to the Residence Halls Section with the highest freshman average for the preceding year. The trophy is a gift from Professor of Chemistry Harold V. Anderson.

PI TAU SIGMA PRIZES. The Pi Tau Sigma honorary fraternity in mechanical and industrial engineering awards each year a mechanical engineers' handbook to the highest ranking freshman in the curricula in mechanical engineering and industrial engineering respectively.

TAU BETA PI PRIZE. The Tau Beta Pi honorary engineering fraternity awards each year a slide rule or other prize of equivalent value to the engineering freshman having the highest scholastic average.

Summer Sessions

The courses offered during the 1956 Summer Session were arranged as follows: (1) two undergraduate sessions of six weeks each from June 19 through July 28 and from July 30 through September 8; (2) the regular graduate session of six weeks, June 20 through July 28; (3) the post session, July 30 through August 14, designed primarily for graduate students; (4) the workshops, June 19 through July 7 or July 21, consisting of programs in the field of health education, elementary education and guidance exclusively for teachers; (5) the special engineering courses and camps including civil engineering, June 11 through June 30 and July 2 through July 21, mechanical engineering, June 18 through July 6, and mining engineering, June 12 through June 25 and (6) the reading and study development laboratory, July 23 through August 10 designed primarily for high school students and August 13 through August 31 designed primarily for college entrants.

The SUMMER SESSION ANNOUNCEMENT, containing a full description of courses to be offered in 1957 together with information concerning admissions, fees, etc., will be sent on request addressed to the director of the Summer Session.

General College Division

The General College Division, plans for which were approved by the faculty on April 6, 1942, was organized to supplement the work of the established undergraduate curricula by meeting the educational needs of certain special groups of students. The Division aims to provide an opportunity for young men not planning a four year program to pursue such work, either of a general or a more specialized nature, as their preparation and interests make desirable; a trial period for those who wish to become candidates for baccalaureate degrees but whose preparatory training does not fully satisfy the entrance requirements for the curricula of their

choice; and facilities for qualified male adults to continue their education without being committed to a restricted or specialized program.

Although all work available through the General College Division will be found at present among the regular offerings of the several departments, the work taken by students enrolled in this division is not regarded as primarily preparation for admission to the upper classes of the University; rather, the courses are looked upon as complete in themselves. As time indicates certain needs not recognized at the moment, consideration will be given to the development of special courses for the General College Division group.

Each student in the General College Division has an individual program, one not subject to distribution or curriculum requirements, yet one limited by the student's ability to meet the prerequisites of the courses which he desires to take. With but few exceptions, the student enrolled in this division enjoys the same privileges as all other undergraduates in the University, including eligibility to unrestricted prizes, access to student aid, and the right of petition; and he is also subject to the same general regulations, those pertaining to scholastic probation not accepted. The General College Division student will not, however, be a candidate for a degree, save in those instances where transfer to one of the undergraduate programs of study leading to degrees is approved by a committee composed of directors of curricula.

Adult Education Program

The Adult Education Program is committed to serving the needs and interests of people in all walks of life. It is limited to special courses offered in the afternoon, evening, and Saturday sessions, but is open alike to men and women students of twenty-one years of age and older.

A wide variety of courses is included in the present program. Some are intended to meet specific needs of special groups. Others attempt to serve the general public in such fields as art, literature, history, government, and international relations. Still others result from cooperative arrangements with business and industry, and with service and welfare agencies.

The Adult Education Program, approved by the faculty on March 6, 1944, is a recognition of the principle that social institutions have service responsibilities within their spheres of influence. As a private educational institution, Lehigh University's interest is as great but its area of operation properly more restricted than that of a publicly supported institution of higher learning. It is the desire of the University to meet the increasing demand for this new service through a flexible program closely adjusted to individual needs and interests.

University Library

The pattern of service in the Library of Lehigh University emphasizes two factors: the building of sound, balanced collections together with their maximum exploitation.

General and special collections number some 355,000 volumes, and are expanding at an annual rate of about 8,500 volumes. Over 2,000 serials and periodicals are currently received, and the Library is a depository for a wide selection of U. S. Government documents.

Because the Library is regarded as far more than a collection of books, every attempt is made to teach students how to assist themselves in finding and using information. All students are given instruction by the Library staff during the first semester of their Freshman year, and many classes are held for upperclassmen in various curricula. For the same reasons, the stacks are open to all students.

In order to provide an interchange of ideas and techniques in the field of library service, a fellowship known as the Commonwealth Research Librarianship is offered annually to qualified librarians from all the countries of the British Commonwealth.

Religious Observances

On each Sunday of the academic year chapel services are held at 11:00 A.M. in Packer Memorial Church, with the chaplain of the University in charge. Outstanding leaders of the Christian Church fill the pulpit approximately once a month. Music for these Sunday services is furnished by the Lehigh University

Chapel Choir. In addition, Holy Communion services are held every Sunday at 9:45 A.M.

There are also a number of special religious observances, such as the Chapel Service and Convocation, which opens Freshman Week; the annual All-University Memorial Observance in November; the annual Christmas Vesper Choral Program; and the observance of the World Student Christian Federation Day of Prayer with other schools in the area.

Attendance at all religious services is voluntary.

Students' Health Service

A dispensary is maintained which is equipped and staffed for routine medical and minor surgical care. Five beds are available for short periods of observation. Dispensary hours are from 8:30 A.M. to 5:00 P.M. weekdays; 8:30 A.M. to 12:30 P.M. Saturdays; and 10:00 A.M. to 12:00 noon on Sundays. During vacation periods and during the Summer sessions no Sunday hours are held.

Patients requiring bed care are sent home or to a local hospital when indicated. Any expenses so incurred must be paid by the student.

A night medical attendant is on duty through the Fall and Spring semesters from 5:00 P.M. - 8:00 A.M. weekdays. Facilities are available during these hours for the treatment of minor injuries and illnesses.

In the event of injury or illness outside regular Dispensary hours the service of a local physician should be obtained. Such physicians' fees will be paid by the student, his family, or by his Health Insurance Plan; not by the Health Service. Any physician of choice may be consulted. However, the names, addresses, and phone numbers of physicians who have signified their availability is distributed at the beginning of the Fall Semester for posting in each student living group. Due to limited Staff and multiplicity of Dispensary duties, Health Service physicians are not able to make professional calls on students in living groups, or in rooms except in cases of absolute emergency. If unable to visit the Dispensary in the event of illness or injury, students are advised to

call in a local physician for treatment. Such physicians' fees will be paid by the student, his family, or his Health Insurance Plan.

