GENERAL ANNOUNCEMENTS

for

September, 1952—June, 1954

of

THE RICE INSTITUTE

FOUNDED BY WILLIAM MARSH RICE

OPENED FOR THE RECEPTION OF STUDENTS IN THE
AUTUMN OF NINETEEN HUNDRED AND TWELVE

Dedicated to the

Advancement of Letters, Science, and Art

HOUSTON, TEXAS

CONTENTS

PAGE

1952

July

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

1953

January

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

August

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

September

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

October

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

November

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

December

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1954

January

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

ACADEMIC CALENDAR

1952

September 18-19	Registration
September 20	Matriculation Address
September 22	Opening of Courses
November 26	Beginning of Thanksgiving Recess at 6:00 P.M.
December 1	Resumption of Courses at 8:00 A.M.
December 20	Beginning of Christmas Recess at 1:00 P.M.

1953

January 5	Resumption of Courses at 8:00 A.M.
January 26-February 5	Midyear Examinations
February 9	Resumption of Courses at 8:00 A.M.
April 2	Beginning of Easter Recess at 6:00 P.M.
April 7	Resumption of Courses at 8:00 A.M.
April 25	Main Entrance Examination Period
May 22	Beginning of Final Examinations
June 4	Baccalaureate Exercises
June 5	Fortieth Commencement
June 20	Second Entrance Examination Period (principally for transfers)

September 17-18	Registration
September 19	Matriculation Address
September 21	Opening of Courses
November 25	Beginning of Thanksgiving Recess at 6:00 P.M.
November 30	Resumption of Courses at 8:00 A.M.
December 19	Beginning of Christmas Recess at 1:00 P.M.

1954

January 4	Resumption of Courses at 8:00 A.M.
January 25-February 4	Midyear Examinations
February 8	Resumption of Courses at 8:00 A.M.
April 15	Beginning of Easter Recess at 6:00 P.M.
April 20	Resumption of Courses at 8:00 A.M.
April 24	Main Entrance Examination Period
May 21	Beginning of Final Examinations
June 3	Baccalaureate Exercises
June 4	Forty-first Commencement
June 19	Second Entrance Examination Period (principally for transfers)

EDGAR ODELL LOVETT, PH.D., SC.D., LL.D.
President Emeritus

OFFICERS OF ADMINISTRATION

WILLIAM VERMILLION HOUSTON, PH.D., D.SC.
President

WILLIAM HENRY MASTERSON, PH.D.
Assistant to the President

GEORGE HOLMES RICHTER, PH.D.
Dean

GUY THORNTON McBRIDE, JR., SC.D.
Associate Dean for Students

MRS. WILFRED SELLERS DOWDEN, M.A.
Adviser to Women

SAMUEL GLENN McCANN, M.A.
Registrar

JOSEPH DAVID THOMAS, A.M.
Assistant Registrar

JOHN THOMAS McCANTS, M.A.
Bursar

VERNE FRANKLIN SIMONS, A.M., C.P.A.
Assistant Bursar

TRUSTEES EMERITI

ALEXANDER SESSUMS CLEVELAND
EDGAR ODELL LOVETT
BENJAMIN BOTTS RICE
JOHN THADDEUS SCOTT

BOARD OF GOVERNORS

TRUSTEES

GEORGE RUFUS BROWN: CHAIRMAN
GUS SESSIONS WORTHAM: VICE-CHAIRMAN
FREDERICK RICE LUMMIS: SECRETARY-TREASURER
LAMAR FLEMING, JR.
JOHN SMITH IVY
WILLIAM ALEXANDER KIRKLAND
JESSE NEWTON RAYZOR

TERM MEMBERS

HERBERT ALLEN
ROBERT PACE DOHERTY
FRANCIS TARRANT FENDLEY
WALTER LEON GOLDSTON
HENRY MALCOLM LOVETT
ROBERT HILLYER RAY
HARMON WHITTINGTON

GENERAL ANNOUNCEMENTS FOR

SEPTEMBER, 1952–JUNE, 1954

THE RICE INSTITUTE

THE NAME

THE institution bears the name of the founder, the late William Marsh Rice. It aspires to university standing of the highest grade. Dedicated to the advancement of literature, science, and art, its educational program of liberal and technical learning may justify the designation "Institute" as representing the functions of a teaching university and, at least in some of its departments, those of the more recent research institutions established in this country and abroad.

HISTORICAL SKETCH

OVER sixty years ago several public-spirited citizens of the community asked Mr. Rice to bear the expense of building a new public high school for the city of Houston. This direct gift to the city's welfare Mr. Rice was unwilling to make, but a little later, taking into his confidence a half-dozen friends, he made known to them his desire to found a much larger educational enterprise for the permanent benefit of the city and state of his adoption. These gentlemen were organized into a Board of Trustees for the new foundation, which was incorporated in 1891 under a broad charter granting the trustees large freedom in the future organization of a non-political and non-sectarian institution to be dedicated to the advancement of letters, science, and art. As a nucleus for an endowment fund, Mr. Rice at this time made over an interest-bearing note of two hundred thousand dollars to the original Board of Trustees, consisting of himself and the late James A. Baker, J. E. McAshan, E. Raphael, F. A. Rice, A. S. Richardson, and C. Lombardi. Under the terms of the charter, the board is a self-perpetuating body of seven members. Vacancies since its organization have been filled by the election of the late William Marsh Rice, Jr., Mr. Benjamin Botts Rice, Mr. Edgar Odell Lovett, Mr. John Thaddeus Scott, Mr. Alexander Sessums Cleveland, the late Edward Andrew Peden, the late Robert Lee Blaffer, the late Harry Clay Hanszen, Mr. George Rufus Brown,

the late Harry Carothers Wiess, Dr. Frederick Rice Lummis, Mr. Lamar Fleming, Jr., Mr. William Alexander Kirkland, Mr. Gus Sessions Wortham, Mr. Jesse Newton Rayzor, and Mr. John Smith Ivy. (See also page 8.)

It was the unalterable will of the founder that the development of the work which he had conceived should progress no further during his lifetime. However, in the remaining days of his life he increased the endowment fund from time to time by transferring to the trustees the titles to certain of his properties, and in the end made the new foundation his residuary legatee. Upon the termination of the long years of litigation which followed Mr. Rice's death in 1900, the Board of Trustees found the Institute in possession of an estate divided by the provisions of the founder's will into almost equal parts available for equipment and endowment, respectively. While proceeding to convert the non-productive properties of the estate into income-bearing investments, the trustees called Mr. Edgar Odell Lovett, a professor in Princeton University, to assist them in developing the founder's far-reaching plans. Before taking up his residence in Houston, the future President visited the leading educational and scientific establishments of the world, returning in the summer of 1909 from a year's journey of study that extended from England to Japan. About this time negotiations were completed by which the Institute secured a campus of three hundred acres situated on the extension of Houston's main thoroughfare, three miles from the center of the city—a tract of ground universally regarded as the most appropriate within the vicinity of the city.

Another early decision of the trustees of the Institute was the determination that the new university should be housed in noble architecture worthy of the founder's high aims; and upon this idea they entered with no lower ambition than to establish on the campus of the Institute a group of buildings conspicuous alike for their beauty and for their utility, which should stand not only as a worthy monument to the founder's philanthropy, but also as a distinct contribution to the architecture of our country. With this end in view they determined to commit to Messrs. Cram, Goodhue, and Ferguson, of Boston and New York, the

task of designing a general architectural plan to embody in the course of future years the realization of the educational program which had been adopted for the Institute. Such a general plan, the work of the late Ralph Adams Cram, exhibiting in itself many attractive elements of the architecture of Italy, France, and Spain, was accepted by the board in the spring of 1910. Immediately thereafter plans and specifications for an administration building were prepared, and in the following July the contract for its construction was awarded; three months later the erection of a mechanical laboratory and powerhouse was begun, and by the next autumn the construction of two wings of the first residential hall for men was well under way. In the preparation of preliminary plans for its initial building operations, the Institute enjoyed the coöperation of an advisory committee consisting of the late Professor Ames, director of the physical laboratory, and afterwards president, the Johns Hopkins University; Professor Conklin, director of the biological laboratory, and at present professor emeritus, Princeton University; the late Professor Richards, chairman of the department of chemistry, Harvard University; and the late Professor Stratton, director of the National Bureau of Standards, subsequently chairman of the corporation of the Massachusetts Institute of Technology. In 1911, on the seventy-fifth anniversary of Texas Independence, the cornerstone of the administration building was laid by the trustees. This building, the mechanical laboratory of the engineering quadrangle, the powerhouse, and the first two wings of the first residential hall for men were ready for occupancy at the beginning of the first academic year in the fall of 1912. The third wing of this residential hall, begun in 1913, was first occupied by students in the autumn of 1914; while the construction of the physics laboratories and lecture amphitheater, begun also in 1913, was completed in the summer of 1914 from plans prepared by Messrs. Cram and Ferguson under the direction of Mr. H. A. Wilson, D.Sc., F.R.S., resident professor of physics in the Institute. In January, 1916, ground was broken for the first wing of the second residential group for men; the construction of this wing was completed by September, 1916. Further building operations were suspended during the war. Shortly thereafter,

an athletic field house and other structures of the exhibition field were erected in 1920. At the commencement exercises of 1923 ground was broken for the new laboratory for chemistry, the plans for which were prepared by Messrs. Cram and Ferguson and Mr. W. W. Watkin, associate architects, under the direction of the late H. B. Weiser, resident professor of chemistry in the Institute. The construction of this laboratory was completed during the academic year 1924–25.

Through personal association with several generations of Rice students, Mr. George Cohen, of Houston, was led to make generous provision for the Robert and Agnes Cohen House in honor of his parents, for long years well-known and highly respected citizens of Texas. This beautiful building, constructed in the materials and architecture of the first of the Rice quadrangles, designed to afford to the faculty the advantages of a club-house on the campus, was dedicated at the annual homecoming meeting of the Association of Rice Alumni on Thanksgiving Day of the year 1927.

In the early autumn of 1912, an academic festival in observance of the formal opening of the Institute was held under altogether favorable conditions of weather, most generous coöperation of the community and commonwealth, and the heartening encouragement of several hundred scholars and scientists who came to Houston to assist in the launching of the new university. Chief among these distinguished representatives of life and learning were the twelve foreign savants who had consented to participate in the inaugural program by preparing series of lectures in the liberal humanities of philosophy, history, letters, and art, and in the fundamental sciences of mathematics, physics, chemistry, and biology. A complete account of the proceedings of the four days devoted to this celebration has been embodied in three commemorative volumes, in which there appear, in particular, the inaugural lectures.

The actual work of instruction of the first academic year began on the twenty-third day of September, 1912, the anniversary of the death of the founder. In the presence of the trustees of the Institute, members of the teaching staff, and representative citi-

zens of the community, the first class of students was received in the faculty chamber of the administration building with appropriate ceremonies on September 26. The scholastic work of the first academic year was limited to a single class of Freshmen of a standard of preparation as high as the best public and private high schools were capable of attaining.

The first class consisted of seventy-seven members, of whom thirty-six were granted degrees at the first commencement in June, 1916. From that small beginning, the enrollment expanded until it reached the limit that could be received, or about one thousand five hundred students. Since 1924 it has been necessary to limit the admission of new students to four hundred in order to keep the total enrollment within the limits indicated by available funds. Throughout its history, the Rice Institute has enrolled nearly sixteen thousand persons and has awarded more than seven thousand degrees.

In 1941, upon attaining the age of seventy, Mr. Lovett announced his retirement as President. He was prevailed upon to continue in active service until a successor could be appointed. Because of the second world war this appointment was delayed almost five years until Mr. William V. Houston assumed the presidency in March, 1946, and Mr. Lovett was made President Emeritus. A year later, the formal inauguration of President Houston on April 10, 1947, was attended by official representatives of more than two hundred and fifty institutions and societies of learning. A commemorative volume has been printed to record the events of the day, including addresses by several distinguished speakers.

Meanwhile, the Board of Trustees was actively planning the post-war development of the Institute. Based on a comprehensive survey undertaken early in 1945, the following twelve-point long-range program was formulated:

1. It shall continue to be the objective of the Rice Institute to provide especially good training for a limited number of students. The Institute will provide a broad and sound basic program with a well-developed and strong curriculum in arts and letters and with the emphasis on science and research that is required to meet changing circumstances.

2. It will be the aim of the Rice Institute to set a high standard of scholarship and to provide leadership in higher education, thereby contributing to the common objective of schools of higher learning to improve the quality of education generally.

3. The growth of Rice since 1912 and the increasing complexity of educational problems impose an undue responsibility and burden on the small board of seven life members provided in the original charter. It will be the policy of the Board of Trustees to enlist the aid of well-qualified individuals who reflect the interest of the public, the alumni, and other important groups, and who will take an active interest in the affairs of the school. The Board of Trustees will arrange for the creation of essential committees on finance, building, library, curriculum, and other phases of the Institute's affairs. In order to maintain a vigorous and active governing group, provision will be made for the creation of an emeritus position for trustees after a certain age.

4. The administrative staff of the Rice Institute shall maintain a close relationship with the faculty and the students, and it shall be the general practice for administrative officers to teach some courses. The coördination of work within and between the various departments and divisions of the Institute shall be handled by the president and his staff, including such deans as may be required.

5. A substantial building program shall be initiated promptly and carried forth with vigor during the next ten years to provide facilities in keeping with the general program of the Institute. Provisions will be made promptly to construct a modern library building with space for administrative offices. Plans will be made for other buildings as required to provide adequate space for classrooms, laboratories, and faculty offices. Additional dormitories are contemplated, and consideration will be given to the need for a student union building to serve as a center of student life and of alumni activities.

6. A president's house will be built on the campus and shall be a center for contacts between faculty members, administrative officers, members of the governing group, and citizens of the community.

7. The general objective of providing exceptionally good training requires a low ratio of students to teaching staff and the employment of a faculty of the highest ability. The ratio of students to teachers in leading educational institutions such as the California Institute of Technology, Harvard, the Massachusetts Institute of Technology, Princeton, and Yale is generally less than seven to one. The ratio at the Rice Institute has varied between fifteen and twenty students to one member of the teaching staff. It shall be the objective to lower the ratio of students to teachers and to attain a goal of ten to one within the next decade.

8. In order to maintain a satisfactory teaching staff, the Institute will establish a salary scale competitive with other leading schools. To meet the problem of post-war salaries and to provide such instruction and research as may be required on a twelve months' basis, an optional plan will be instituted providing for compensation on an annual basis, with appropriate provisions for vacations, as distinguished from the usual academic term of nine months. Arrangements will also be made for a system of annuities, based in part upon contributions by staff members.

9. As the faculty is expanded, it will be the policy of the Institute to broaden its course of study, providing for a well-rounded basic undergraduate program and for diversified graduate and research work.

10. The realization of the higher objectives and standards envisioned for the Institute will require additional emphasis on graduate and research

work. Consideration will be given to the creation of graduate fellowships and scholarships to assist exceptionally able students.

11. It will continue to be the policy of Rice to select its students carefully in order to realize high educational standards. The enrollment must depend upon the availability of funds in relation to the cost of maintaining the desired standards, but it will be the objective of the Institute to provide for an enrollment approximating that of the years immediately preceding 1941.

12. It is recognized that the present assets and income of Rice may not be adequate to enable the attainment of all the objectives outlined above. The trustees are encouraged to undertake the program in the belief that attainment of these objectives will be of such service to the community, state, and nation that Rice will merit and secure an increasing public interest and support, which will contribute to realization of the entire program.