Ambulatory Dispensary Services

Medical and minor surgical problems of students are dealt with by the Dispensary. The Dispensary is not responsible for the care of any chronic illness, or any illness or injury contracted or sustained while away from the University, excepting on official trips. A necessarily limited emergency service is also extended by the Health Service to those faculty members and other employees who wish to avail themselves of it.

Physical Examinations

As a part of routine admission procedure, each prospective new or transfer undergraduate student, prior to his arrival on campus, must submit a Health History Form and a Record of Physical Examination completed and signed by his own physician. Appropriate forms will be provided by the University Health Service to all applicants for admission prior to their arrival on campus when possible, and are to be returned in completed form to the Director of the Health Service within the time limit specified. All undergraduate students are responsible for completion of the Record of Physical Examination and Health History forms.

Late, or non-return of these forms results in incompleteness of our Records, and necessitates special handling in order to bring them to completion. Therefore, a fine of \$10.00 is charged all students whose completed form(s) are not returned within the time specified. In addition, any further delay in completion and delivery to the Health Service of these forms after arrival on campus, following personal notification of such deficiency by the Health Service, will result in an additional fine of \$10.00 for each successive failure to comply. Please note also that a fine of \$10.00 will be levied for each default against any student who fails to respond to an official summons from the Health Service, or who fails to appear for a regularly and officially scheduled Health Service procedure in which he is involved.

All new employees are expected to have a physical examination before beginning their duties at the University. Such pre-employment examinations may be done by the Health Service Staff, or by the applicant's chosen physician (at the applicant's expense) on

Health Service forms supplied for that purpose. All completed forms are to be returned to the Director of the Health Service as soon as possible for confidential analysis and filing.

The physicians of the Health Service carefully analyze the results of all physical examinations in order to detect any latent or obvious physical, emotional, or mental abnormality. When found, the person involved may be invited in for a conference, and his disability discussed with him confidentially.

Close cooperation between the Department of Physical Education and the Health Service permits the establishment of rehabilitation measures, etc., as indicated, for students. All students are graded for the Physical Education program according to their abilities to participate in physical activities.

In addition, students who are unable to meet the physical requirements for participation in the Reserve Officers' Training Corps program are disqualified from that unit by the Health Service.

The Health Service wishes to work closely with the student's family physician, and as far as possible will continue any treatments or follow-up studies requested by him.

Tuberculosis Survey

A 70 mm. Chest X-ray is made of each incoming student routinely. Any departure from the normal noted during the reading of these films calls for a 14"x17" chest X-ray and further investigation. An endeavor is made to have at least two such X-rays completed on each student during his attendance at the University.

Immunizations

In accordance with University regulations, all new and transfer students are required either to show evidence of vaccination against smallpox within three years, or to submit to such vaccination prior to the beginning of classes.

In addition, immunization with Tetanus Toxoid and the Salk Vaccine is strongly recommended before coming to Lehigh.

Neuropsychiatric Services

Assistance is offered to students who have personal and confidential problems that interfere with their school work.

The Health Service assists the University's Student Counseling Service. The contribution to this Service consists of establishing, insofar as possible, the mental, emotional and physical status of any referred student's health.

Laboratory

Facilities are available for routine Laboratory procedures. Additional procedures are performed at a local hospital at the expense of the student.

X-ray Services

The X-ray equipment of the Health Service includes a diagnostic unit, a 70 mm. Chest X-ray unit, and necessary developing and drying apparatus. Our X-ray services are limited to bone and chest films. No X-rays are taken of any body organs which involve the use of dyes, barium, etc.

A small charge is made to cover the cost of reading the X-ray by a local Radiologist.

Physiotherapy

A well-equipped physiotherapy section is a valuable adjunct to the University Health Service. A well trained technician administers treatment under the supervision of the University physician with such equipment as diathermy, whirlpool, ultra-violet and infra-red lamps.

Personnel

Full-time Health Service personnel normally includes two Physicians: the Director, and the Assistant Director; a Physiotherapist, a Laboratory and X-ray Technician, two Nurses, a night medical attendant, a Secretary, an Administrative Assistant, and a Receptionist.

Health and Accident Insurance

The University offers students a choice between two kinds of insurance policies against illness and/or injury. One policy covers both illness and accident, and the other accident only. The latter policy, of course, costs less. Both kinds are offered for a nominal fee, and on an entirely voluntary basis.

The Health Service recommends highly these insurance plans to both present and prospective students. Much experience has emphasized the importance of such protection, and we urge all students to participate in one or the other of these plans throughout their college careers.

All foreign students and others who, in the opinion of the administrative officers of the University, may not be in a position to meet the costs of sickness or injury are usually required to carry both health and accident insurance.

Placement, Counseling and Testing Services

In order to prepare the student for the exigencies of college life, the University maintains a placement, counseling and testing service. This service functions to help the student make satisfactory adjustments to his college environment and to provide counseling and aid in obtaining a job upon graduation.

Counseling and Testing Services

The primary aim of counseling is to aid the student in gaining a better understanding of himself so that he may have a basis for more satisfactory adjustments.

Many normal individuals fail to achieve genuine satisfaction and true success because they are blocked by lack of knowledge of their abilities and aptitudes, inadequate vocational information or inability to make personal and social adjustments.

There is available a well-developed library of occupational and educational materials and a variety of interest, achievement, personality, aptitude, and ability tests for the use of the student in self-appraisal. Counselors confer with those seeking guidance, interpreting test results and helping the student to analyze his capacities so he can better make his own decisions as to his future course of action. Every student in the University is privileged to avail himself of this counseling and testing service without cost.

Another service is the administration of many group testing programs throughout the year. In addition to the Freshman Week testing program there are offered the Graduate Record Examination, Law School Admissions Test, Medical College Admissions Test, Graduate Study in Business Test, National Teacher Examinations, Selective Service College Qualification Test, Accounting Orientation Test and others.

One of the important functions of the Service, is the undertaking of research and study dealing with tests, counseling, and other personnel problems.

Placement Services

Assistance is given to seniors seeking positions, underclassmen seeking summer jobs and alumni looking for employment or a change of positions.

This office places particular emphasis upon the techniques of job seeking and interviewing. A well developed vocational material file is maintained. Descriptive literature concerning many different companies is also available.

During the college year representatives of several hundred industries and business houses visit the campus to recruit graduates.