The foregoing proposals have since been carried forward very actively. The most visible evidence has been an extensive building program planned by a committee of the Board of Trustees composed of the late Messrs. Wiess (Chairman) and Hanszen and Mr. Brown. The Fondren Library (see also page 86) was the first new building to be announced. Its cornerstone was laid in a formal exercise on December 21, 1947; the library was opened for use at the end of May, 1949, and formally dedicated during the homecoming exercises of that year on November 4. The M. D. Anderson Hall, a classroom and office building, was opened on November 7, 1947. The Abercrombie Engineering Laboratory was dedicated during the homecoming exercises on November 20, 1948. A fourth dormitory for two hundred men, built in an architectural style conforming to existing buildings and ideally adapted to the local climate, was dedicated as Wiess Hall on March 26, 1950. Besides these structures, a two-story president's house has been built in a wooded area near the main entrance to the Institute.

At the western corner of the campus is a new football stadium, completed in the early autumn of 1950, which seats 70,000 persons and is designed for expansion up to 100,000 as required. Adjacent is the new field house, which was dedicated in March of 1951. This building contains a basketball arena with permanent and temporary seating for 6600 persons, several gymnasiums, a swimming pool, squash courts, and special exercise rooms. In addition to offices for the Rice Institute Athletic Association, a

physical education department is included, with special provision for ample gymnasium and recreational facilities for women.

Like the building program, all other phases of the post-war plans announced by the trustees have been rapidly developed. For instance, the number of faculty members, with the rank of instructor or higher, has grown from less than seventy before the war to well over a hundred. A retirement plan, similar to that followed in other institutions of higher learning, has been inaugurated for members of the staff. The undergraduate curricula have been revised, selective entrance procedures have been intensified, and programs of graduate study and research have been greatly expanded.

By resolution of the trustees on December 4, 1947, followed by a brief ceremony, the administration building was renamed Lovett Hall in honor of President Emeritus Lovett. An inscription, carved near the Sallyport, expresses "grateful homage to the clear vision, unfaltering zeal, and beneficent labors" of the first President of the Rice Institute.

On September 8, 1949, the directing body of the Institute was enlarged to a fifteen-member Board of Governors, composed of the seven permanent trustees and eight governors appointed by the trustees for terms of one to four years. When the rotation plan is fully established, the tenure of all term governors will be four years. The first group of term governors consisted of the late Lewis Edgar Garfield and Messrs. Herbert Allen, Robert Pace Doherty, Francis Tarrant Fendley, Walter Leon Goldston, John Smith Ivy (since elected to be a trustee), Robert Hillyer Ray, and Harmon Whittington. In 1951 Mr. Henry Malcolm Lovett was selected to fill the first vacancy.

INSTRUCTIONAL STAFF

EMERITUS FACULTY

DEAN, ALICE CROWELL
B.A. (Rice) 1916, M.A. (Rice) 1919
Librarian Emerita

FREUND, FRIEDRICH ERNST MAX
Ph.D. (Leipzig) 1902
Professor Emeritus of German

LOVETT, EDGAR ODELL
A.B. (Bethany) 1890, M.A., Ph.D. (Virginia) 1895, Ph.D. (Leipzig) 1896, LL.D. (Drake, Tulane, Baylor, Bethany), Sc.D. (Colorado College)
President Emeritus of the Rice Institute

SLAUGHTER, JOHN WILLIS
A.B., B.D. (Lombard) 1898, Ph.D. (Michigan) 1901
Lecturer Emeritus in Civics and Philanthropy

WILSON, HAROLD ALBERT
M.A. (Cambridge) 1904, M.Sc. (Leeds) 1897, D.Sc. (London) 1900, F.R.S.
Professor Emeritus of Physics

FACULTY

AGMON, SHMUEL
M.S. (Jerusalem) 1947, Docteur ès Sciences (Paris) 1949
Assistant Professor of Mathematics

AKERS, WILLIAM WALTER
B.S. in Ch.E. (Texas Tech.) 1943, M.S. in Ch.E. (Texas) 1944, Ph.D. (Michigan) 1950
Assistant Professor of Chemical Engineering

ALTENBURG, EDGAR
A.B. (Columbia) 1911, A.M. (Columbia) 1912, Ph.D. (Columbia) 1916
Associate Professor of Biology

BARKER, J. R.
B.S. in Ph.Ed. (Rice) 1949
Instructor in Physical Education

BATTISTA, JOSEPH LLOYD
Certificat d'Études françaises (Bordeaux) 1919, Diplomé d'Études supérieures (Bordeaux) 1919, B.A. (Michigan) 1920, M.A. (Washington Univ.) 1923, M.A. (Harvard) 1929
Assistant Professor of Romance Languages

BENNETT, MERRILL KELLEY
Ph.B. (Brown) 1920, A.M. (Brown) 1921, A.M. (Harvard) 1926, Ph.D. (Stanford) 1928
M. D. Anderson Visiting Professor of Economics

BLACK, HUGH CLEON
B.A. (Rice) 1941, M.Ed. (Texas) 1947, Ph.D. (Texas) 1949
Assistant Professor of Philosophy and Education

BONN, GEORGE S.
B.Ch.E. (Ohio State) 1935, M.Sc. (Ohio State) 1936, M.L.S. (Chicago) 1951
Associate Librarian

BONNER, TOM WILKERSON
B.S. (Southern Methodist) 1931, M.A. (Rice) 1932, Ph.D. (Rice) 1934
Professor of Physics

BOUGEOIS, ANDRÉ MARIE GEORGES
Bachelier ès Lettres (Paris) 1921, Bachelier en Droit (Paris) 1923, Certifié d'Études supérieures de lettres (Paris) 1930, M.A. (Texas) 1934, Docteur d'Université (Paris) 1945, Officier de l'Instruction Publique 1945
Associate Professor of French

BRAY, HUBERT EVELYN
B.A. (Tufts) 1910, M.A. (Harvard) 1916, Ph.D. (Rice) 1918
Professor of Mathematics

CAMDEN, CARROLL
A.B. (Centre) 1925, M.A. (Iowa) 1928, Ph.D. (Iowa) 1930
Professor of English

CHANDLER, ASA CRAWFORD
B.A. (Cornell) 1911, M.S. (California) 1912, Ph.D. (California) 1914
Professor of Biology

CHAPMAN, ALAN JESSE
B.S. in M.E. (Rice) 1945, M.S. (Colorado) 1949
Assistant Professor of Mechanical Engineering

CHILLMAN, JAMES, JR.
B.S. in Arch. (Pennsylvania) 1913, M.S. in Arch. (Pennsylvania) 1914, F.A.A.R. (Am. Acad. in Rome) 1922
Professor of Architecture

CRAIG, HARDIN, JR.
A.B. (Princeton) 1929, A.M. (Harvard) 1931, Ph.D. (Harvard) 1937
Professor of History

DAUGHERTY, JACK WOODWARD
A.B., B.S. (Southeast Missouri) 1939, A.M. (Missouri) 1940, Ph.D. (Wisconsin) 1949
Assistant Professor of Biology

DAVIES, JOSEPH ILOTT
B.A. (Rice) 1928, M.A. (Rice) 1929, Ph.D. (Rice) 1937
Associate Professor of Biology

DAVIS, JACK F.
B.S. (Livingston State Teachers College) 1949, M.A. (Iowa) 1950
Assistant Professor of Physical Education

DEZURKO, EDWARD ROBERT
B.S. in Ed. (Illinois) 1939, B.S. in Arch. (Illinois) 1940, M.S. in Arch. (Columbia) 1942
Associate Professor of Architecture

DIBOLL, WALLACE BORN, JR.
B.E. in M.E. (Tulane) 1944, M.M.E. (Rensselaer) 1951
Assistant Professor of Mechanical Engineering

DIX, WILLIAM S.
B.A. (Virginia) 1931, M.A. (Virginia) 1932, Ph.D. (Chicago) 1946
Associate Professor of English and Librarian

DOWDEN, WILFRED SELLERS
B.A. (Vanderbilt) 1939, M.A. (Vanderbilt) 1940, Ph.D. (North Carolina) 1949
Assistant Professor of English

DREW, KATHERINE FISCHER
B.A. (Rice) 1944, M.A. (Rice) 1945, Ph.D. (Cornell) 1950
Assistant Professor of History

DUNAWAY, JAMES KARL
B.A. (Rice) 1936, B.S. in Arch. (Rice) 1937, M.A. (Rice) 1938, M.S. (Columbia) 1941
Associate professor of Architecture

DURST, LINCOLN KEARNEY
B.A. (U.C.L.A.) 1945, B.S. (Calif. Inst. of Tech) 1946, Ph.D. (Calif. Inst. of Tech.) 1952
Instructor in Mathematics

EDWARDS, GERALD
B.S. (Brooklyn College) 1950, M.A. (Columbia) 1950
Instructor in Physical Education

ETTLINGER, MARTIN GROSSMAN
B.A. (Texas) 1942, M.A. (Texas) 1943, Ph.D. (Harvard) 1946
Assistant Professor of Chemistry

FULTON, JAMES STREET
B.A. (Vanderbilt) 1925, M.A. (Vanderbilt) 1929, Ph.D. (Cornell) 1934
Professor of Philosophy

GALLEGLY, JOSEPH S., JR.
B.A. (Rice) 1925, M.A. (Rice) 1926
Assistant Professor of English

GARRISON, ALLEN DARNABY
B.A. (Rice) 1918, M.S. (Rice) 1920, Ph.D. (Rice) 1921
Associate Professor of Chemistry

GENTILE, RALPH
D.Ind.E. (Rome) 1938, D.C.E. (Rome) 1940
Assistant Professor of Electrical Engineering

GILES, JAMES BERNARD
B.B.A. (Texas) 1936, M.A. (Texas) 1937
Assistant Professor of Economics

HARTSOOK, ARTHUR J.
A.B. (Nebraska Wesleyan), 1911, S.B. in Ch.E. (M.I.T.) 1920, S.M. (M.I.T.) 1921
Professor of Chemical Engineering

HEAPS, CLAUDE WILLIAM
B.S. (Northwestern) 1909, Ph.D. (Princeton) 1912
Professor of Physics

HERMANCE, GILBERT LESLIE
B.S. (Oregon) 1927, M.A. (Columbia) 1930
Professor of Physical Education

HODGES, JOHN ELTON
B.B.A. (Texas) 1935, M.B.A. (Texas) 1937
Associate Professor of Economics

HODGES, LEE
S.B. (Harvard) 1930, M.A. (Rice) 1934
Instructor in French and Spanish

HOUSTON, WILLIAM VERMILLION
B.A., B.S. in Ed. (Ohio State) 1920, S.M. (Chicago) 1922, Ph.D. (Ohio State) 1925, D.Sc. (Ohio State) 1950
Professor of Physics and President of the Rice Institute

HUDSON, BRADFORD BENEDICT
A.B. (Stanford) 1930, Ph.D. (California) 1947
Associate Professor of Psychology

HUDSPETH, C. M.
B.A. (Rice) 1940, LL.B. (Texas) 1946
Lecturer in Government

JITKOFF, ANDREW N.
Bachelor (Prague Inst. of Tech.) 1928, Master (Prague Inst. of Tech.) 1931
Lecturer in Russian

JORDAN, FLOSSIE E.
B.S. in M.E. (Purdue) 1948, M.S. in Psych. (Illinois Tech.) 1950
Instructor in Engineering Drawing

KILPATRICK, JOHN EDGAR
B.A. (Stephen F. Austin) 1940, A.M. (Kansas) 1942, Ph.D. (California) 1945
Associate Professor of Chemistry

KNIGHTLEY, WILLIAM JOHN, JR.
A.B. (Wichita) 1946, M.A. (Wichita) 1948
Instructor in English

KOBAYASHI, RIKI
B.S. in Ch.E. (Rice) 1944, M.S.E. in Ch.E. (Michigan) 1947, Ph.D. (Michigan) 1951
Assistant Professor of Chemical Engineering

LEAR, FLOYD SEYWARD
A.B. (Rochester) 1917, A.M. (Harvard) 1920, Ph.D. (Harvard) 1925
Professor of History

LEIFESTE, A. A., JR.
A.B. (Southwestern) 1934, B.S. in Arch. (Rice) 1941
Assistant Professor of Architecture

LENT, ROBERT FOLSOM
B.Arch. (Cornell) 1928
Associate Professor of Architecture

LEWIS, EDWARD S.
B.S. (California) 1940, M.A. (Harvard) 1947, Ph.D. (Harvard) 1947
Assistant Professor of Chemistry

LILLIE, ALAN B.
B.Sc. (Queen's) 1946, M.Sc. (Queen's) 1948, Ph.D. (Rice) 1951
Research Associate in Physics

LOUIS, ANDREW
Ph.B. (Wesleyan) 1929, Ph.D. (Cornell) 1935
Associate Professor of German

LYLE, C. COLLIS, JR.
B.A. (Cornell) 1933, M.A. (Cornell) 1934, Ph.D. (Iowa) 1948
Assistant Professor of German
(On leave of absence 1951-52)

MCBRIDE, GUY T., JR.
B.S. in Ch.E. (Texas) 1940, Sc.D. (M.I.T.) 1948
Assistant Professor of Chemical Engineering and Associate Dean for Students

MCCANN, SAMUEL GLENN
Ph.B. (Wooster) 1914, M.A. (Rice) 1917
Instructor in Jurisprudence and Registrar

MCCANTS, JOHN THOMAS
B.S. (Marion Inst.) 1902, B.A. (Marion Inst.) 1905, M.A. (Virginia) 1906, M.A. (Yale) 1909
Instructor in Business Administration and Bursar

MCDOUGLE, CLYDE CALVIN
B.S. in Ph.Ed. (Rice) 1942, M.A. (Columbia) 1948
Assistant Professor of Physical Education

MCENANY, MICHAEL VINCENT
B.S. in E.E. (Colorado College) 1929, M.A. in Physics (Dartmouth) 1931
Associate Professor of Electrical Engineering

MACKEY, WILLIAM STURGES, JR.
B.A. (Rice) 1943, C.P.A. 1948, M.B.A. (Texas) 1950
Assistant Professor of Business Administration

MCKILLOP, ALAN DUGALD
A.B. (Harvard) 1913, A.M. (Harvard) 1914, Ph.D. (Harvard) 1920
Professor of English

MACLANE, GERALD R.
B.A. (Yale) 1941, A.M. (Harvard) 1942, Ph.D. (Rice) 1946
Assistant Professor of Mathematics

MacLean, James Beattie
B.A. (British Columbia) 1928, M.A. (Washington) 1935, M.R.S.T. (London) 1938, Ph.D. (Washington) 1951
Instructor in German

Mandelbrojt, Szolem
B.S. (Warsaw) 1917, Docteur ès Sciences (Paris) 1923
Professor of Mathematics

Mansfield, Lester
B.A. (City College of New York) 1941, Certificat de l'École Supérieure des Professeurs de Français (Paris) 1947, Docteur d'Université (Paris) 1949
Assistant Professor of French

Marsh, Malcolm Ray
B.S. in C.E. (Texas) 1927
Instructor in Engineering Drawing

Masterson, William Henry
B.A. (Rice) 1935, M.A. (Pennsylvania) 1946, Ph.D. (Pennsylvania) 1950
Assistant Professor of History and Assistant to the President

Mendelssohn, K.
D.Phil. (Berlin) 1930, F.Inst.P. (London) 1937, M.A. (Oxford) 1942
Visiting Professor of Physics

Milligan, Winfred O.
A.B. (Illinois College) 1930, M.A. (Rice) 1932, Ph.D. (Rice) 1934, Sc.D. (Illinois College) 1946
Professor of Chemistry

Moraud, Marcel
Bachelier ès Lettres (Poitiers) 1907, Licencié ès Lettres (Paris) 1908, Diplomé d'Études supérieures (Paris) 1910, Agrégé de l'Université (Paris) 1914, Docteur ès Lettres (Paris) 1933
Professor of French

Morehead, James Caddall, Jr.
A.B. (Princeton) 1935, B.Arch. (Carnegie Inst. of Tech.) 1939
Professor of Architecture

NEELY, JESS CLAIBORNE
LL.B. (Vanderbilt) 1924
Director of Athletics and Head Coach of Football

NICHOLAS, HENRY OSCAR
A.B. (Oberlin) 1919, Ph.D. (Yale) 1923
Associate Professor of Chemistry

NIELSEN, NIELS C., JR.
B.A. (Pepperdine) 1942, B.D. (Yale) 1946, Ph.D. (Yale) 1951
Assistant Professor of Philosophy and Religious Thought

PARISH, JOHN EDWARD
B.A. (Sam Houston) 1934, M.A. (Texas) 1938, Ph.D. (Columbia) 1951
Assistant Professor of English

PASLAY, PAUL R.
B.S. in M.E. (Louisiana State) 1950
Instructor in Mechanical Engineering

PAUW, ADRIAN
B.S. in C.E. (Washington) 1937, M.S. (Calif. Inst. of Tech.) 1947
Assistant Professor of Civil Engineering

PERKINS, CYRUS WILFRED
B.A. (McMaster) 1910, M.A. (McMaster) 1911
Professor Emeritus of Modern Foreign Languages, Grinnell College; Visiting Lecturer in German

PERRY, WILLIAM C.
B.A. (Rice) 1938, LL.B. (Texas) 1941
Instructor in Business Law

PFEIFFER, PAUL E.
B.S. in E.E. (Rice) 1938, B.D. (Southern Methodist) 1943, M.S. in E.E. (Rice) 1948
Instructor in Electrical Engineering

PHILLIPS, EDWARD HAKE
A.B. (Cincinnati) 1940, A.M. (Harvard) 1946, Ph.D. (Harvard) 1950
Assistant Professor of History

PHILLIPS, GERALD CLEVELAND
B.A. (Rice) 1944, M.A. (Rice) 1947, Ph.D. (Rice) 1949
Assistant Professor of Physics

PITKANEN, PAUL H.
A.B. (Carleton) 1940
Instructor in Physics

PLUMBLEY, JOHN A.
B.S. in Ph.Ed. (Rice) 1948, M.A. (Texas) 1950
Instructor in Physical Education
(On leave of absence 1951-52)

POINDEXTER, HALLY BETH WALKER
B.A. (Rice) 1947, B.S. (Univ. of Houston) 1949, M.A. (Colorado State College of Education) 1950
Instructor in Physical Education

READER, WILLIAM WHITNEY
B.A. (Rice) 1932, C.P.A. 1943
Visiting Lecturer in Taxation

RICHTER, GEORGE HOLMES
B.A. (Rice) 1926, M.A. (Rice) 1927, Ph.D. (Rice) 1929
Professor of Chemistry and Dean

RISSER, J. R.
A.B. (Franklin and Marshall) 1931, M.A. (Princeton) 1935
Ph.D. (Princeton) 1938
Associate Professor of Physics

RYON, LEWIS BABCOCK
C.E. (Lehigh) 1917
Professor of Civil Engineering

SHELTON, FRED VERNON
B.A. (Rice) 1926, M.A. (Rice) 1928, M.A. (Univ. Nac. de Mexico) 1942
Associate Professor of French

SIMONS, VERNE FRANKLIN
A.B. (Kansas) 1923, A.M. (Kansas) 1925, C.P.A. 1931
Associate Professor of Economics and Assistant Bursar

SIMS, JAMES REDDING
B.S. in C.E. (Rice) 1941, M.S. (Illinois) 1950
Assistant Professor of Civil Engineering

SMITH, JOHN TREANOR
B.S. in Ch.E. (Rice) 1940, M.S. (Michigan) 1941, Ph.D. (Michigan) 1943
Assistant Professor of Chemistry

SQUIRE, CHARLES FRANCIS
Ph.D. (Johns Hopkins) 1937
Professor of Physics

SZEGO, PETER
B.S. (Stanford) 1947, Ph.D. (Stanford) 1951
Assistant Professor of Mechanical Engineering

TALMAGE, ROY V.
A.B. (Maryville College) 1938, M.A. (Richmond) 1940, Ph.D. (Harvard) 1947
Associate Professor of Biology

THIBODEAUX, MURPHY H.
B.S. in C.E. (Rice) 1949
Instructor in Civil Engineering

THOMAS, JOSEPH DAVID
Ph.B. (Chicago) 1929, A.M. (Chicago) 1930
Assistant Professor of English and Assistant Registrar

TODD, ANDERSON
B.A. (Princeton) 1943, M.F.A. in Arch. (Princeton) 1949
Instructor in Architecture

TSANOFF, RADOSLAV ANDREA
B.A. (Oberlin) 1906, Ph.D. (Cornell) 1910
Professor of Philosophy

TURNER, RICHARD BALDWIN
A.B. (Harvard) 1938, A.M. (Harvard) 1940, Ph.D. (Harvard) 1942
Assistant Professor of Chemistry

ULRICH, FLOYD EDWARD
B.S. in E.E. (Union College) 1926, M.S. in E.E. (Union College) 1928, A.M. (Harvard) 1929, Ph.D. (Harvard) 1938
Associate Professor of Mathematics

WALKER, WILLIAM DELANY, JR.
B.A. (Rice) 1944, Ph.D. (Cornell) 1949
Assistant Professor of Physics
(On leave of absence 1951-52)

WANN, TRENTON WILLIAM
A.B. (California) 1937, Ph.D. (California) 1949
Assistant Professor of Psychology

WASER, JÜRG
Ph.D. (Calif. Inst. of Tech.) 1944
Associate Professor of Chemistry

WATERS, JAMES STEPHEN
B.S. (Rice) 1917
Professor of Electrical Engineering

WATKIN, WILLIAM WARD
B.S. in Arch. (Pennsylvania) 1908
Professor of Architecture

WELSH, HUGH CLAYTON
M.D. (Texas) 1923
Medical Adviser and Instructor in Biology

WHITING, GEORGE WESLEY
A.B. (West Virginia) 1908, A.M. (Harvard) 1913, Ph.D. (Chicago) 1926
Professor of English

WILLIAMS, GEORGE GUION
B.A. (Rice) 1923, M.A. (Rice) 1925
Associate Professor of English

WISCHMEYER, CARL RIEHLE
B.S. in E.E. (Rose Polytechnic) 1937, M.Eng. in E.E. (Yale) 1939, E.E. (Rose Polytechnic) 1942
Associate Professor of Electric Engineering

WOODBURN, JAMES
B.S. (Purdue) 1938, Dr.Eng. (Johns Hopkins) 1947
Associate Professor of Mechanical Engineering

WYATT, EDWIN MATHER
B.S. (Kansas Teachers College) 1917, M.S. (Wisconsin) 1927
Instructor in Engineering Drawing

YOUNG, HOMER HARRY
B.A. (Austin College) 1930, M.A. (Southern Methodist) 1937, Ph.D. (Texas) 1949
Assistant Professor of Education

YOUNG, JAMES DEAN
B.S. (Calif. Inst. of Tech.) 1949, A.M. (Stanford) 1950
Instructor in English

FACULTY IN MILITARY AND NAVAL SCIENCE

DEZARN, LOWELL BERNARD
B.S. (South Dakota State) 1945
Captain, C.E.
Assistant Professor of Military Science and Tactics

DILLON, EDWARD H.
B.S. in C.E. (Montana State) 1936, M.C.E. (Cornell) 1939
Lieutenant Colonel, C.E.
Professor of Military Science and Tactics

FITZSIMMONS, RICHARD C.
B.A. (Muskingum) 1940
Major, C.E.
Assistant Professor of Military Science and Tactics

JORDAN, RAYMOND CROWLEY
B.S. (U.S. Naval Academy) 1944
Lieutenant, U.S.N.
Assistant Professor of Naval Science

KNIGHT, OLYCE THOMAS
A.B. (Arizona State) 1940, M.A. (Arizona State) 1941
Lieutenant Commander, U.S.N.
Assistant Professor of Naval Science

LAIRD, WILLIAM MCKENNA
B.A. (Florida) 1938
Lieutenant Commander, U.S.N.R.
Assistant Professor of Naval Science

MCCRARY, ROBERT DAVISON
B.S. (U.S. Naval Academy) 1944
Lieutenant, U.S.N.
Assistant Professor of Naval Science

MEWHINNEY, LEONARD SPARKS
B.S. (U.S. Naval Academy) 1927, M.A. (Northwestern) 1947
Captain, U.S.N.
Professor of Naval Science

SHEPHERD, JOHN ELMER, JR.
B.S. (Purdue) 1940
Major, U.S.M.C.
Assistant Professor of Naval Science

THOMPSON, HOWARD A.
B.A. (American Univ.) 1936, M.A. (Columbia) 1942
Lieutenant Commander, U.S.N.R.
Assistant Professor of Naval Science

ASSISTANTS, GRADUATE ASSISTANTS, AND FELLOWS

ADAMS, CHARLES REX
B.A. (East Texas State) 1950
Graduate Assistant in Chemistry

ALDRICH, DAVID V.
A.B. (Kenyon) 1950
Graduate Assistant in Biology

BARRETT, JOHN HAROLD
B.S. (Rice) 1948, M.A. (Rice) 1950
Charles A. Coffin Fellow in Physics

BENT, ROBERT D.
B.A. (Oberlin) 1950
Graduate Assistant in Physics

BINFORD, JESSE STONE, JR.
B.A. (Rice) 1950, M.A. (Rice) 1951
Graduate Assistant in Chemistry

BOOZER, CHARLES EUGENE
B.S. (Stephen F. Austin) 1949, M.A. (Rice) 1951
Graduate Assistant in Chemistry

BRUGGER, ROBERT M.
B.A. (Colorado College) 1951
Graduate Assistant in Physics

BURNS, JOHN HOWARD
B.A. (Rice) 1951
Graduate Assistant in Chemistry

BURNS, JOHN SANDIDGE
B.A. (New York Univ.) 1951
Graduate Assistant in English

BUTT, ARNOLD F.
A.B. (Nebraska) 1949, B.A. of Arch. (Nebraska) 1950
Fellow in Architecture

CARRIÓN, VICENTE
B.S. (Univ. Nac. de Mexico) 1943
Assistant in Romance Languages

CHUOKE, ROBERT L.
B.A. (Texas) 1945, M.A. (Texas) 1947
Graduate Assistant in Physics

CLOSMANN, PHILIP J.
B.E. in Ch.E. (Tulane) 1944, S.M. in Ch.E. (M.I.T.) 1948, M.S. in Phys. (Calif. Inst. of Tech.) 1950
Graduate Assistant in Physics

CONNER, JERRY POWER
B.A. (Rice) 1948
A.E.C. Fellow in Physics

COOK, CHARLES FALK
B.A. (Texas Christian) 1948, M.A. (Texas Christian) 1950
Dick Mayo Lykes Fellow in Physics

COOKENBOO, LESLIE, JR.
B.A. (Rice) 1947
Assistant in Economics

COPPINGER, GALVIN M.
B.S. (U.C.L.A.) 1949
Graduate Assistant in Chemistry

DALRYMPLE, GEORGE F.
A.B. (Phillips) 1951
Graduate Assistant in Physics

DOUGLAS, JIM, JR.
B.S. in C.E. (Texas) 1946, M.S. in C.E. (Texas) 1947, M.A. (Rice) 1950
Assistant in Mathematics

DULLER, NELSON MARK, JR.
B.S. (Texas A. and M.) 1948, M.A. (Rice) 1951
Humble Fellow in Physics

DVORETZKY, ISAAC
B.A. (Rice) 1948, M.A. (Rice) 1950
Humble Fellow in Chemistry

FAMULARO, KENDALL FERRIS
B.S. (Calif. Inst. of Tech.), 1949
Dow Fellow in Physics

FILGO, HOLLAND C., JR.
B.S. (Baylor) 1948, M.A. (Rice) 1951
Graduate Assistant in Mathematics

FLATT, HORACE PERRY
B.A. (Rice) 1951
Graduate Assistant in Mathematics

FLECK, JOSEPH AMADEUS
A.B. (Harvard) 1948, M.A. (Rice) 1950
Shell Fellow in Physics

FOLKERS, GEORGE F.
B.A. (Knox) 1951
Assistant in German

FROST, ROBERT CARLTON
B.A. (Reed) 1948, M.A. (Rice) 1950
A.E.C. Fellow in Biology

GALLIE, THOMAS M., JR.
A.B. (Harvard) 1947, M.A. (Texas) 1949
Graduate Assistant in Mathematics

GARSON, SEYMOUR
B.S. (City College of New York) 1948, M.S. (Michigan) 1951
Graduate Assistant in Biology

GOSSETT, CHARLES R.
B.S. (Duke) 1951
Graduate Assistant in Physics

GOVITS, JEROME
B.S. in Ch.E. (Purdue) 1951
Graduate Assistant in Chemical Engineering

GRAHAM, JOHN WAYNE
B.A. (Rice) 1948
Graduate Assistant in Physics

HAKE, EVELYN KUHN
B.A. (Rice) 1930, M.A. (Rice) 1932
Research Assistant in Biology

HARVEY, PHILLIP D.
B.S. (Colorado) 1951
Pan American Refining Corporation Fellow in Chemical Engineering

HEYNEMAN, DONALD
A.B. (Harvard) 1950
Graduate Assistant in Biology

HODGKINS, JOE E.
B.A. (Texas Christian) 1950, M.A. (Texas Christian) 1951
Graduate Assistant in Chemistry

HOLMES, BILLY GAUVAIN
B.S. (East Texas State) 1949
Graduate Assistant in Chemistry

HOOP, MILDRED CLAIRE
B.A. (Rice) 1948, M.A. (Rice) 1949
Graduate Assistant in French

KIRK, FRANKIE JO
B.A. (Texas) 1947
Graduate Assistant in English

KRAINTZ, LEON
A.B. (Harvard) 1949
Graduate Assistant in Biology

KUNETKA, ROBERT E.
B.A. (Rice) 1949
Graduate Assistant in Chemistry

KWEI MAN WEI
B.S. in E.E. (National Sun Yat-sen) 1945
Graduate Assistant in Electrical Engineering

LATHROP, ARTHUR L.
B.S. (Washington State) 1943, M.S. (Illinois) 1946
Graduate Assistant in Physics

LEE, RAYMOND CURTIS
B.A. (Rice) 1950
Graduate Assistant in Chemistry

LEUNG CHU YUEN
B.S. (Amoy) 1948, M.A. (Rice) 1951
Graduate Assistant in Chemistry

LEUNG PUI LO
B.S. (National Sun Yat-sen) 1944, B.S. (Univ. of Houston) 1950
Graduate Assistant in Mechanical Engineering