Reading and Study Services

There are many factors which influence the performance of college students. An important one is the expertness with which they master the skills necessary for college work. High level skills are needed in: preparing assignments, note-taking, outlining, listening, recalling information and facts, taking examinations, preparing written and oral reports and reading critically and accurately. Most students entering college have some proficiency in these skills, but is it enough?

The Reading and Study Services offer Lehigh men an opportunity to develop satisfactory reading and study habits. The following services are available to all students:

- . . . Analysis of reading and study skills
- . . . Reading and study improvement programs
- . . . Individual guidance on problems of academic adjustment.

We encourage first year students, particularly, to arrange for a conference. We assist them in making an evaluation of their learning tools and in planning for more effective work.

The improvement programs are offered periodically during the fall and spring semesters. Small group instruction is scheduled for interested students three hours a week for six consecutive

weeks. The instruction is adapted to the needs of the individual in well equipped classrooms.

Academic Observances

Baccalaureate Sunday

Baccalaureate Services were held on Sunday afternoon, June 17, 1956, in Packer Memorial Church. The sermon was delivered by The Rt. Rev. Henry Knox Sherrill, Presiding Bishop of the Protestant Episcopal Church in the U.S.A.

University Day

University Day was observed Monday, June 18, 1956. Commencement exercises were held in Eugene Gifford Grace Hall. The address to the graduating class was delivered by The Honorable Henry Cabot Lodge, Jr., United States Representative to the United Nations. Honorary degrees and degrees in course were conferred, commissions in the Regular Army of the United States, the Regular United States Air Force and the Officers' Reserve Corps were awarded, and graduation honors and prizes won by members of the graduating class were announced.

Founder's Day

The annual exercises in honor of the founder of the University were held Sunday afternoon, October 14, 1956, in the Packer Memorial Church. The address was delivered by Dr. Theodore A. Distler, Executive Director of the Association of American Colleges. Degrees were conferred; and graduation honors, class honors and prizes were announced.

Alumni Association

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name of the Alumni Association of the Lehigh University, Inc. The offices of the association are located in the Alumni Memorial Building. Along with the regular alumni activities, the association is largely concerned with fund raising to meet the needs of the University.

The officers of the Alumni Association for 1956-57 are:
President, Ralph L. Wilson, '21, Canton, Ohio.
Vice-President, S. Murray Rust, Jr., '34, Pittsburgh, Pa.
Vice-President, Edwin H. Snyder, '23, West Orange, N. J.
Treasurer, H. P. McFadden, '25, Bethlehem, Pa.
Archivist, James D. Mack, '38, Bethlehem, Pa.
Executive Secretary and Editor of the *Lehigh Alumni Bulletin*,
Robert A. Harrier, '27, Pen Argyl, Pa.

Over seventeen thousand Lehigh alumni throughout the country who maintain an active interest in the University are afforded opportunities for frequent social contact with Lehigh men of all classes through thirty-seven alumni clubs established in areas of alumni concentration. Important outposts of the University, these clubs hold meetings and carry on activities that mirror the activities of the University in its cultural, social, financial and recreational phases.

The following are the alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington, D. C., Lehigh Club, Detroit Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Youngstown (Ohio) Lehigh Club, Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N.Y.), Lehigh Club of Northern Ohio (Cleveland, Ohio), Lehigh Club of Southern New England, Lehigh Club of Western New York (Buffalo, N. Y.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of Southeastern Pennsylvania (Reading, Pa.), Lehigh Club of Central Jersey (Trenton, N. J.), Lehigh Club of York-Lancaster (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco), Lehigh Club of Southern California (Los Angeles), Lehigh Club of Delaware (Wilmington), Lehigh Club of Monmouth County, N. J., South Jersey Lehigh Club (Camden), Bergen-Passaic Lehigh Club (Glen Rock, N. J.), Central Ohio Lehigh Club, Twin-City Lehigh Club (Minneapolis, Minn.), Lehigh Club of St. Louis (St. Louis, Mo.), Lehigh Club of Milwaukee, (Wisc.), Lehigh Club of Rochester (N. Y.), Lehigh Club of Syracuse (N.Y.), Lehigh Club of Atlanta (Ga.), Watchung Area Lehigh

Club (Plainfield, N. J.), Lehigh Club of Kansas City (Mo.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Lehigh Club of Texas (Dallas-Ft. Worth).

Organizations

National Honor Societies — General

- Phi Beta Kappa (scholarship)
- Tau Beta Pi (engineering)
- Beta Gamma Sigma (business administration)
- Phi Eta Sigma (freshman scholarship)

National Honor Societies— Departmental

- Alpha Epsilon Delta (pre-medical)
- Alpha Pi Mu (industrial engineering)
- Chi Epsilon (civil engineering)
- Eta Kappa Nu (electrical engineering)
- Phi Alpha Theta (history)
- Pi Gamma Mu (social science)
- Pi Mu Epsilon (mathematics)
- Pi Tau Sigma (mechanical engineering)
- Psi Chi (psychology)

National Recognition Societies

- Alpha Phi Omega (campus service)
- Arnold Air Society
- Eta Sigma Phi (classics)
- Omicron Delta Kappa (student leadership)
- Pershing Rifles (military)
- Pi Delta Epsilon (college journalism)
- Sabre Society (air force)
- Scabbard and Blade (military)
- Sigma Xi (scientific research)

COURSE SOCIETIES

Intellectual interest in various fields of study and professional spirit among arts, business, and engineering students is promoted by a group of organizations commonly called course societies. The first of these organizations historically was the Chemical Society, established in 1871. The list now includes:

In Arts and Science

- Circulo de Espanol
- Delta Omicron Theta (debating)
- Der deutsche Verein
- International Relations Club
- Newtonian Society
- Psychology Club
- Robert W. Blake Society (philosophy)
- Robert W. Hall Pre-Medical Society

In Business Administration

- Alpha Kappa Psi (professional fraternity in business administration)
- Lambda Mu Sigma (marketing)
- Lehigh Accounting Society
- Lehigh Business Society

In Engineering

- American Chemical Society (chapter of student affiliates)
- American Institute of Chemical Engineers (student chapter)
- American Institute of Electrical Engineers and Institute of Radio Engineers (combined, student branch)
- American Institute of Industrial Engineers (student branch)
- American Institute of Physics (student section)
- American Society of Civil Engineers (student branch)
- American Society of Mechanical Engineers (student branch)
- Howard Eckfeldt Society and Geological Society (student branch of the American Institute of Mining and Metallurgical Engineers)
- Metallurgical Society
- Society of American Military Engineers
- Student Chemical Society

Other Student Organizations

- Alpha Chi Epsilon (Episcopal pre-theological honorary society)
- Alpha Lambda Omega (Allentown group)
- Arcadia, the Student Council
- Band
- Bowling Club
- Bridge Club
- Brown Key Society

ORGANIZATIONS

Camera Club
Canterbury Club
Chapel Choir
Chess Club
Christian Council
Combined Musical Club, (Glee Club, Cliff Clefs, Collegians, Symphony Orchestra, Brass Choir)
Conservation Club
Cosmopolitan Club
Cut and Thrust Society (fencing)
Cyanide Club (junior honorary society)
Ernest W. Brown Astronomical Society
Evangelical & Reformed Student Group
Flying Club
Hillel Society
Hockey Club
Interfaith Council
Interfraternity Council
Intervarsity Christian Fellowship
Lutheran Student Fellowship
Model Railroad Club
Motor Club
Music Festival
Methodist Student Fellowship
Mustard and Creese (dramatic club)
Newman Club
Political Science Assembly
Radio Society
Residence Halls Council
Roger Williams Fellowship
Sailing Club
Shop Club
Skiing Club
Town Council
Varsity "L" Club
Westminster Fellowship

The following Greek letter national social fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Sigma Phi, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Chi, Delta Phi, Delta Sigma Phi, Delta Tau Delta, Delta Upsilon,

Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Phi Delta Theta, Phi Gamma Delta, Phi Sigma Kappa, Pi Kappa Alpha, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma Phi Epsilon, Tau Delta Phi, Theta Chi, Theta Delta Chi, Theta Kappa Phi, Theta Xi.

Student Publications and Radio

The students of Lehigh University publish a semi-weekly college newspaper, The Lehigh Brown and White, and a year book, The Epitome. The students' modern radio station, WLRN, 640 kc, has a broadcast day of eighteen hours. The Radio Workshop which broadcasts weekly programs over local commercial stations provides practical experience for students taking certain courses in the Division of Speech.

Lehigh Institute of Research

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the application of science to the affairs of modern life. The Institute was reorganized in 1945 in order to cooperate more effectively with industry and government agencies.

The purposes of the Institute of Research include the training of men for research work, the publication of results of investigations, the conduct of general research, the conduct of cooperative research, and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research will be provided by the Director upon request.

INSTITUTE OF RESEARCH APPOINTMENTS

Lehigh University cooperates with industrial concerns, technical associations and government agencies in carrying on basic research and applied research designed to develop new and to improve old products and methods of production. Cooperative research projects usually provide every year a number of research assistantships which are available to qualified graduate students.

These assistantships provide stipends which vary from \$150 to \$350 per month, depending upon the qualifications of the appointee and the time assigned to the project. Appointments are for one year and may be renewed or extended. Part- or full-time employment on research projects is frequently available during the summer, and whenever possible it is desirable for entering students who hold research appointments to begin their employment in June or July before the commencement of formal graduate study in the fall. Applications for research assistantships should be accompanied by evidence of the candidate's qualifications for the appointment sought and sent to the Director of the Lehigh Institute of Research or to the head of the department concerned.

Among the cooperative research programs in progress at present are those sponsored by the following agencies:

Various departments of the United States
Government, Army, Navy and Air Force
Aluminum Company of America
American Institute of Steel Construction
American Iron and Steel Institute
American Cyanamid Company
American Association of Railroads
Armstrong Cork Company
Bethlehem Steel Company
Burroughs Corporation
Columbia-Southern Chemical Corporation
Column Research Council
Concrete Products Company
Corn Industries Research Foundation
Diamond Alkali Company
Economic Education League
Esso Education Foundation
Folding Paper Box Association
Fuller Company
S. B. Foot Tanning Company
A. F. Gallun & Sons Company
Gannett Fleming Corddry and Carpenter, Inc.
Heat Exchange Institute
Ingersoll-Rand Corporation
International Nickel Company
Jones and Laughlin Steel Corporation

Kentile, Inc.
William S. Merrill Company
Minerals and Chemicals Corporation of America
Modjeski and Masters
Mutual Chemical Company
National Aniline Division of Allied Chemical
& Dye Corporation
National Lead Company
National Printing Ink Research Institute
National Science Foundation
Nopco Chemical Company
The Ohio Leather Company
Pennsylvania Department of Highways
Pennsylvania Power and Light Company
Pfister and Vogel Tanning Company
Pressure Vessel Research Council
Purolator Products, Inc.
Radio Corporation of America
The Reading Company
Research Corporation
Revere Copper and Brass Incorporated
John A. Roeblings' Sons Corporation
Rohm and Haas Company
Fred Rueping Foundation, Inc.
Stressteel Corporation
Schuylkill Products, Inc.
A. Trostel & Sons Company
United States Steel Corporation
Welding Research Council
Westvaco Chemical Division of
Food Machinery and Chemical Corporation

Bureau of Educational Service

The Bureau of Educational Service was organized in 1953 to coordinate the many educational services rendered by the University to public and private schools and to provide further professional assistance to schools and school groups.

Among its purposes are the rendering of professional assistance to educational agencies in the cooperative study of their problems,

the fostering of educational research, and the making more readily available the educational research facilities of the University. In fulfilling its purposes, the services of specialists—local, state, and national—in the several fields of education, both subject matter and professional, are made available.

Detailed information concerning the organization and operation of the Bureau will be provided by the Director upon request.

Buildings and Grounds

The University occupies thirty-two buildings which are located on a tract of land covering one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the City of Bethlehem. In addition, the University has an athletic field, seven and one-half acres in area with field house, gymnasium, and covered grandstand, located about a mile from the University campus.

Alumni Memorial Building

The Alumni Memorial Building, which is used as the administration building of the University, was erected as a memorial to 1,921 Lehigh men who served in World War I and especially to the forty-six who gave their lives. The cost of erection was raised by subscription from about 1,700 alumni. The Memorial Hall contains the records of the Lehigh men who served and those who died, together with mementos of the war.

In the south wing of the building are the offices of the president, vice-president, dean of students, registrar, business offices, and superintendent of buildings and grounds. The north wing contains the offices of the bursar, director of admission, public information, alumni association, and supply bureau.

The north wing lobby contains the permanent collection of contemporary American paintings. In the south wing is housed the collection of portraits of the founder and numerous faculty and trustee members.