LIDE, FRANCIS P., JR.
B.S. (Wake Forest) 1951
Graduate Assistant in German

MCELROY, DAVID BRIAN
B.A. (Davidson College) 1949, M.A. (Duke) 195
Graduate Assistant in History

MCLEOD, ROBERT MELVIN
B.S. (Mississippi State) 1950
Graduate Assistant in Mathematics

MEADOR, WILLIAM RALPH
B.A. (Rice) 1951
Graduate Assistant in Chemistry

MILLER, ALVIN E.
B.Arch. (Rensselaer) 1948
Fellow in Architecture

PARK, KING TRAVIS, JR.
B.A. (Rice) 1951
Graduate Assistant in Chemistry

PONS, V. BÉNÉDICTE
Licencié ès Lettres (Paris) 1950
Graduate Assistant in French

REITER, HANS JAKOB
B.A. (Vienna) 1939, M.A. (Rice) 1950
Assistant in Mathematics

RICE, JOHN D.
B.A. (Rice) 1949, M.A. (Rice) 1951
Graduate Assistant in Mathematics

RIVAS-CRESPO, JOSEFA
Licenciada in Philosophy and History (Santiago, Spain) 1945
Graduate Assistant in French

ROBERTS, THOMAS D.
B.A. (Hardin-Simmons) 1944, Sc.M. (Brown) 1946
Graduate Assistant in Physics

SIEGEL, STANLEY ELLIOT
B.A. (Washington and Jefferson) 1949, M.A. (Maryland) 1950
Assistant in History

SIMMONS, JOHN E., JR.
B.A. (Rice) 1950
Graduate Assistant in Biology

SINCLAIR, ROLF MALCOLM
B.S. (Calif. Inst. of Tech.) 1949, M.A. (Rice) 1951
Graduate Assistant in Physics

SINGLETON, TOMMY CLARK
B.S. (Stephen F. Austin) 1949, M.A. (Columbia) 1951
Graduate Assistant in Chemistry

SIPPEL, ROBERT F.
B.S. (Southern Methodist) 1950
Graduate Assistant in Physics

SMITH, JAMES RICHARD
A.B. (Brigham Young) 1949, M.A. (Rice) 1951
Dick Mayo Lykes Fellow in Physics

SMITH, THERON LAVON
B.A. (Texas Christian) 1951
Graduate Assistant in Physics

STEWART, ELMO JOSEPH
B.S. (Utah) 1937, M.S. (Utah) 1939
Assistant in Mathematics

SUMMERS, THOMAS W.
B.S. (Texas Tech.) 1949
Graduate Assistant in Physics

SWIM, RICHARD TAYLOR
B.A. (Rice) 1950, M.A. (Rice) 1951
Magnolia Petroleum Company Fellow in Physics

TAYLOR, HERBERT LYNDON
B.A. (Austin College) 1951
Graduate Assistant in Physics

TAYLOR, RAYMOND DEAN
B.S. (Kansas State Teachers at Pittsburg) 1950
Graduate Assistant in Chemistry

THOMPSON, LEWIS CHISHOLM
B.A. (Rice) 1950
Graduate Assistant in Physics

TIGHE, CHARLES L.
B.A. (Rice) 1951
Assistant in History

TRUITT, NORMAN ERIC, JR.
B.S. (Illinois) 1950
Humble Fellow in Chemistry

VERNON, LONNIE WILLIAM
B.A. (Rice) 1948, M.A. (Rice) 1950
Humble Fellow in Chemistry

WARD, EVELYN JANE ABERCROMBIE
B.A. (Indiana) 1951
Graduate Assistant in English

WILSON, JOSEPH BENJAMIN
B.A. (Rice) 1950
Assistant in German

WINDHAM, PAT MORRIS
B.S. (North Texas State) 1947, M.S. (North Texas State) 1951
Graduate Assistant in Physics

WOJECKI, EDWARD J.
B.S. (Louisiana Tech.) 1936
Assistant in Physical Education

FACULTY COMMITTEES

THE PRESIDENT is a member, ex officio, of all committees.

COMMITTEE ON ADMISSIONS: Mr. McCann, chairman; Messrs. Black, Hudson, Sims, Thomas, Walker, and Wischmeyer.

COMMITTEE ON GRADUATE INSTRUCTION: Mr. Houston, chairman; Messrs. Bonner, Bray, Chandler, Lear, Richter, and Woodburn.

COMMITTEE ON EXAMINATIONS AND STANDING: Mr. Thomas, chairman; Messrs. Akers, Chapman, Dix, Giles, Masterson, and Richter.

COMMITTEE ON SCHEDULES: Mr. McCann, chairman; Messrs. Hartsook, J. E. Hodges, Nicholas, Risser, and Waters.

COMMITTEE ON STUDENT ACTIVITIES: The Associate Dean for Students, ex officio, chairman; Messrs. Davies, Gallegly, Hermance, Masterson, and E. H. Phillips; the Executive Officers of the Naval R.O.T.C. and the Army R.O.T.C.; the Adviser to Women; the Chairman of the Hall Committee; the Chairman of the Honor Council; the President of the Student Association; the President of the Women's Council; the Editor of the *Thresher*.

COMMITTEE ON THE LIBRARY: Mr. Lear, chairman; Messrs. Daugherty, Dix, Heaps, Lewis, Pauw, Tsanoff, Ulrich, and Woodburn.

COMMITTEE ON GROUNDS AND BUILDINGS: Mr. Morehead, chairman; Messrs. Lent, McEnany, Simons, and Sims.

COMMITTEE ON PUBLICATIONS: Mr. Thomas, chairman; Messrs. Camden, Fulton, Kilpatrick, Kobayashi, Mackey, MacLane, and Talmage.

COMMITTEE ON PUBLIC LECTURES: Mr. Masterson, chairman; Messrs. Bonner, Chillman, Dowden, Moraud, and Wischmeyer.

COMMITTEE ON OUTDOOR SPORTS: Mr. Bray, chairman; Messrs. Hermance and Nicholas; representatives of the R Association: Messrs. John Byrd Coffee and Russel Lee Jacobe.

R.O.T.C. COMMITTEE: Mr. Waters, chairman; the Professor of Naval Science; the Professor of Military Science; Messrs. Craig, McCann, McDougle, G. C. Phillips, and Ryon.

COMMITTEE ON STUDENT HEALTH SERVICE: Mr. Hermance, chairman; Dr. Welsh; Messrs. Chandler, McBride, Thomas, and Wann; the Adviser to Women; the Manager of the Residential Halls.

COMMITTEE ON THE FRESHMAN COURSE: Mr. Davies, chairman; Mrs. Drew; Messrs. Heaps, Leifeste, Louis, McBride, Shelton, Wann, Waser, and Williams.

THE RICE INSTITUTE MARSHALS: Mr. Masterson, chief marshal; Messrs. Thomas, McBride, Walker, Dowden, Battista, and Sims.

EXECUTIVE COMMITTEE: The President, ex officio, chairman; the Dean; Messrs. Chillman, Hartsook, and Heaps.

STAFF OF THE ATHLETIC DEPARTMENT

BALE, ALLEN MELBERT
Assistant Coach of Football

BRUNSON, EMMETT EVANDER
Business Manager of Athletics and Coach of Track

CONNELLEY, QUINN
Coach of Tennis

DAVIS, JACK F.
Coach of Swimming

DAVIS, JOE WALLACE
Line Coach of Football

GRIGG, CECIL BURKETT
Backfield Coach of Football and Assistant Coach of Track

MOORE, CHARLES EDWARD, JR.
Assistant Coach of Football

NEELY, JESS CLAIBORNE
Director of Athletics and Head Coach of Football

STOCKBRIDGE, HAROLD DENNIS
Assistant Coach of Football and Coach of Baseball

SUMAN, DONALD WARD
Coach of Basketball and Athletic Concession Manager

WHITMORE, WILLIAM ROGERS
Athletic Publicity Director

WOJECKI, EDWARD J.
Trainer

REQUIREMENTS FOR ADMISSION TO THE RICE INSTITUTE

GENERAL UNDERGRADUATE REQUIREMENTS

SINCE the opening in 1912, the Rice Institute has maintained high standards of admission consistent with its general policy of high standards in education. The rapid growth in population of Houston and the Southwest, accompanied by an even more rapid increase in the demand for college training, forced the Institute in 1924 to limit the size of its student body in order to retain the standards of instruction previously established. As the number of applications since that time has greatly exceeded the available space, admission has thus become competitive.

Students are registered only in September of each year, when approximately four hundred new undergraduate students are admitted to the Institute. In general, candidates for admission are required to present evidence of good health, satisfactory testimonials as to their character, and evidence of graduation from an approved public or private high school. The work of fifteen standard, accredited units is required for admission to the Freshman Class. No candidate will be approved with fewer than fifteen acceptable units. There is no admission "with conditions" or "on individual approval," and no "special" students are accepted. The merits of each applicant are considered individually and with reference to the facilities available at the Institute. The determination of eligibility for admission has been delegated to the Committee on Admissions.

Toward the required total of fifteen units each candidate should present, from the list of subjects printed below, the following distribution of basic preparatory subjects:

English, 4	Trigonometry, ½
Social studies, at least 2	Foreign language, 2 (preferably Latin)
Algebra, 2	Science, 2 (biology, chemistry, or physics)
Plane geometry, 1	Electives, 1½, selected from the list below

Variations in the above distribution of units will be considered individually in the case of unusually promising candidates. Approved variations, however, are the exception rather than the rule, and approval is subject to the discretion of the Committee on Admissions.

List of Subjects with Values in Units

BIOLOGY 1; BOTANY 1; CHEMISTRY 1; CIVICS ½ or 1; ENGLISH 3 or 4; FRENCH 2, 3, or 4; GERMAN 2, 3, or 4; HISTORY (Ancient 1, Medieval and Modern 1, World 1, English 1, American 1, Texas ½); LATIN 2, 3, or 4; MATHEMATICS (Algebra 2, Plane Geometry 1, Solid Geometry ½, Trigonometry ½); SPANISH 2, 3, or 4; PHYSICS 1; PHYSICAL GEOGRAPHY ½; PHYSIOLOGY ½; GENERAL SCIENCE 1; ZOOLOGY 1.

SPECIFIC PLAN OF UNDERGRADUATE ADMISSION

In addition to the application of the foregoing general, quantitative requirements, acceptance of candidates will be based on the following:

1. Satisfactory personal qualifications, including good health, good character, industry, coöperation, definiteness of purpose, etc.

2. Satisfactory mental qualifications for the course desired, as shown by grades in high school subjects, by relative rank in the graduating class, by mental tests administered by the high schools or required by the Institute, and by subject-matter examinations in certain basic courses that will be prescribed for certain candidates by the Committee on Admissions.

Personal qualifications (1, above) will be determined by a health report from the applicant's family physician, by one or more statements of recommendation from teachers or school officials, and by a personal interview with a member of the Committee on Admissions or with a representative of that committee. Mental qualifications (2, above) will be determined by the methods outlined below.

Admission by Certificate. Each year a portion of the quota of new students will be filled on the basis of satisfactory personal qualifications and a certificate of an outstanding high school record leading to graduation. Students ranking high in a sizable graduating class, about whose preparation there is no question, either quantitatively or qualitatively, *will be admitted without entrance examinations.* The size of this group will be determined each year by the Committee following the receipt and study of the initial group of records in February. Prospective high school graduates ranking in the top 25 per cent are especially encouraged to apply for admission, although rank in this bracket does not necessarily insure admission without examination.

Admission by Examination. Applicants whose records do not warrant admission by certificate will be given an opportunity, *if approved by the Committee on Admissions,* to establish the adequacy of their preparation by taking entrance examinations. At present, examinations are given in two fundamental subjects, English and mathematics. These examinations will also be available as an aid in determining the relative capacity of applicants competing for places in the limited quota when the problem cannot be satisfactorily solved by reference to the high school records.

These examinations will be general in nature and especially designed to test capacity as well as fundamental knowledge. No special preparation, other than normal high school work, is necessary, and specimen copies of examinations are not available for distribution. In English, the examination will test the applicant's general knowledge of literature and his ability in reading and in composition, including such matters as organization of subject matter, paragraphing, spelling, and punctuation. In mathematics, the examination will cover the basic operations involved in the usual high school courses in algebra and plane geometry. Since many high schools give the final work in algebra in the second semester of the Senior year, the April examination will include the work of one and one-half years of algebra as given in this state (through factoring, radicals, and quadratic equations) and of one year of plane geometry. The June examination will cover two years' work in algebra, one year's work in plane geometry, and

some elementary trigonometry. These examinations will be two hours in length; they will be graded by members of the English and the mathematics departments of the Institute. While an absolute grade will be assigned, a most important secondary result will be the determination of the applicant's relative standing in comparison with that of other candidates for admission to similar standing in the same program. It is obvious, therefore, that isolated results will be meaningless. Consequently, no grade will be issued to the applicant, and his relative standing will be the confidential information of the Committee on Admissions.

According to the schedule printed on page 39, these examinations will be offered to applicants designated by the Committee on Admissions both at the Institute and in examination centers in certain of the cities of the Southwest. In case an applicant designated for an examination is unable because of distance to present himself at the Institute or at some other center, permission will be granted for him to take the examination on the announced date under the supervision of one of his teachers or school officials. Arrangements should be made well in advance of the scheduled examination date by submitting a letter from the person agreeing to supervise the test, stating that the required arrangements will be made. As indicated below, the major examination period is scheduled for April, although a secondary examination period may be available in June for late applicants. Attention is called to the fact that the number of places remaining in the quota by June will inevitably be small. Except where excessive hardship is involved, because of distance or other factors, no examinations will be given at other times, and following the June period no examinations will be available. No candidate will be approved for more than one effort at the examinations in any year.

The Committee on Admissions reserves the right to modify the examination system by changing the types of examinations, or by changing the subjects in which examinations are given. Ample notice will be given to applicants of changes that may be made in any year.

PROCEDURES FOR UNDERGRADUATE ADMISSION

Application for undergraduate standing should be filed on forms available from the Registrar of the Institute. For the convenience of Houston applicants, the proper application forms will be made available also in the general Registrar's Office of each public and private high school. These forms should be filed as early as possible after the completion of the work of the first semester of the Senior year, not later than March 15 of a given year, if the applicant is to be considered when action is first taken on applications. As indicated previously, applications will be considered throughout the spring, and a second examination period is scheduled in June. However, attention is called to the fact that admission will become more difficult as time elapses and the quota is gradually filled. In fact, *the quota may be filled at any time after May 1,* although the general policy will be to keep some space open until July 1.

Interviews of all applicants who can conveniently present themselves at the Institute will be held between December 1 and April 1 each year at a time scheduled by the Institute. Applicants living at a distance who cannot conveniently come to Houston will be given opportunities for interviews in the last two weeks of March in certain cities of the Southwest,[1] at a date and place to be announced individually to each applicant who submits his application papers before March 15. Those who, because of distance, are unable to meet interview engagements either in Houston or at one of the centers just referred to will be interviewed individually by alumni; or, if that should be impossible, their applications will be given full consideration without the interview. In no case need the applicant assume any responsibility for the interview until notified of the time and place. However, applicants from a distance who happen to find it convenient to come to Houston between December 1 and April 1 will be interviewed at the Institute at the time of their visit to Houston.

Examinations will be given at the Institute and in certain cities

[1] It is contemplated that if sufficient need exists students will be interviewed and examined in Beaumont, Dallas, Fort Worth, and San Antonio.

on the fourth Saturday in April.[1] *This is the principal examination date.* Applicants applying late may be admitted to examinations on the third Saturday in June. The June examinations will be held only at the Rice Institute unless individual arrangements are made for the supervision of the examinations by a teacher or school official in the applicant's home town. Again, applicants are urged to apply in time for consideration in the first action, as the quota may be filled at any time after May 1.

ADMISSION OF TRANSFERS FROM OTHER COLLEGES

In general, applicants for transfer from other colleges and universities will be admitted under procedures similar to those outlined above for high school graduates, except that applicants for transfer to courses of pure and applied science usually will be required to take examinations to determine their admission and their placement in Rice courses that are essential as prerequisites. For example, an applicant for transfer into the second year's work in engineering at Rice normally will be required to pass examinations in mathematics and in physics or chemistry, or in all three, to determine his fitness to take up the work of the Sophomore year in these essential subjects. *Attention is directed to the fact that the unit of credit at Rice is the full-year course. Advanced credit will not be considered for courses that are not approximately the same in content as the courses given at the Institute.* Advancement toward graduation is made by the accumulation of prescribed and elective course credits. Should a student fail to prove completely qualified for all the work of the Sophomore year, he may possibly be admitted to some of it while being required to take certain other courses of Freshman standing. Each case will be dealt with individually.

Applicants for transfer who are not admitted on certificate, but who are approved for examinations, will normally take them in June, following the completion of the year's work, at the same time that high school examinations are given, viz., the third Saturday in June. Space will be held for a certain number of transfers

[1] It is contemplated that if sufficient need exists students will be interviewed and examined in Beaumont, Dallas, Fort Worth, and San Antonio.

until they have the opportunity to take the June examinations, if examinations should be required. Also, arrangements may be made for the supervision of these examination on the scheduled date in the institution which the student has been attending. As in the case of applicants from high school, interviews will be arranged at the Institute during the winter and spring, and in certain cities in the last two weeks in March. When necessary, designated alumni representatives will also aid in conducting interviews.

SPECIAL INFORMATION FOR ALL UNDERGRADUATE APPLICANTS

Calendar of Applications, Interviews, and Examinations

February 1–March 15	Period for filing applications, of both high school students and transfers
December 1–April 1	Main interview period for applicants who can come to the Institute
Last two weeks of March	Interview period for applicants living at a distance[1] who cannot come to Houston
Fourth Saturday in April	Main examination period[1] (for high school graduates or Seniors)
Third Saturday in June	Second examination period, at the Institute only (for high school graduates and for transfers)

NOTICES of action taken by the Committee on Admissions will be mailed somewhat prior to the examination dates in April and in June: notices that certain applicants have been accepted by certificate and without examination, and also notices that others designated by the Committee will be admitted to the examinations. A student who has been admitted to the Institute will be required within two weeks after the date on the notice of acceptance to signify his intentions in writing, accompanied by a

[1] It is contemplated that if sufficient need exists students will be interviewed and examined in Beaumont, Dallas, Fort Worth, and San Antonio, the exact location and time of interviews and examinations to be furnished the applicants individually.

payment of $25.00 which will be credited on his account as full payment of the registration fee required at the opening of the session. Should such a student fail to register, without giving notice of change of intentions prior to August 1, the $25.00 payment will be forfeited. The payment will be returned if the student changes his plans and serves notice before August 1. After August 1 it will be refunded only in case of hardship because of illness, etc.

Since most records will be acted upon prior to the close of the school year, *it is the duty of the applicant to furnish a supplementary transcript showing graduation from high school and the grades of the final semester.* It must be emphasized that the admission granted to students whose courses are in progress is "provisional." Previous favorable action will be revoked if the grades of the final semester fail to maintain the previously established high level.

For further information, publications, or application forms, candidates for admission as undergraduates should communicate with the Registrar of the Institute. On requesting application forms, the candidate should clearly indicate whether he is a prospective high school graduate or a prospective transfer from another college.

ADMISSION TO GRADUATE STANDING

THE Rice Institute offers excellent opportunities for properly qualified graduates to undertake advanced study and research leading to the master's and doctor's degrees. Work leading to the degree of Master of Arts or Master of Science is available in many departments; work leading to the degree of Doctor of Philosophy is available in the fields of biology, chemical engineering, chemistry, English, French, history, mathematics, and physics. Applicants are required to present evidence of graduation or of prospective graduation from an accredited college or university, with academic records showing high promise for advanced study and research. Each applicant and his record will be considered individually and with reference to the facilities of the Institute for research in the field of his interest.

Graduate candidates are advised to take the Graduate Record Examination, arrangements for which may be made by writing to the Educational Testing Service, 20 Nassau Street, Princeton, New Jersey. Since the Rice Institute maintains an examination center for local supervision of the examinations, applicants in the Houston area may make the necessary arrangements by applying in person at the Office of the Registrar. Preference will be given to applicants who earn high scores on examinations given by this organization. At the discretion of the Committee on Graduate Instruction, the Graduate Record Examination or other examinations may be required of individual applicants.

The Institute publishes biennially the *Graduate Announcements,* in which courses of graduate study are announced and information is given regarding fellowships, graduate assistantships, and graduate scholarships that are available. This bulletin and the graduate application form may be obtained from the Registrar of the Institute.

EXPENSES

THE opportunities for study and research offered by the Rice Institute are open without tuition both to young men and to young women. Students, of course, are expected to meet all expenses incurred in the purchase of textbooks, drafting instruments, notebooks, examination papers, and certificates and diplomas. Laboratory expenses in the experimental courses in pure and applied science are met by laboratory fees. Extra charges will be made for excessive use of material, for excessive and unusual breakage, and for other damage to equipment.

SPECIAL CHARGES

Late registration ..... $ 5.00
Late examination (Each course) 10.00
Late spelling test 5.00
Diploma 5.50
(Required of all candidates for degrees.[1])

FEES

Registration fee $25.00
(An annual fee required of all students.)
Library fee 25.00
(An annual fee required of all students.)
Examination fee 5.00
(A fee to cover the cost of examinations and transcripts.)
Blanket-tax 9.70
(An annual charge for student activities.)

Health Service fee

DORMITORY RESIDENTS 10.00
TOWN STUDENTS 5.00

Gymnasium fee 4.00
(All students pay this fee for the use of gymnasium equipment.)

[1] In addition, graduating students pay for the rental of their caps, gowns, and hoods. The cost, which was $3.50 at the last commencement, varies slightly from year to year.

Laboratory fees

BIOLOGY 100	30.00
220, 240, 460, 470	25.00
330a	20.00
330b, 390, 480a	15.00
360, 410	12.50
All 500, 600, and 700 courses having laboratories	30.00
CHEMISTRY 100, 120, 200, 310	30.00
230	15.00
220, 300	40.00
410a, 440b	25.00
470a, 470b	20.00
500, 600, 700	50.00
ECONOMICS 350	5.00
HISTORY 100, 110	1.50
PHYSICS 100, 200	30.00
300, 310	10.00
410	20.00
PSYCHOLOGY 310	5.00
PHYSICAL EDUCATION 125, 225, 325	5.00
425	15.00
410	20.00
ENGINEERING 130	39.50
280	10.00
300	10.00
250, 330b	20.00
360	5.00
CHEMICAL ENGINEERING 450	30.00
550	40.00
585	50.00
CIVIL ENGINEERING 320b, 480a	10.00
300b, 320a, 331b, 420, 460	15.00
300a	20.00
480b	30.00
440	40.00
465	25.00
500, 510, 530	50.00

ELECTRICAL ENGINEERING	300, 330, 340	20.00
	420, 520	25.00
	440, 450, 500, 510, 530, 540, 550	50.00
MECHANICAL ENGINEERING	300	20.00
	330a, 410	10.00
	350	40.00
	420	30.00
	440	25.00
	550	50.00
ARCHITECTURE (Every student classified as an architect)		40.00
ARCHITECTURE 210, 310, 410, 450, or 455, if taken alone		15.00

If a student withdraws during the two weeks following the opening day of classes, all fees will be refunded. When withdrawal occurs within the third or fourth week after the opening of classes, 50 per cent of laboratory fees (only) will be refunded. No refund will be given if withdrawal is made more than four weeks after the opening of classes.

A student not in residence must pay all fees for the academic year in which he is a candidate for a degree.

By special arrangement with the head of the department in which he is specializing, a graduate student who is already a candidate for an advanced degree may enroll in an approved research course during the summer. Such enrollment will be for a twelve-week period starting with the end of the regular academic year. Laboratory fees only will be charged.

No student in arrears in his bills, including obligations to loan funds, will be admitted to any of the examinations, or be given any certificate or report of academic standing.

RESIDENTIAL ACCOMMODATIONS

ROOMS, completely furnished exclusive of linen, may be rented in the residential halls for men, $25.00 of the rental being paid when the lease is signed. The amount of rental charges will be announced by the Office of the Bursar in advance of the offering of any leases. As the charge for table board will be made at actual cost, the monthly price, payable in advance, will probably vary during the year. Rooms in the halls will be let in the order of ap-

plications received. Such applications should be addressed to the Office of the Bursar. The residential halls are governed by a student Hall Committee, under the general supervision of the Associate Dean for Students.

Accommodations for the residence of young women on the university grounds are not available at present, but rooms are provided for rest and study under the supervision of Mrs. Wilfred S. Dowden, A.B. (Baylor), M.A. (Peabody), Adviser to Women. Several apartments for occupancy by women students of Sophomore, Junior, Senior, and graduate standing are maintained and supervised in an Institute housing unit about one mile from the campus. Information about these and other desirable places of residence for young women students, including Freshmen, may be had from the Adviser to Women.

HEALTH SERVICE

A HEALTH SERVICE located in West Hall is maintained for students. This service includes dispensary and infirmary care. The school physician makes scheduled sick calls and can be called in case of an emergency. A registered nurse is on duty during school hours; a qualified attendant is available at all hours. Information about the facilities and care, and about insurance,[1] can be secured at the Office of the Health Service (reached by the east entrance of West Hall).

[1] A Hospitalization and Accident Insurance policy with a nationally known company is available for students who desire this coverage.

STIPENDS AND FUNDS

FELLOWSHIPS

PROVISION is made for a variety of fellowships available to graduates of this and other institutions. There are several memorial fellowships that have been founded and endowed by gift or bequest on the part of friends of the Rice Institute. These provide a stipend designed to enable the holder to devote his time to study and research in his chosen field. There are also several industrial fellowships maintained by companies interested in the development of technical fields and the training of competent scientists and engineers.

Persons desiring to be considered for appointment as fellows should consult with the department in which they desire to work and should make application to the Registrar as early as possible.

THE WALTER B. SHARP MEMORIAL FUND FOR RESEARCH IN PURE AND APPLIED SCIENCE

In memory of her husband, Walter B. Sharp, one of the earliest and most successful of the pioneers in the development of the petroleum industry in this country, Mrs. Estelle B. Sharp, of Houston, has endowed at the Rice Institute the Walter B. Sharp Memorial Fund for Research in Pure and Applied Science. The income from this fund is to be used for the maintenance of resident or traveling fellowships in scientific research, preference to be given to geological research, with special reference to petroleum and allied products. A requisite for eligibility to these fellowships is the degree of Doctor of Philosophy, or similar standing in this or other institutions. The awards are to be known as the Walter B. Sharp Fellowships, and the holders thereof as the Walter B. Sharp Fellows of the Rice Institute. The first Walter B. Sharp Fellow was appointed for the academic year 1931–32.

THE SAMUEL FAIN CARTER FELLOWSHIP

The late Mrs. Carrie B. Carter established at the Rice Institute in 1932 the Samuel Fain Carter Fellowship in memory of her husband, one of the first promoters of the lumber industry in Texas

and the founder of the Second National Bank of Houston. In accordance with the terms of the gift, the endowment of $20,000 is administered in trust by the Second National Bank. The annual income of this trust fund is to be awarded to a graduate student of the Rice Institute, or a white graduate of an approved institution of learning, for the purpose of enabling the student to continue in postgraduate work, preferably at the Rice Institute; and, when the appropriate graduate schools shall have been organized, precedence is to be given to candidates in banking, business administration, and forestry. In the meantime, the award is to be made for the prosecution of postgraduate work in history and allied subjects, in science or engineering, or in other branches of liberal and technical learning for which facilities for advanced work may be available at the Rice Institute. Should a graduate of any institution other than the Rice Institute receive the award, then the postgraduate work shall be done only at the Rice Institute. The holder is to be known as the Samuel Fain Carter Fellow of the Rice Institute. The award is to be made by the faculty, on the basis of highest standing in scholarship, with consideration of financial circumstances, personality, and physical fitness. The first Samuel Fain Carter Fellow was appointed for the academic year 1933–34.

THE ORA N. ARNOLD FELLOWSHIP FUND

The will of Mrs. Ora Nixon Arnold created in 1936 a fund of which the interest is available to finance traveling fellowships. Either graduates of the Rice Institute, of outstanding ability and character, or graduates of the University of Mexico, of equal distinction, may be appointed. An incumbent from Rice may study in Mexico, the South American states, the West Indies, or the Philippine Islands; an incumbent from the University of Mexico is expected to study at the Rice Institute.

THE TRAVELING FELLOWSHIP IN ARCHITECTURE

Provision for a Rice Institute Traveling Fellowship in Architecture has been made by the Alumni of the Department of Architecture and the Architectural Society of the Rice Institute, who have pledged themselves to raise funds to be given each year to a

student in architecture for the purposes of foreign and domestic travel and study. The selection of the holder of the Traveling Fellowship is to be made annually by the faculty by means of a formal competition, in which students or graduates of the Rice Institute are eligible to participate.

THE JAMES A. BAKER AND ALICE GRAHAM BAKER BEQUEST

By the last will and testament of Captain James A. Baker, for more than fifty years Chairman of the Board of Trustees of the Institute, the trustees received a fund in excess of $60,000 to be known as the James A. Baker and Alice Graham Baker Bequest. The fund is to be kept invested by the trustees and the income thereof "used in part, by the Institute, in establishing scholarships and fellowships, and to pay in whole or in part the salaries of its professors, teachers and lecturers, and in the payment of annual prizes to the students to stimulate their interest in their work."

THE CATHARINE WITHERS ROPER AND BENJAMIN E. ROPER MEMORIAL FUND

Miss Mary Withers Roper bequeathed to the Rice Institute the residue of her estate in a sum in excess of $11,000 as a memorial to her mother and father, Catharine Withers Roper and Benjamin E. Roper, pioneering contemporaries of the founder of this institution. Only the income of this fund may be expended; the principal thereof is to be kept intact in the permanent endowment fund of the Institute. Miss Roper passed away at the advanced age of eighty-four years. She began teaching very early in life, and at the time of her retirement she had spent an active life of sixty years in teaching in the schools of this vicinity.

THE DOW CHEMICAL COMPANY FELLOWSHIPS

On the intiative of Dr. Willard H. Dow, President of the Dow Chemical Company, a scholarship or fellowship was established by the Company in September, 1943, on a year-to-year basis, to be awarded to a Rice student in chemistry, chemical engineering, or physics. A Senior student receiving the award will be the Dow Chemical Company Scholar; a graduate student receiving this award will be the Dow Chemical Company Fellow. The present

amount of the stipend is $750. The Dow Chemical Company has also provided a fellowship in the amount of $1500 to be awarded to a graduate student of mechanical engineering.