The Arboretum

The Arboretum is a tract of about eleven acres adjoining Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees and of cultivating trees and shrubs for the beauti-

fying of the park. All of the more important species of North American trees are to be found in the Sayre Park and the Arboretum. A tract of seven acres adjoining the Arboretum has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

The Chemistry Building

The Chemistry Building is a three-story fire-proof sandstone edifice, 259 feet long and 44 feet wide, with a wing 62 feet long and 42 feet wide, and with a three-story extension, 60 feet long and 37 feet wide. An additional three-story wing, 116 feet long by 52 feet wide, has been added to the east of the original building.

Laboratory space and equipment are provided for qualitative and quantitative analysis, inorganic chemistry, organic chemistry, sanitary chemistry, industrial biochemistry, colloid chemistry, X-ray analysis, gas analysis, the furnace assay of ores, industrial chemistry, chemical engineering, and research in chemistry and chemical engineering.

The trustees of the University named this building, exclusive of the new east wing, the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as professor of chemistry, 1871-1906. The east wing was named the Harry M. Ullmann Chemistry Laboratory, in recognition of Dr. Ullmann's service as head of the chemistry department.

Christmas-Saucon Hall

Christmas-Saucon Hall is a three-story stucco building. It contains the office of the College of Business Administration, the offices, lecture rooms, and recitation rooms of the departments of English, accounting, economics and sociology, and finance, University Counseling Center and the Director of Placement. Christmas Hall has historic interest as the first building of Lehigh University.

Coppee Hall

Coppee Hall is the headquarters of the College of Arts and Science. It contains the offices of the College of Arts and Science, a lecture room, and the offices and recitation rooms of the departments of German, Latin, Greek, romance languages, history and government, international relations, and fine arts.

The Eckley B. Coxe Mining Laboratory

The Eckley B. Coxe Mining Laboratory is a two-story sandstone building, 100 feet long and 75 feet wide, occupied exclusively by the department of Mining Engineering.

The building contains the offices of the department, two classrooms, a shop, a drafting room, various laboratories, and a utility room in the basement.

The utility room houses the air compressor, suction pump, and motor generator set. The offices and classrooms are on the first floor together with the laboratories for engineering geophysics and rock mechanics, a dust measurement room, and a calorimetry room. The geophysics laboratory is equipped with the standard prospecting and research equipment for electrical, seismic, magnetic and gravitational study. The rock mechanics laboratory has equipment for determining the physical properties of rocks.

The second floor is composed of the fuel technology and mineral preparation laboratories. In the former, equipment is available for the analysis of solid and liquid fuels. One portion of the mineral preparation laboratory houses the sizing, screening and crushing equipment. In the remainder of the laboratory are the conventional units for mineral preparation: ball mills, classifiers, jugs, shaking table, cyclone, spiral, filters, flotation machines, magnetic separators, and a Chance-sand coal cleaner; there is also available a float and sink apparatus.

The drafting room and ventilation laboratory are on the third floor. The drafting room contains the drafting tables and storage files for use in preparing mine maps. The ventilation laboratory contains a fan-duct system for making air measurements, safety lamps and gas detectors.

The building was named in memory of Eckley B. Coxe, a pioneer and leader in mining engineering in this country. He was a close associate of the founder of the University and served as a trustee from its early days until his death in 1895. His widow established an endowment fund for this building.

Drown Memorial Hall

Drown Memorial Hall was erected by friends and alumni as a memorial to the late Thomas Messinger Drown, LL.D., fourth president of the University from 1895 to 1904. The building is

devoted to the social interests of the University family. It contains study, reading, and lounging rooms, an assembly hall, the offices of Arcadia (student governing body), the student radio station WLRN and of the college publications. It is hoped that these activities will be moved to the University Center when construction is completed in the summer of 1957.

The Education Building

The Education Building, headquarters of the department of education, is a rebuilt, temporary one-story frame structure, 76 feet long and 30 feet wide. The building has a classroom with a capacity of approximately thirty, a seminar room, and six offices.

The Fritz Engineering Laboratory

The Fritz Engineering Laboratory, headquarters for the department of civil engineering, was established on the campus in 1909 by the late John Fritz of Bethlehem, known as the father of the steel industry in the United States, who served as trustee of the university for 35 years.

The original building, which was designed and erected under the personal supervision of Mr. Fritz, has been used by the department for various research and industrial projects and for laboratory instruction in mechanics of materials and hydraulics.

In October 1955, a new addition to the laboratory was dedicated. It houses the world's largest university hydraulic testing machine capable of applying 5,000,000 lb. load to tension or compress members up to 40 feet in length and flexure specimens up to 120 feet long.

The new addition consists of a seven-story section 130 ft. by 70 ft., plus a four-story section 114 ft. by 24 ft. The new building is a steel structure with reinforced concrete flooring and yellow brick and granite exterior. Two large aluminum-framed solex glass windows permit a maximum amount of natural light to enter the 50 ft. by 130 ft. crane bay which houses the huge vertical testing machine and the Amsler repeated load equipment, another outstanding feature of the new addition. The repeated load bed is a heavily reinforced concrete structure measuring 70 ft. by 14 ft. in plan, and 6 $\frac{1}{2}$ ft. deep. Carefully machined steel plates in the

top surface are designed to transmit shear and direct forces under all types of repeated loads.

A floor-controlled 20-ton capacity crane, 70 feet above floor level, services the new south bay and the 5,000,000 lb. testing machine. A 10-ton crane serves the original north bay with its 800,000 lb. machine, 2,000,000 inch-pound torsion machine and other machines of smaller capacity.

Research and student instructional laboratories in hydraulics, soil mechanics, concrete, structural models and sanitary engineering, as well as a separate student laboratory for materials testing, are provided.

The concrete laboratory includes storage bins for aggregates, together with equipment for making and storing all types of plain, reinforced, and prestressed concrete specimens.

The hydraulics laboratory has three levels, with pumps, tanks, turbines, weirs, and other appropriate apparatus used both for student instruction and industrial tests. Space is available for model tests of spillways, rivers, channels, etc.

The laboratory machine shop is completely equipped with lathes, millers, drill-presses, grinders, power saws, and miscellaneous tools and equipment. The welding shop provides facilities for both electric arc and gas welding.

Other facilities include photoelastic stress analysis equipment, a photographic darkroom, research library, staff offices, seminar rooms and a conference room.

Eugene Gifford Grace Hall

Eugene Gifford Grace Hall, named for the donor who served as president of the Board of Trustees from 1924 to 1956, is a stone structure 120 feet wide and 180 feet long used for sports and recreation. The building contains an athletic palestra, which also serves as an assembly hall for the University, with a seating capacity of 3,000. The second floor is a large drill floor which is available for the major University dances and receptions. In addition, there are classrooms for the band, orchestra, dressing rooms for athletic squads, and classrooms and offices for the departments of Air and Military Science. Promenade terraces at the level of the dance floor on three sides of the building afford views over the Lehigh Valley and of South Bethlehem. A student lounge was provided on the second floor during the past year.

The Health Services Building

The Health Center is located on University Avenue diagonally across from Taylor Hall. A recent addition to the campus it is a three-story building constructed of native stone with the main entrance on University Avenue.

The main floor contains a waiting lounge, record office, clinical laboratory, examining offices, dispensary, X-ray, observation rooms, and an ear, nose and throat room. On the ground floor are the physiotherapy department, library and conference room, Director's office and administrative offices.

The second floor contains several rooms which are used for storage and filing of inactive medical records. The Reading and Study Clinic occupies the basement.

The building was erected in 1955.

Lamberton Hall

The first floor of this building contains the main dining hall for student use and a private dining room, together with a complete kitchen and cafeteria counter. The second floor has a large dining room, pantry and service rooms. Storerooms and service rooms for help are located in the basement. It is hoped these functions will be moved to the University Center when construction is completed in the summer of 1957.

A portion of the basement is used by the military department as a rifle range. This portion contains two indoor rifle and pistol ranges.

Lehigh Field and Field House

An additional athletic field seven and one-half acres in area, with field house, gymnasium, and covered grandstand, is located about a mile from the University campus. The field house has dressing rooms, lockers, and shower baths; the gymnasium is equipped with basketball and volley ball courts. Here are eleven tennis courts for intercollegiate and intramural tennis. This field includes a playing ground for intercollegiate soccer and a field for intramural baseball and other intramural activities.

The University Library

The University Library is a five-story building of native stone, with limestone trim, in the collegiate Gothic style of architecture. It incorporates the original library building, erected in 1877 by

Asa Packer and named in memory of his daughter, Lucy Packer Linderman, and a completely modern edifice built in 1929 with funds contributed by alumni.

The main floor of the new portion of the building is occupied by the general reading room with its two alcoves, offices of the library staff, and the lobby, where are located the loan desk, card catalogue, and serial indexes. On the upper floors of this portion of the building are eleven seminar rooms, the Treasure Room, the Lehigh Collection, and the Lehigh Art Gallery. The remainder of the new wing and the entire older portion of the building are occupied by stacks. In the stacks are a number of cubicles, which may be reserved by students and faculty members engaged in special work.

The Mathematics Building

Formerly the temporary Health Center, the building is now the temporary home of the Mathematics Department. It is a rebuilt one-story frame structure, 151 feet long and 26 feet wide. It contains only the general offices of the department.

The Ordnance Laboratory

The facilities of the Departments of Air and Military Science and Tactics, located in Eugene Gifford Grace Hall, have been augmented by a temporary one-story frame structure, 60 feet long and 25 feet wide. This building contains Army and Air Force ROTC supply storage facilities and garage space.

The James Ward Packard Laboratory of Electrical and Mechanical Engineering

The late James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of mechanical engineer, the designer of the first Packard motor car and founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company, of Warren, Ohio, donated \$1,200,000.00 for the erection and equipment of an electrical and mechanical engineering laboratory, which was completed in 1929.

This building, named for the donor, is a five-story steel-framed sandstone structure 225 feet long and 180 feet wide. The lobby is finished in Italian travertine. The halls throughout the building are wainscoted with Tennessee marble. An auditorium on the first floor with a seating capacity of 622 is equipped with still- and motion-picture apparatus.

The western half of the building contains the offices, classrooms, research rooms, and laboratories of the department of electrical engineering. The main dynamo laboratory contains more than 100 generators and motors of various types. The high-tension laboratory is equipped with a 150 kv. and a 60 kv. testing transformer, a 700 kv. oscillation transformer, and a source of high direct current voltage up to 100 kv. The transients laboratory is provided with six magnetic oscillographs, two cathode-ray oscillographs, two artificial transmission lines, a surge generator, and a photographic dark room. A five-unit harmonic phase-shifting motor-generator set supplies voltage of various frequencies and wave forms for special tests. The communications laboratory has extensive equipment of high-frequency measuring apparatus, vacuum-tube circuits, speech amplifiers, and a 40/80 meter transmitter (C.W. or phone) used by the radio club. The wiring system provides for quick communication and interconnection between any two parts of the building. Transforming machinery and switchboard for the laboratory power supply are located in the basement.

The eastern half of the building houses the department of mechanical and industrial engineering, with classrooms, drawing rooms, offices, research rooms, photographic dark room, shop, instrument room and laboratories.

The main laboratory contains steam power equipment, including boilers, steam engines, turbines, condensers, heaters, pumps, etc. The equipment is arranged so that tests may be made of a complete steam power plant or tests may be made of individual components. In addition, reciprocating air compressors, a ventilating fan and a high-pressure centrifugal blower are available.

The internal combustion engine laboratory has a number of automotive-engines, both spark-ignition and compression ignition types, set up for testing with an electric dynamometer. A Cooperative Fuel Research single cylinder engine is used for investigational tests. Two two-stroke supercharged marine diesel engines are set up with a hydraulic dynamometer. A small single-cylinder diesel engine, connected to an electric generator is also available.

The instrument room has a complete supply of portable instruments. The shop has facilities for maintenance and for construction of new equipment, instruments, and models.

Courses in machine design at the graduate and undergraduate levels emphasize important experimental techniques. For work in

experimental stress analysis a 60,000 lb. universal testing machine is available, along with strain gage equipment, oscilliscopes, Stress-coat and a polariscope for photoelastic investigations. For vibration and balancing studies, the equipment includes vibration velocity meters, a displacement indicator, recording vibrometer, electromagnetic torque meter and portable balancing equipment.

Packer Hall

Packer Hall is a four-story sandstone building, 215 feet long and 60 feet wide.

The historic structure is being remodeled as a University Center. An addition to this, the first building constructed for educational purposes when the university was founded, is expected to be completed for use in the summer of 1957. The new addition, 180 feet long and 75 feet wide, together with the renovated original structure, will become the center of university life on the campus.

The Packer Memorial Church

The Packer Memorial Church, in which religious services are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the founder of the University. It was built in 1887. Occasional musical recitals and the annual Bach Festival are held in this building which now contains the Starkey Memorial Organ.