THE HUMBLE OIL AND REFINING COMPANY FELLOWSHIPS

In September, 1945, the Humble Oil and Refining Company established at the Rice Institute two fellowships for X-ray diffraction research. The amount of the stipend will be based in each case on the previous training of the fellow. Effective in September, 1947, the Humble Company also established one fellowship in chemistry and one in physics carrying stipends of $1250. No limitation is placed on the nature of the research carried on by these two fellows.

THE MAGNOLIA PETROLEUM COMPANY FELLOWSHIP

The Magnolia Petroleum Company has established at the Rice Institute a fellowship for research work in the general field of physics of the liquid and solid state. This fellowship carries a stipend of $1500 per year, and is awarded to a graduate student who has completed one or more years of graduate work in physics.

THE SHELL FELLOWSHIP IN PHYSICS

The Shell Fellowship Committee has established at the Rice Institute a Shell Fellowship in Physics. The stipend of this fellowship is $1200 and its award is subject to the final approval of the Shell Fellowship Committee.

THE PAN AMERICAN FELLOWSHIP IN CHEMICAL ENGINEERING

The Pan American Refining Corporation has established at the Rice Institute a Pan American Fellowship in Chemical Engineering. The stipend of this fellowship is $1250 and its award is subject to the approval of the Pan American Refining Corporation.

THE DICK MAYO LYKES MEMORIAL FELLOWSHIPS

Mr. James M. Lykes, Jr., has established two fellowships of $750 annually in memory of his brother, Dick Mayo Lykes. The fellowships are designed to assist graduate students doing re-

search in nuclear physics. The first award was made for the academic year 1949–50.

THE M. N. DAVIDSON FELLOWSHIP IN ARCHITECTURE

The M. N. Davidson Fellowship in Architecture in memory of the late M. N. Davidson of Houston, Texas, has been established by his family. The fellowship provides a stipend of $500 annually, as long as funds are available. The fellowship is to be awarded by the faculty of architecture to a student completing his five years of study for the professional degree of Bachelor of Science in Architecture, and having the highest academic record of the students to reach graduation in that year. The award shall be used by the student for the purpose of travel and study within the United States, beginning not later than six months after the award is made.

NON-INSTITUTIONAL FELLOWSHIPS

In addition to the above fellowships, students may pursue advanced research through Atomic Energy Commission Fellowships.

The Committee on Graduate Instruction processes applications for fellowships submitted by graduate students of the Rice Institute for research in other institutions and in other countries. Among available fellowships of this nature are the Rotary International Fellowship, the Rhodes Scholarships, the Charles A. Coffin and Gerard Swope Fellowships awarded by the General Electric Educational Fund, and the Frank B. Jewett Fellowships awarded by the Bell Telephone Laboratories. Applicants for predoctoral fellowships under the Fulbright Act administered by the Institute of International Education, and for postdoctoral research and teaching exchanges under the same act administered by the Committee on International Exchange of Persons, should also file with the Committee on Graduate Instruction.

Rice is one of the sponsoring universities of the Oak Ridge Institute of Nuclear Studies. The Oak Ridge Institute provides a number of fellowships to doctoral candidates who have completed their residence requirements and who want to work on a thesis problem at Oak Ridge because of the special facilities which are available.

THE RALPH BUDD AWARD

Through the generosity of Mr. Ralph Budd, former President of the Burlington Lines, a prize in the form of a medal is available for the best thesis in engineering submitted each year.

THE H. A. WILSON MEMORIAL AWARD

A substantial prize is being provided for the best research in physics done by a graduate student each year. The funds are being contributed by former graduate students of Professor Emeritus H. A. Wilson, who retired as head of the physics department in 1947.

GRADUATE ASSISTANTSHIPS

GRADUATE students with high academic records and outstanding qualifications may be awarded graduate assistantships in the various departments of the Rice Institute. The minimum stipend of a graduate assistantship is $800 with the exemption from all fees. A student holding a graduate assistantship must be a candidate for an advanced degree; he will be expected to devote a substantial part of his program to study and research, and at the same time to teach one section in an elementary course or to do an equivalent amount of other departmental work. He will thus get a certain amount of valuable practical training in preparation for an academic career. Appointments carrying larger stipends, with a schedule equivalent to a teaching load of two sections, are occasionally available; such appointments depend on the interests and attainments of the student and on the requirements of the department.

GRADUATE SCHOLARSHIPS

STUDENTS whose previous records show marked promise but for whom no graduate assistantships are available may, especially in their first year of graduate study at the Rice Institute, be awarded graduate scholarships with exemption from all fees but without stipend. Graduate scholars may carry a full schedule of graduate work, and are not required to render any service to the Institute.

UNDERGRADUATE SCHOLARSHIPS AND AWARDS

WHILE seeking to develop its students in culture, in character, and in citizenship, the Rice Institute will reserve its highest rewards for scholarship, and in particular for evidences of creative capacity in productive scholarship. To encourage this devotion to learning, there have been established through the donations of friends of the Institute a number of undergraduate scholarships to be awarded principally to students who have been in residence at the Institute for at least one year. Moreover, honorary scholarships without stipend may be granted to students whose scholastic standing shows marked ability. Certain funds, as noted below, are for the benefit of holders of a bachelor's degree. (See also the sections on graduate awards, immediately above.)

THE GRAHAM BAKER STUDENTSHIP

The first undergraduate scholarship at the Institute, the Graham Baker Studentship, was founded by the late Captain and Mrs. James A. Baker, of Houston, in memory of their eldest son, Frank Graham Baker. This studentship is awarded annually to that student in the three lower classes of the Rice Institute who earns the highest scholastic standing for the academic year, and the holder is known as the Graham Baker Student for the year. The award is announced at the commencement convocation in June, and the annual stipend is $175. The first award was made for the academic year 1918–19.

THE HOHENTHAL SCHOLARSHIPS

The Hohenthal Scholarship Fund derives from Lionel Hohenthal, of Houston, who instructed William M. Rice, Jr., his executor, to devote the residue of his estate to the founding of a permanent memorial to Mr. Hohenthal's mother, father, and brother. The scholarships provided by this fund are known as the Hohenthal Scholarships, and the holders as the Hohenthal Scholars of the Institute. These scholarships are awarded annually to students of high standing in scholarship who are earning a substantial part of their college expenses. The first awards were made for the academic year 1918–19.

THE D.A.R. SCHOLARSHIP

The John McKnitt Alexander Chapter of the Daughters of the American Revolution has provided an endowed undergraduate scholarship at the Rice Institute. It is awarded to a young woman student of the Institute and carries with it an annual stipend of $175. The first award was made for the academic year 1919–20.

THE ELLEN AXSON WILSON SCHOLARSHIP

The Axson Club, an organization of Houston women in the interests of literary pursuits, has endowed at the Rice Institute a permanent scholarship in memory of Ellen Axson Wilson (the late Mrs. Woodrow Wilson). The scholarship is awarded from year to year to a young woman student of the Institute of Junior or Senior standing. The annual stipend of the Ellen Axson Wilson Scholarship is $350. The first award of the scholarship was made for the academic year 1922–23.

THE ELIZABETH BALDWIN LITERARY SOCIETY SCHOLARSHIP

The Elizabeth Baldwin Literary Society of the Rice Institute is maintaining annually a scholarship with a view to providing permanent endowment therefor. This scholarship is available to a student of the Rice Institute, either a young man or a young woman, the candidate to be chosen by the faculty on grounds of scholarship, personality, and physical vigor. The minimum annual stipend of the Elizabeth Baldwin Literary Society Scholarship is now $175. The first award of the scholarship was made for the academic year 1926–27.

THE PALLAS ATHENE LITERARY SOCIETY SCHOLARSHIP

The Pallas Athene Literary Society of the Rice Institute is providing an annual scholarship at the Rice Institute, with the intention of raising a permanent endowment for the scholarship. This scholarship is open to a young woman student of the Rice Institute, to be selected by the faculty on grounds of scholarship, personality, and physical vigor. The minimum annual stipend of the Pallas Athene Literary Society Scholarship is now $175. The first award of the scholarship was made for the academic year 1926–27.

THE DANIEL RIPLEY SCHOLARSHIP

In memory of her husband, Daniel Ripley, for many years a prominent citizen of Houston, the late Mrs. Edith Ripley established the Daniel Ripley Scholarship by the donation to the Institute of $10,000. The annual income of this trust fund is to be awarded to that self-supporting young man or woman student completing the Freshman year at the Rice Institute who receives the highest grades. The first award of the Daniel Ripley Scholarship was made for the academic year 1927–28.

THE EDITH RIPLEY SCHOLARSHIPS

The late Mrs. Edith Ripley, of Houston, established three Edith Ripley Scholarships by the donation of $10,000 to the Rice Institute, the income of which is to be distributed equally and annually to three young women students of the Institute to be selected by the faculty. In selecting the beneficiaries of this donation, consideration is to be given to the mental, moral, and womanly qualities of the candidates, as well as to their financial necessities. The first awards of the three Edith Ripley Scholarships were made for the academic year 1928–29.

THE MARY PARKER GIESEKE SCHOLARSHIP

The late Fred A. Gieseke, of Houston, and his daughter, Mrs. James Carter Boone, a graduate of the Rice Institute, established the Mary Parker Gieseke Scholarship in memory of Mrs. Fred A. Gieseke, by a gift to the Rice Institute of $5000. This memorial scholarship is to be awarded annually for high standing in scholarship to a student of the Rice Institute who has been in residence at least one year. The first award of the Mary Parker Gieseke Scholarship was made for the academic year 1929–30.

THE THOMAS AUBREY DICKSON AND PAULINE MARTIN DICKSON SCHOLARSHIPS

Mrs. Pauline Martin Dickson, of Houston, in execution of the wishes of herself and her husband, Dr. Thomas Aubrey Dickson, bequeathed a sum of $10,000, the income of which is to be paid semi-annually to the Rice Institute for the support of scholarships

to be known as the Thomas Aubrey Dickson and the Pauline Martin Dickson Scholarships, awarded by the faculty to self-supporting students of the Institute, young men or young women, on the basis of scholarship. The first awards of these scholarships were made for the academic year 1932–33.

THE CHAPMAN-BRYAN MEMORIAL SCHOLARSHIP

By bequest of Miss Johnelle Bryan, of Houston, made on behalf of herself and her sister, Mrs. Caro Bryan Chapman, the Rice Institute received the sum of $2500 for the endowment of the Chapman-Bryan Memorial Scholarship at this institution. The scholar on this foundation, a student of the Institute, is to be selected by the faculty on the basis of high standing, personality, and physical fitness. The first award of the scholarship was made for the academic year 1937–38.

THE LADY WASHINGTON TEXAS CENTENNIAL AWARD

From the Lady Washington Chapter of the Daughters of the American Revolution, the Rice Institute has received the sum of $1000 in endowment of the Lady Washington Texas Centennial Award. This award is to be made yearly for scholarship to a young woman student of the Rice Institute, preference to be given to Houston students of Sophomore standing. The first award was made for the academic year 1937–38.

THE KATIE B. HOWARD SCHOLARSHIP

The Axson Club has raised the sum of $7500, with the expectation of increasing that sum to $10,000, for the maintenance of the Katie B. Howard Scholarship in memory of Mrs. A. R. Howard, the first president of the Axson Club. The income of this fund is awarded from year to year to a young woman student of the Institute. The first award of the Katie B. Howard Scholarship was made for the academic year 1937–38.

THE SAMUEL S. ASHE SCHOLARSHIP

The late Mrs. Sallie Ashe Fitch endowed a scholarship at the Rice Institute in memory of her father, Samuel S. Ashe, who for many years and until his death was a prominent citizen of Hous-

ton, and in full sympathy with the purposes and aspirations of the Rice Institute. This scholarship is to be awarded annually to a deserving but necessitous young man or young woman of the Freshman class of the Institute on completing the work of that year with highest grades. The first award of the Samuel S. Ashe Scholarship was made for the academic year 1939–40.

THE ENGINEERING ALUMNI SCHOLARSHIP

As evidence of their continued interest in engineering education at the Rice Institute, the Engineering Alumni are providing an annual stipend of $300 for that engineering student, of good character and personality, entering the fifth year, who shows by his scholastic record and his interest and participation in student affairs that he gives promise of being a credit to the engineering profession. Consideration is to be given to the financial circumstances of the student, and the award is to be contingent on his continuing his work at the Rice Institute. The first award of the Engineering Alumni Scholarship was made for the academic year 1938–39.

THE THOMAS RICHARD FRANKLIN AND JULIA HADLEY FRANKLIN SCHOLARSHIPS

Mrs. Mabel Franklin Astin, daughter of a family distinguished in the history of the city and commonwealth, bequeathed to the Rice Institute approximately $62,000 to constitute, as a memorial to her father and mother, the Thomas Richard Franklin and Julia Hadley Franklin Scholarship Fund. The income of this fund is to be devoted to the awarding of annual scholarships to properly qualified students of the Institute. Both male and female students are eligible to Franklin Scholarships, and in awarding them, the Institute is to take into consideration not only the scholarly standing but also the financial necessities of the candidates. The recipients are known as the Thomas R. Franklin and Julia H. Franklin Scholars. The first awards were made for the academic year 1939–40.

THE WALSH SCHOLARSHIP IN ARCHITECTURE

The Walsh Scholarship in Architecture, in memory of the late Timothy Walsh, F.A.I.A., of the firm of Maginnis and Walsh of

Boston, Massachusetts, is being established by his son, Mr. James A. Walsh, of Houston. The scholarship provides a stipend of $150 annually to be awarded by the faculty by means of a formal competition, to a student completing his fourth year in architecture, for the purpose of assisting him to carry on through his fifth year. The first award was made for the academic year 1941–42.

THE PREMEDICAL SOCIETY SCHOLARSHIP

The Premedical Society, consisting of students looking forward to the study and practice of medicine, is providing annually a scholarship in the sum of $100. This scholarship is to be awarded by the Committee on Examinations and Standing of the Institute, on the basis of scholarship and financial need, to a student intending to enter medical college. The first award of the Premedical Society Scholarship was made for the academic year 1942–43.

THE MAX AUTREY MEMORIAL SCHOLARSHIPS

Under the last will and testament of Mrs. Nettie S. Autrey, for many years a resident of Houston, the Rice Institute received a cash bequest of $20,000 to establish the Max Autrey Scholarship Fund, from the income of which scholarships are to be awarded, on such terms as the authorities of the Institute may determine, as a memorial to the donor's son, Max Autrey, in service in the first world war and since deceased. The students receiving such awards are to be designated as Max Autrey Memorial Scholarship Students. From the income of this bequest the first awards of three Max Autrey Memorial Scholarships, based on character, personality, and high scholastic standing, were made for the academic year 1942–43.

THE COLLEGE WOMEN'S CLUB FUND OF THE RICE INSTITUTE

In January, 1942, the trustees of the Institute received from the College Women's Club of Houston a check for $5000 for the endowment of a fund to be known as the College Women's Club Fund of the Rice Institute, to be held in trust by the trustees and kept invested by them. From the income of this fund an award is

to be made annually to some woman Senior at Rice whom the President of the Institute and his committee may select as an outstanding student, to be used by her in working on her master's degree, either at Rice or some university of the same rank. The first award of a scholarship from the College Women's Club Fund was made for the academic year February to October, 1944.