The Physics Building

The Physics Building is a four-story sandstone structure, 240 feet long and 44 to 56 feet wide. This building is devoted entirely to the department of physics. In addition to offices, recitation rooms, and lecture rooms, there are fully equipped laboratory rooms for undergraduate and graduate classes, a number of smaller laboratories for research, a reading room, machine shop, wood-working shop, glass-blowing room, constant-temperature rooms, storage battery room, sound-proof room, and dark rooms. The building is equipped throughout with water, gas, compressed air, and electric power outlets.

Psychology Building

The psychology department is temporarily housed in a former residence immediately adjoining the campus at 103 E. Packer Avenue. The building is a three story brick structure, 55 feet long and 35 feet wide. It contains departmental and staff offices, a class

room, a seminar and library, a photographic dark room, rooms for statistical machine calculation, psychometric testing, and research.

Psychology Laboratory Building

This two-story stone building, 70 feet by 20 feet in plan, temporarily houses the elementary and advanced instructional laboratories, together with student and staff shop facilities of the psychology department. Adjoining the building is a one-story lean-to, 25 feet long and 20 feet wide, which contains the machine shop.

Sayre Observatory

The Sayre Observatory was the gift of the late Robert H. Sayre, one of the original trustees of the University.

The observatory contains an equatorial telescope of six inches clear aperture and of eight feet focus, by Elvin Clark, a zenith telescope of four and one-half inches clear aperture, an astronomical clock by William Bond & Son; a meridian circle; a prismatic sextant by Pistor and Martins; an engineer's transit and a sextant by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

Sayre Park

A development of the mountainside on the University grounds was affected through the donation in 1909 of the sum of \$100,000.00 by the children of the late Robert H. Sayre, to be used in the development of Sayre Park as a memorial to their father, who was a trustee of the University from its foundation until his death in 1907.

Service Building

The Service Building, headquarters of buildings and grounds, consists of one main building, a 5-story brick structure 160 feet long by 40 feet wide and a lean-to, a one- and one-half story brick structure 160 feet long by 40 feet wide. Located at Adams and 4th Streets, 250 yards from the University Campus.

The main building is used chiefly for the storage of maintenance materials and supplies, lumber, building materials, plumbing and heating supplies and electrical supplies. A freight elevator

20 feet by 10 feet is used to handle materials to the various levels. The lean-to houses the various maintenance shops, carpenter shop, tinsmith shop, paint shop and cement masons shop, along with the materials used by the trades.

Taylor Field

An athletic field more than nine acres in area is provided for the accommodation of students who participate in the various outdoor sports. The stadium, located on the lower level, provides football and baseball fields, surrounded by concrete stands having a seating capacity of 12,000. New steel stands were erected in 1953 above south concrete stands providing 4,000 more seats for a total seating capacity of 16,000. A new press box, men's and women's toilet rooms and concession booths under steel stands were erected, and all other toilet facilities were modernized. On the upper level there is a practice field for football, baseball, lacrosse, and soccer; also a quarter-mile track and a 220-yard straight-away. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

Taylor Gymnasium and Field House

In 1913, Charles L. Taylor, E.M., '76, donated to the University the funds required for the erection of a gymnasium and field house.

These buildings were recently remodeled, re-equipped and expanded as one of the major projects of the Lehigh Progress Fund.

Taylor Gymnasium, which adjoins the athletic field, is a building 222 feet long and 73 feet wide. It has been expanded by the addition of a new swimming pool measuring 75 by 42 feet, and a new gymnasium measuring 94 by 77 feet. The new swimming pool ranges in depth from five to ten feet, and includes a large gallery for spectators, an observation room below the water line and the latest filtration equipment.

Included in the renovations of the old buildings and in the new construction are locker facilities for 2600 students, a faculty locker room, coaches locker room, five basketball courts, boxing room, fencing room, golf practice room, wet and dry steam rooms, and a specially designed wrestling room. Also included are a well equipped first aid room for physical education activities, corrective exercise gymnasium, modern trainer's room with latest facilities, and class and meeting rooms.

Athletic, physical education and business offices have been incorporated in the new construction. Improved heating is furnished by electric blowers.

The former entrance way has been transformed into a trophy room measuring 26 by 55 feet as a repository for athletic prizes and awards. The third floor addition known as the Samuel E. Berger Room, the gift of Mr. Samuel Erwin Berger, B.A., '89, has also been remodeled.

The W. A. Wilbur Engineering Laboratory and Power House

The W. A. Wilbur Engineering Laboratory and Power House is a two-story sandstone building, 188 feet long and 44 feet wide.

The Power plant contains four Babcock and Wilcox straight-tube cross-drum boilers, each rated at 300 boiler horse-power, one coke chain grate stockers, one turbine driven Sturtevant blowers and coal-, water-, and ash-handling equipment of modern design. Two boilers are equipped with Petro oil burners and are fully automatic controlled. A third boiler has been equipped with a B. & W. oil burner also fully automatic controlled. Four 15,000 gal. fuel oil storage tanks are installed at convenient locations for receiving oil supply.

The plant is designed and equipped to provide steam at 250 pounds pressure to the engineering laboratories, in addition to heating the University buildings. It is so arranged that any boiler can be isolated for laboratory tests for long periods if necessary. From this plant a six inch line carries steam to the Packard Laboratory at the pressure desired for the laboratory work. Modern safety appliances and measuring equipment have been incorporated.

A coal-storage yard has room for two months' supply of coal and a system of belt-conveyers and bucket-elevators is provided for receiving coal, dumping it on the storage pile, and conveying it into the boiler room as needed.

Williams Hall

Williams Hall, the donation of the late Dr. Edward H. Williams, Jr., of the Class of 1875, was so named by the trustees of the University in recognition not only of this gift but also of Dr. Williams' long continued and important service to the University as professor of mining and geology.

Originally a three-story brick building, 186 feet long and 70 feet wide, Williams Hall was rebuilt as a four-story building and basement after it had been severely damaged by fire in January 1956. It contains the offices, classrooms, laboratories, departmental libraries, and special collections of the departments of biology, geology, and metallurgical engineering.

Williams Hall Annex contains some of the research facilities of the departments of biology and psychology. This concrete and brick structure is connected to Williams Hall by a bridge passage between the third floor of the annex and the second floor of Williams Hall.

The northern portion consists of a three story section, 35 feet long and 25 feet wide, which houses animal quarters together with aquatic-biology, virology, and bacteriology laboratories of the biology department. The entire third floor is a green house.