THE SCHOLARSHIP OF THE HOUSTON CHAPTER OF THE AMERICAN PETROLEUM INSTITUTE

The Houston Chapter of the American Petroleum Institute provides a sum of $100 on an annual basis for an engineering scholarship available to a Junior student of Rice, conditioned on class standing, extracurricular activities, and his continuing his Senior year at Rice.

THE JESSE H. JONES NAVAL SCHOLARSHIPS

In 1948 Mr. and Mrs. Jesse H. Jones, through Houston Endowment Inc., began the establishment of two funds, which will total $20,000, for the award of scholarships honoring Fleet Admiral William F. Halsey, Jr., and General Alexander Archer Vandegrift. Members of the N.R.O.T.C. unit, including entering students, are eligible. Selections are made under the direction of the R.O.T.C. Committee on a basis of need and outstanding ability. Awards are for one year, but special consideration will be given to previous holders. The first appointments were made for the academic year 1948–49.

THE SARAH LANE LITERARY SOCIETY SCHOLARSHIP

The Sarah Lane Literary Society of the Rice Institute is maintaining a scholarship with a view to providing permanent endowment therefor. This scholarship is available to a woman student of the Rice Institute who has successfully completed her Freshman year, the candidate to be chosen by the faculty on grounds of scholarship, personality, and physical vigor. The present annual stipend of the Sarah Lane Literary Society Scholarship is at least $175. The first award of the scholarship was made for the academic year 1948–49.

THE BLANCHE WHITE SCHOLARSHIP

Miss Blanche White bequeathed to the Institute a sum of $10,000, from the income of which one or more awards may be made annually, on the basis of scholarship, general intelligence, and personality, with due consideration of financial circumstances, to men or women students who have been in residence at least one year. The first Blanche White Scholar was selected for the academic year 1948–49.

THE STUDENTS' MEMORIAL SCHOLARSHIP

The Students' Memorial Loan Fund was established in 1936 by a gift from Mr. W. C. Hogg under the terms of his will. In 1948 the charter of the loan fund was amended to arrange for the awarding of scholarships in addition to the making of loans to students. The first scholarship was awarded for the academic year 1948–49.

THE AMERICAN SMELTING AND REFINING COMPANY SCHOLARSHIP

Beginning with the academic year 1949–50, the American Smelting and Refining Company has provided a scholarship carrying a stipend of $500. The holder is selected by the Rice Institute from among students entering the fourth or fifth year of mechanical engineering.

THE CIVIL ENGINEERING SCHOLARSHIP

To foster interest in civil engineering education at the Rice Institute and to provide recognition for work well done, an anonymous donor is contributing to the Rice Institute the sum of $175 annually as a stipend for the Civil Engineering Scholarship. The Scholarship is to be awarded at the end of his fourth year to that male student planning to continue through the fifth year of the civil engineering course, who has high scholastic standing and who shows the greatest promise of a distinguished engineering career. The Scholarship is awarded on recommendation of the members of the civil engineering faculty without reference to the financial circumstances of the student.

THE THETA PSI OMEGA SCHOLARSHIP

The Theta Psi Omega Fraternity, an organization of businessmen chartered by the State of Texas, interested in civic, charitable, and educational affairs, has established a scholarship in the sum of $300. The scholarship, known as the Theta Psi Omega Scholarship, is to be awarded annually to an American male student of the Rice Institute by the Committee on Examinations and Standing of the Institute, on the basis of scholarship and financial need. The first award of the scholarship was made for the academic year 1950–51.

THE HOUSTON ENGINEERS' CLUB SCHOLARSHIP

An award of $300 is given by the Houston Engineers' Club to a candidate for the Bachelor of Science degree in engineering. This award is not necessarily made annually. The holder must be a resident of Harris County but may be other than a student of the Rice Institute.

THE ELOISE SZABÓ WITTE STUDENTSHIP IN HISTORY

As a memorial to Eloise Szabó Witte, her daughter, Ruth Witte Lane, and her grandson, Jonathan Lane, have on an annual basis provided for a studentship. Mrs. Witte's intense interest in history and allied subjects of study prompted the donors to stipulate that the award should go to that young man or young woman of the Freshman Class who, in that year, has indicated a desire for further study in any branch of history, preferably Biblical or ancient history, and who in the opinion of the department of history has demonstrated the greatest promise in the study of that subject. The studentship is to be granted upon the recommendation of the chairman of the department of history.

WAR ORPHANS SCHOLARSHIPS

The Rice Institute has allocated two undergraduate scholarships in the amount of $300 per year to be awarded to the orphans of veterans of World War II. These scholarships will be administered jointly by the Rice Institute and War Orphans Scholarships, Inc. The funds for these scholarships are provided by other scholarship grants as listed above, and students actually holding such

awards will be designated under the names of the grant providing the funds.

THE LADY GEDDES PRIZE IN WRITING

The Right Hon. Sir Auckland Geddes, British Ambassador to the United States, Godwin Lecturer at the Rice Institute in 1921, has endowed at Rice a prize in writing, which is to bear the name of Lady Geddes and is to be awarded annually from the income of the endowment of $1000. Competition for this award is open to Freshmen and Sophomores of the Rice Institute. The first award of the Lady Geddes Prize in Writing was made at the end of the academic year 1922–23.

THE OWEN WISTER LITERARY SOCIETY FUND

The Owen Wister Literary Society of the Rice Institute is providing an annual donation at the Rice Institute, with the intention of raising a permanent endowment. This gift, now at least $175 annually, the Society has assigned to the library for the purchase of books on the history of Texas and the West.

THE OWEN WISTER LITERARY SOCIETY ALUMNÆ FUND

A fund is being contributed by alumnæ of the Owen Wister Literary Society to assist Rice students needing loans.

THE RICHARDSON FUND FOR RICE STUDENTS

Mrs. Libbie A. Richardson, widow of Alfred S. Richardson, who was a charter member of the Board of Trustees of the Rice Institute, bequeathed in trust to the Houston Bank and Trust Company, as trustee, a fund amounting at present to approximately $50,000, the income therefrom to be used in educating necessitous young men and women at the Rice Institute.

THE GRANT WILLIAM JORDAN AND CORA JORDAN MEMORIAL FUND

Under the will of Mrs. Cora Jordan, a resident of Houston, the bulk of her estate was left in trust with the Houston Bank and Trust Company, as trustee, the income therefrom to be used in assisting worthy young men and women in obtaining an education

at the Rice Institute. The Jordan Memorial Fund amounts at present to approximately $51,000.

THE SARA STRATFORD FUND

The Sara Stratford Fund for Women Students of the Rice Institute, in memory of the late Mrs. Sara Stratford, first Adviser to Women, who served faithfully and efficiently in that capacity from the opening of the Institute, has been established by her daughter, Mrs. William Bradshaw Torrens, her immediate successor as Adviser to Women. The first awards from the Sara Stratford Fund were made in the autumn of 1931.

THE MARY ALICE ELLIOTT LOAN FUND

In memory of their daughter, Mary Alice Elliott, who at the time of her death was a student in architecture at the Rice Institute in the class attaining, at the graduation of 1931, the degree of Bachelor of Science in Architecture, Mr. Card G. Elliott, of Houston, and the late Mrs. Elliott, undertook the establishing of a fund of $2500 for the maintenance of the Mary Alice Elliott Loan Fund for Foreign Travel and Study in Architecture. A loan of $500 from this fund is to be available each year, on recommendation of the faculty, to an architectural graduate who has received honorable mention in the annual competition for the regular Traveling Fellowship. The first award from the Mary Alice Elliott Loan Fund was made for the academic year 1931–32.

THE ROBERT PILCHER QUIN AWARD

By a group of student friends of the late Robert Pilcher Quin, a member of the Class of 1933, provision has been made for an annual "Bob Quin Award," in the form of a medal, for qualities in athletics, leadership, scholarship, and sportsmanship in which he himself excelled. The first of these medals was awarded for the academic year 1930–31.

THE EDWARD BOWERS ARRANTS AWARD

In 1943 a fund was established in memory of Edward Bowers Arrants, B.S. in Arch. (1927), by his classmates in architecture. This fund provides for a gold medal to be awarded annually to the

architectural student who has maintained the highest scholastic record throughout his entire five-year course at the Institute. The first award of the Edward Bowers Arrants medal was made in 1943.

THE ALICE THIELEN READER PRIZE AND INTERNSHIP IN PUBLIC ACCOUNTING

In memory of his mother, Mrs. Alice Thielen Reader, for many years a teacher of commercial subjects in the Houston public schools, Mr. William Whitney Reader, C.P.A., a graduate of the Rice Institute, is providing annually a prize in the sum of $200 and the opportunity for part-time internship with Reader & Carter, Certified Public Accountants, during the Senior year of the recipient. Through the coöperation of the International Accountants Society, Inc., a C.P.A. Coaching Course will be furnished to the recipient upon graduation from Rice. The award is made to a Junior student of business administration who intends to enter professional accounting practice, on the basis of personality, aptitude, scholarship, and financial need, contingent upon continuation of the Senior year at Rice. The first award was made in 1950.

SCHOLARSHIPS FOR ENTERING STUDENTS

A limited amount of scholarship aid can be made available from certain funds to selected new students, with exceptional school records, who face difficulty in financing their education. Certain awards of this type, available without respect to the home city or state of applicants, are designated as the Distinguished Student Scholarships. Further information may be obtained from the Registrar. Information concerning several scholarships and fellowships not controlled by the Rice Institute, but open to its students, may also be obtained from the Registrar. In view of these numerous forms of aid, no prospective student of outstanding previous record should hesitate, for financial reasons, to apply for admission.

LOANS AND SELF-HELP

Besides the stipends of graduate and undergraduate awards, there are, on the campus and in the city, opportunities in considerable

variety for worthy and deserving students to earn a part of their living expenses while attending the Institute. Information concerning such openings may be obtained from the Placement Service.

Thanks to the generosity of a number of citizens of Houston, there are available several student loan funds. Inquiries concerning the administration of these funds should be addressed to the Bursar.

CURRICULA AND DEGREES

THE Rice Institute offers several baccalaureate, professional, and advanced degrees in arts and sciences, physical education, engineering, and architecture. The Institute does not have schools of medicine and law, but in the courses of arts and sciences the essential premedical and prelegal subjects can be elected.

All programs except that in physical education are so arranged that the degree of Bachelor of Arts is taken at the end of four years;[1] the student may then be admitted to candidacy for a professional or an advanced academic degree. During the first two years, the student is registered in one of four basic curricula (academic, science-engineering, architecture, physical education), in which a considerable part of the work is prescribed. During the second two years, wider choice of majors and individual courses is given. Throughout the entire four-year period, however, each student pursues a broad program of the fundamental sciences and humanities, rather than a narrow course of specialization.

Fifth-year and sixth-year degree programs are offered in engineering and architecture. Students wishing to specialize in arts or sciences with a view to research and university teaching may proceed by graduate study to the degrees of M.A. and Ph.D.

In the majority of courses, the formal instruction offered consists of three lectures a week throughout the academic year, together with concurrent laboratory work in certain subjects.

Courses are divided into three groups:

GROUP A—languages and literature

GROUP B—history, social studies, philosophy, and education

GROUP C—biology, chemistry, mathematics, physics, and psychology

The schedules shown below are subject to modification.

[1] To students of exceptionally high scholastic standing at the end of the fourth year, the Bachelor of Arts degree may be awarded either "with distinction," or "with honors in [the field of major study]." To obtain the degree "with honors" the student must signify his preference to the Committee on Examinations and Standing at the beginning of his fourth year. With the approval of the department of specialization the Committee may recommend the applicant to the faculty for that degree.

Students working toward bachelor's degrees will be registered in the following programs:

Academic[1]

First Year

(1) Mathematics 100
(2) Physics 100, Chemistry 100 or 120, or Biology 100
(3) English 100
(4) French or German
(5) History 100 or 110
(6) Physical Training 100

Second Year

(1) Mathematics 200 or 210, or a laboratory science
(2) English or general literature elective
(3) French or German (continuation of language elected in first year)
(4) Elective in Group B
(5) Free elective

Third and Fourth Years

Ten courses, including two in Group A, two in Group B, and one in Group C. At least seven of the ten courses must be advanced (numbered 300 or higher). Not less than three nor more than five of the advanced courses may fall within a student's major field. *The schedule of every student must be approved by his department of specialization in each of these two years.*

Business Administration—Economics Major

Students who wish to major in business administration and economics should take Business Administration 200 and Eco-

[1] Academic majors are offered in business administration and economics, English, German, history, mathematics, philosophy, premedical studies, psychology, and Romance languages. A major in mathematics may be taken in either an academic or a science program. (Concerning the composite biology major, see pages 67-68.)

Special arrangements may be made for certain modifications of any curriculum leading to a bachelor's degree, in order that the required courses in naval or military science and other subjects may be taken.

nomics 200 in their second year. A Sophomore not taking both courses should confer with a member of the department as soon as he decides he wishes to major in this field.

Majors will be required to take five approved advanced courses (thirty semester hours) in business administration and/or economics. Students desiring to take the state C.P.A. examination can satisfy the requirements of twenty semester hours of college courses in accounting by electing—in addition to Business Administration 200—Business Administration 390a, 395b, 420a, and 425b, and the related income tax course (Business Administration 410).

Program for Prelaw Students

Since the admission requirements of law schools are very broad in scope, students at the Rice Institute preparing for the study of law may major in any department. They should acquaint themselves with the specific requirements of the law school which they plan to attend and confer with the prelaw adviser. A course in accounting (Business Administration 200) and one in government (Political Science 210) are recommended.[1]

Psychology Major

Students planning to major in psychology should take Physics 100 in the Freshman year and Biology 100, together with Psychology 210 as their free elective, in the Sophomore year. In the third and fourth years they take four advanced courses in psychology and two in biology, together with electives in Groups A and B.

Biology Major

Students desiring to major in biology may follow the academic schedule in the first two years and the science-engineering schedule in the last two years. In the Freshman year Chemistry 120 is substituted for French or German 100, the language being started in the following year. In the Sophomore year a second course in biology is taken as a science, and Physics 100 as the

[1] Law and Society (Political Science 310) is not recommended for students who have definite intentions of entering law school, since most of the material covered in this course will be duplicated and presented in more detail during the professional studies. It may prove of value, however, to those students who have not definitely decided on a legal career.

free elective. Since biology is the "science in major field," a different science should be substituted for the biology course normally specified for science majors in the Senior year. (See page 69.)

Premedical Major

Students preparing for entrance to medical or dental schools should acquaint themselves with the specific requirements and recommendations of the professional schools to which admission is desired. They may follow a slightly modified academic program similar in the first two years to that of a biology major, except that Physics 100 is taken in the Freshman year instead of Biology 100, and Biology 100 and Chemistry 220 are taken in the Sophomore year. If Chemistry 220 is not required by the professional school to which admission is desired, a free elective may be substituted for that course. In the Junior and Senior years a total of at least four science courses are taken, including Chemistry 300B, Biology 330a and 330b, and Psychology 300. If the three named courses are taken in the Junior year, the requirements for admission to most medical or dental schools will have been fulfilled in three years, assuming high grades. It should be noted that satisfactory preparation for entrance to medical or dental schools can be obtained by taking a biology major, or various other majors, provided the courses specifically required by the medical schools are included in the program.

Science-Engineering[1]

First Year

(1) Mathematics 100
(2) Physics 100
(3) Chemistry 120
(4) English 100
(5) History 100 or 110
(6) Engineering 130
(7) Physical Training 100

[1] Special arrangements may be made for certain modifications of any curriculum leading to a bachelor's degree, in order that the required courses in naval or military science and other subjects may be taken.