The southern portion, a single story section, 35 feet long and 21 feet wide, contains the bioelectric research laboratory of the psychology department. This laboratory has electrically shielded and sound proofed recording and instrument rooms, an operating and work room, photographic dark-room and an electronics shop.

THE RESIDENCE HALLS

Six residence halls are located on the campus. These modern structures provide living accommodations for approximately 1200 students. They are located near the center of the campus within walking distance of the Student Health Services Building, the University Center and the classroom buildings.

Dravo House

Dravo House, a five-story fireproof dormitory completed in April, 1948, provides accommodations for approximately 280 students. The building was made possible by the alumni and friends of the University through their contributions to the Progress Fund. It is named in memory of Francis R. Dravo and Ralph M. Dravo, former university trustees. Each of the four wing structures which compose the building has its own lounge and game rooms; and the center unit has a lounge and reception room for visiting friends, in addition to a ladies' lounge. There are rooms for one, two, and three students.

The Henry Sturgis Drinker House

The Henry Sturgis Drinker House, named for the university's fifth president, was completed in 1940. It is a four-story fireproof residence hall with accommodations for 190 students. It has rooms for two and three students, a spacious lounge, and a reception room for visitors.

The Henry Reese Price House

The Henry Reese Price House, named in honor of Dr. Henry Reese Price, an alumnus of the University of the Class of 1870 and late president of the board of trustees, furnishes dormitory accommodations for 40 students.

The Charles Russ Richards House

The Charles Russ Richards House, named in honor of the sixth president of the university, was completed in 1938. It is a four-story fire-proof dormitory with rooms for two students. In addition to bedrooms and studies accommodating a total of approximately 210, the building contains an adequate recreation room, a spacious lounge, and two reception rooms for visiting friends.

The Charles Lewis Taylor House

The Charles Lewis Taylor House, the gift of Mr. Andrew Carnegie, is a three-story concrete dormitory with accommodations for approximately 190 students, the majority of whom are housed in three-room suites, four to each suite. The building was named Taylor Hall by Mr. Carnegie in honor of Charles L. Taylor, his former partner in business, a graduate of the University of the Class of 1876 and a trustee of the University. The building was completed in 1907.

New Residence Hall

The New Residence Hall was completed in December 1956, providing accommodations for 296 upperclass students. The building consists of three student living floors each with 48 double rooms, two section president rooms, a lounge and two special purpose rooms. The ground floor holds the Residence Halls Office, Residence Hall Council, House president's suite and a large Recreation Room.

REGISTRATION STATISTICS

SUMMARY OF STUDENT REGISTRATION

Spring 1956

Students in the University

Undergraduate Students	2560
Graduate Students	534
Total	3094

Students in Undergraduate Curricula

Curriculum	Seniors	Juniors	Sophomores	Freshmen	G.C.D.	Total
Arts and Science	102	102	124	123	—	451
Business Administration	162	160	152	110	—	584
Chemical Engineering	52	40	53	85	—	230
Chemistry	8	7	7	4	—	26
Civil Engineering	37	43	37	41	—	158
Electrical Engineering	46	64	64	82	—	256
Engineering Physics	25	18	27	23	—	93
Industrial Engineering	47	46	58	29	—	180
Mechanical Engineering	73	85	90	91	—	339
Metallurgical Engineering	39	38	29	24	—	130
Mining Engineering	5	8	11	11	—	35
Unclassified Engineers	—	—	—	62	—	62
General Science & Mathematics.....	1	2	—	—	—	3
General College Division	—	—	—	—	13	13
Total	597	613	652	685	13	2560

LEHIGH UNIVERSITY

Summer 1956

Students in the University

Undergraduate Students	637
Graduate Students	219
Total	856

Fall 1956

Students in the University

Undergraduate Students	2673
Graduate Students	560
Total	3233

Students in Undergraduate Curricula

Curriculum	Seniors	Juniors	Sophomores	Freshmen	G.C.D.	Total
Arts and Science	107	114	139	167	—	527
Business Administration	153	162	133	107	—	555
Chemical Engineering	40	52	65	3	—	160
Chemistry	9	8	12	—	—	29
Civil Engineering	37	36	38	—	—	111
Electrical Engineering	53	67	80	3	—	203
Engineering Physics	23	27	33	1	—	84
Industrial Engineering	38	58	44	3	—	143
Mechanical Engineering	82	79	104	6	—	271
Metallurgical Engineering	36	36	30	3	—	105
Mining Engineering	9	8	13	1	—	31
Unclassified Engineers	—	—	—	442	—	442
General Science & Mathematics.....	1	1	—	—	—	2
General College Division	—	—	—	—	10	10
Total	588	648	691	736	10	2673

GEOGRAPHICAL DISTRIBUTION OF STUDENTS

Spring 1956

Alabama	1	Rhode Island	4
California	4	Tennessee	4
Connecticut	79	Texas	5
Delaware	11	Vermont	1
District of Columbia	9	Virginia	13
Florida	9	West Virginia	2
Georgia	2	Wisconsin	1
Illinois	9	Brazil	3
Indiana	2	Burma	9
Kentucky	2	China	1
Maryland	55	Colombia	2
Massachusetts	29	Cuba	2
Michigan	9	Dominican Republic	1
Missouri	1	England	1
Montana	1	Hawaii	1
New Hampshire	1	Mexico	4
New Jersey	627	Netherlands West Indies	3
New Mexico	1	Panama	2
New York	497	Philippine Islands	3
North Carolina	4	Puerto Rico	3
Ohio	30	Venezuela	6
Pennsylvania	1106		

GEOGRAPHICAL DISTRIBUTION OF STUDENTS

Fall 1956

Alabama	1	South Carolina	1
California	3	Tennessee	3
Connecticut	87	Texas	2
Delaware	9	Vermont	3
District of Columbia	13	Virginia	12
Florida	12	West Virginia	2
Georgia	4	Wisconsin	1
Illinois	9	Alaska	1
Indiana	2	Brazil	2
Kentucky	2	Burma	5
Louisiana	1	Canada	1
Maine	1	China	1
Maryland	65	Colombia	2
Massachusetts	35	Cuba	4
Michigan	7	England	1
Missouri	3	Hawaii	3
New Hampshire	2	Korea	1
New Jersey	643	Mexico	3
New Mexico	1	Netherlands West Indies	2
New York	516	Panama	1
North Carolina	6	Philippine Islands	3
Ohio	36	Puerto Rico	4
Pennsylvania	1147	Thailand	1
Rhode Island	2	Venezuela	7

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