Second Year

(1) Mathematics 200 or 210
(2) Physics 200
(3) Chemistry 220; *civil, electrical, and mechanical engineering students substitute Business Administration 220 (one semester) and Engineering 250 (one semester)*
(4) English elective
(5) German
(6) Engineering 280

BIOLOGY, CHEMISTRY, MATHEMATICS, AND PHYSICS[1]

Third Year

(1) Science in major field
(2) Science in major field
(3) Science outside major field[2]
(4) French or German
(5) Humanity elective

Fourth Year

(1) Science in major field
(2) Science in major field
(3) Free elective outside major field
(4) Biology; *biology majors substitute another science*
(5) Humanity elective

GEOLOGY

The Harry Carothers Wiess Chair of Geology was founded by an endowment in January, 1952. It is anticipated that courses in this field may be established for the academic year 1952–53.

CHEMICAL ENGINEERING

Third Year

(1) Physical Chemistry (Chemistry 310)

[1] The schedule of every student must be approved by his department of specialization in each of the last two years.

[2] Students majoring in chemistry and physics must take Mathematics 300 or 310.

(2) Mathematics 300 or 310
(3) Heat Machinery (M.E. 330a) (first half-year)
Chemical Engineering Fundamentals (Ch.E. 305b) (second half-year)
(4) Scientific German (German 210)
(5) Engineering Economics (Economics 360)

Fourth Year

(1) Organic Chemistry (Chemistry 300A)
(2) Unit Operations (Ch.E. 405)
(3) Applied Mechanics (Engineering 330a) (first half-year)
Strength of Materials (Engineering 330b) (second half-year)
(4) Direct and Alternating Current Machinery and Circuits (E.E. 330)
(5) Humanity elective
(6) Fuels and Combustion Laboratory (Ch.E. 450)
Plant Inspection (Ch.E. 445a) (first half-year)

Fifth Year (B.S. in Ch.E.)

(1) Colloid Chemistry (Chemistry 410a) (first half-year)
Plant Design (Ch.E. 530b) (second half-year)
(2) Approved elective (first half-year)
Advanced Organic Chemistry (Chemistry 440b) (second half-year)
(3) Distillation (Ch.E. 570a) (first half-year)
Fluid Dynamics and Heat Transfer (Ch.E. 520b) (second half-year)
(4) Chemical Engineering Thermodynamics (Ch.E. 505a) (first half-year)
Chemical Engineering Thermodynamics (Ch.E. 510b) (second half-year)
(5) Chemical Literature (Ch.E. 525a) (first half-year)
Seminar (Ch.E. 590b) (second half-year)
(6) Unit Operations Laboratory (Ch.E. 550)

CIVIL, ELECTRICAL, AND MECHANICAL ENGINEERING

Third Year (uniform)

(1) Mathematics 300 or 310

(2) Kinematics (Engineering 360) (one semester)
Elementary Electronics (E.E. 340) (one semester)
(3) Engineering Mechanics (Engineering 300)
(4) Engineering Economics (Economics 360)
(5) Humanity elective

Fourth Year—Civil Engineering

(1) Direct and Alternating Current Machinery and Circuits (E.E. 300)
(2) Thermodynamics and Heat Engines (M.E. 300)
(3) Strength of Materials (C.E. 300a) and Mechanics of Liquids (C.E. 300b)
(4) Advanced Surveying (C.E. 320a) (first half-year)
Stresses in Structures (C.E. 320b) (second half-year)
(5) Approved elective

Fourth Year—Electrical and Mechanical Engineering

(1) Direct and Alternating Current Machinery and Circuits (E.E. 300)
(2) Thermodynamics and Heat Engines (M.E. 300)
(3) Strength of Materials (C.E. 300a) and Mechanics of Liquids C.E. 300b)
(4) Mechanical Vibrations (M.E. 320) (one semester)
Heat Transfer (M.E. 340) (one semester)
(5) Mechanical Processes (M.E. 350)
(6) Approved elective (first half-year)
Industrial Management (M.E. 460b) (second half-year); *or*
Two semesters of approved elective

CIVIL ENGINEERING

Fifth Year (B.S. in C.E.)

(1) Steel and Timber Structures (C.E. 460)
(2) Concrete Structures (C.E. 440)
(3) Municipal Engineering (C.E. 420)
(4) Elementary Indeterminate Structures (C.E. 480a) (first half-year)
Elementary Soil Mechanics (C.E. 480b) (second half-year)
(5) Seminar (Engineering 400)

Electrical Engineering

Fifth Year (B.S. in E.E.)

(1) Advanced Electrical Circuits and Transmission Lines (E.E. 400 or 430)
(2) Advanced Electrical Machinery (E.E. 410)
(3) Electrical Design (E.E. 420) or Electronics Engineering (E.E. 440)
(4) Seminar (Engineering 400)
(5) Engineering Analysis (Engineering 420)
(6) Advanced Laboratory Measurements (E.E. 450)

Mechanical Engineering

Fifth Year (B.S. in M.E.)

(1) Machine Design (M.E. 410)
(2) Power Plants; Heating; Ventilation; Air Conditioning (M.E. 420)
(3) Materials and Metallurgy; Internal-combustion Engines and Fuels (M.E. 440)
(4) Engineering Analysis (Engineering 420)
(5) Seminar (Engineering 400)

Architecture[1]

First Year

(1) Mathematics 100
(2) Chemistry 100
(3) English 100
(4) French
(5) History 100 or 110
(6) Architecture 100
(7) Physical Training 100

Second Year

(1) Mathematics 200 or 210
(2) English or general literature elective

[1] Special arrangements may be made for certain modifications of any curriculum leading to a bachelor's degree, in order that the required courses in naval or military science and other subjects may be taken.

(3) French
(4) Architecture 200
(5) Architecture 210
(6) Architecture 220b (second half-year)

Third Year

(1) Physics 100
(2) Elective (business administration, sociology, or psychology)
(3) Architecture 300
(4) Architecture 310
(5) Architecture 330
(6) Civil Engineering 331b (second half-year)

Fourth Year

(1) Architecture 400
(2) Architecture 410
(3) Architecture 420
(4) Architecture 430
(5) Architecture 440

Fifth Year (B.S. in Architecture)

(1) Architecture 500a (first half-year)
(2) Architecture 510b (second half-year)
(3) Architecture 520a (first half-year)
(4) Architecture 530
(5) Architecture 540b (second half-year)
(6) Architecture 550

Physical Education[1]

First Year

(1) English 100
(2) Biology 100
(3) Physical Education 100-125
(4) French, German, or Spanish
(5) Economics 100, or elective

[1] Special arrangements may be made for certain modifications of any curriculum leading to a bachelor's degree, in order that the required courses in naval or military science and other subjects may be taken.

Second Year

(1) English 200 or 210
(2) Chemistry 100 or 120
(3) Physical Education 200-225
(4) French, German, or Spanish[1]
(5) Elective

Third Year

(1) Biology 390
(2) Psychology 300
(3) Physical Education 300-325
(4–5) Two other subjects[2]

Fourth Year

(1) Physical Education 400-425[3]
(2–5) Four other subjects[2]

Students working toward master's and doctor's degrees will be registered in the following programs:

Master of Arts

A student who has received the bachelor's degree may obtain the Master of Arts degree after the successful completion of one year of graduate work. Possession of a bachelor's degree from the Rice Institute or elsewhere does not, however, automatically guarantee admission to graduate work. Applicants will be passed upon by the department concerned and by the Committee on Graduate Instruction, and will be required to submit evidence of suitable preparation and of ability to do work of the quality expected.

A candidate for the M.A. degree must elect a principal subject, and submit his schedule in writing when he reports his candidacy.

[1] The language begun in the first year should be continued.
[2] Students planning to enter public school work should elect education in the third and fourth years and Political Science 210 in the third or fourth year.
[3] Forty-five hours of practice teaching at the high school level must be completed during the Senior year.

Such a schedule must represent the equivalent of four advanced courses to be passed with high credit. The work shall consist of (*a*) personal investigation, the results of which must be submitted as a thesis; (*b*) at least two advanced courses, one of which must be a graduate course in the principal subject. In addition, candidates for the M.A. degree must pass a public oral examination.

A candidate for the master's degree will be expected to demonstrate a reading knowledge of either French or German[1] to a committee composed of one representative of the appropriate language department and one representative of the candidate's major department.

Graduate Work in Engineering

The Rice Institute offers graduate work in engineering to its own graduates of superior standing, and to similarly qualified holders of bachelor's degrees from other recognized institutions. Possession of a degree does not automatically guarantee admission to graduate work. Applicants will be passed upon by the department concerned and by the Committee on Graduate Instruction, and will be required to submit evidence of suitable preparation and of ability to do work of the quality expected. Those interested should apply to the Registrar not later than July 15.

The courses outlined below indicate the general nature of the requirements for the degree of Master of Science in the several fields of engineering. In addition, a candidate may be required to pass courses which he has not previously taken, but which are required by the Rice Institute for the degree of Bachelor of Science in the field of engineering concerned. Furthermore, attention is called to the fact that completion of the courses indicated below will not automatically lead to the award of a degree. The general quality of the candidate's course work, as well as the quality of his thesis, will be carefully considered by the department concerned and by the Committee on Graduate Instruction before he is recommended to the faculty for a Master of Science degree. In exceptional cases, a student may complete the necessary work in one year, but more often he should count on a minimum of two

[1] In cases of candidates for degrees to be awarded before June, 1955, the Committee on Graduate Instruction may recommend appropriate exceptions.

years, particularly if he is a holder of an appointment requiring some teaching or other service.

A candidate for the master's degree will be expected to demonstrate a reading knowledge of either French or German[1] to a committee composed of one representative of the appropriate language department and one representative of the candidate's major department.

Master of Science in Chemical Engineering

(1) Chemical Reaction Kinetics (Ch.E. 555a) (first half-year)
Reservoir Mechanics (Ch.E. 560b) (second half-year)
(2) Mass Transfer (Ch.E. 565a) (first half-year)
Chemical Engineering Mathematics (Ch.E. 515) (second half-year)
(3) Approved elective
(4) Research and Thesis (Ch.E. 585)
(5) Seminar (Ch.E. 590b)

Master of Science in Civil Engineering

(1) Advanced course in structures
(2) Approved elective in engineering
(3) Approved elective in mathematics, physics, chemistry, biology, or engineering other than civil
(4) Research and Thesis (C.E. 530)
(5) Graduate Seminar (C.E. 505)

Master of Science in Electrical Engineering[2]

(1) Advanced Circuit Analysis (E.E 500)
(2) Research and Thesis (E.E. 530)
(3) Advanced Electrical Power Engineering (E.E. 520), or
Advanced Communications Engineering (E.E. 540), or
Servo-mechanisms (E.E. 510), or
Advanced Electrical Machinery (E.E. 550)

[1] In cases of candidates for degrees to be awarded before June, 1955, the Committee on Graduate Instruction may recommend appropriate exceptions.

[2] A student who is a candidate for the degree of Master of Science in Electrical Engineering may take an additional approved elective upon consent of the electrical engineering department.

(4) Approved elective in mathematics, physics, or engineering
(5) Graduate Seminar (E.E. 505)

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

(1–2) Two approved graduate courses in mechanical engineering
(3–4) Two approved electives in mathematics, physics, chemistry, or engineering
(5) Research and Thesis (M.E. 550)
(6) Graduate Seminar (M.E. 505)

Graduate Work in Architecture

A candidate for the master's degree will be expected to demonstrate a reading knowledge of either French or German[1] to a committee composed of one representative of the appropriate language department and one representative of the candidate's major department.

MASTER IN ARCHITECTURE

(1) Postgraduate Design (Architecture 600)
(2) Postgraduate Architectural History (Architecture 610), or Postgraduate Construction (Architecture 630)
(3) Elective (advanced course)

Doctor of Philosophy

A student who has received the bachelor's degree may be admitted as a candidate for the degree of Doctor of Philosophy. Possession of a bachelor's or master's degree from the Rice Institute or elsewhere does not, however, automatically guarantee admission to graduate work or continuance beyond the M.A. degree. Applicants will be passed upon by the department concerned and by the Committee on Graduate Instruction, and will be required to submit evidence of suitable preparation and of ability to do work of the quality expected.

In addition to high attainment, preparation for the Ph.D. degree involves usually at least three years of graduate work. Candidates for the degree must submit a thesis and pass a public examination.

[1] In cases of candidates for degrees to be awarded before June, 1955, the Committee on Graduate Instruction may recommend appropriate exceptions.

The thesis must present a distinctly original contribution to the subject.

A candidate for the degree of Doctor of Philosophy is expected to satisfy his language requirements[1] at least one year before the date on which the degree is granted. He will be expected to demonstrate a reading knowledge of either French or German to a committee composed of one representative of the appropriate language department and one representative of the candidate's major department. In addition, he will be expected to demonstrate to the satisfaction of his major department a reading knowledge of one other language approved by the major department.

[1] In cases of candidates for degrees to be awarded before June, 1955, the Committee on Graduate Instruction may recommend appropriate exceptions.

RULES OF EXAMINATIONS AND STANDING FOR UNDERGRADUATE AND PROFESSIONAL STUDENTS[1]

Schedules. Except by special permission of the Committee on Examinations and Standing, no student shall be allowed to register in less than a normal schedule. *Only students having a grade average of II[2] or higher for the preceding year may register for an extra course.*

The regular schedule for all undergraduate students matriculated in or since 1946 is at least five full courses each year. Any irregular schedules are arranged at the time of registration, and are subject to review and correction by the Committee on Examinations and Standing. A student of the Institute who has had four full years of college work is permitted to complete a first baccalaureate degree by registering for only those courses actually needed for graduation, provided he is not on probation.

No student shall reduce the program for which he is registered without permission of the Committee on Examinations and Standing. After the third week of the academic year, any other course change also requires the approval of the Committee on Examinations and Standing.

Examinations. Regular written three-hour examinations are given to all students at midyear, and at the close of the academic year in May. Late examinations are given only by permission of the Committee on Examinations and Standing; they carry a fee of $10.00 each, which may be waived when an excuse of illness is accepted. Other tests and examinations are given from time to time at periods decided by the instructors. Tests and examinations are conducted under a student honor system. (See page 98.) In

[1] Students working toward any bachelor's degree, or not working toward a degree, are under the jurisdiction of the Committee on Examinations and Standing. (Students working toward a master's or doctor's degree are under the jurisdiction of the Committee on Graduate Instruction.)

[2] Grade symbols have the following meanings: I, very high standing; II, high standing; III, satisfactory standing; IV, poor standing; V, failure. In the evaluation of year grades, the grades of one-semester courses in *both* semesters shall be taken into account.

determining the standing of a student in each class, both his work during the term and the record of his examinations are taken into account.

Probation. Every student at the Rice Institute is expected to do academic work of high quality at all times. A student shall be placed on probation:

(1) If he earns passing semester grades[1] in more than 50 per cent but not more than 75 per cent of his full schedule in any semester.

(2) If he earns passing year grades[1] in more than 50 per cent but not more than 75 per cent of his full schedule in any academic year.[2]

(3) If he does not earn semester grades of III or better[1] in at least 40 per cent of his full schedule in any semester.

(4) If he does not earn year grades of III or better[1] in at least 40 per cent of his full schedule in any academic year.[2]

The period of this probation shall be the next semester in which the student is enrolled in the Institute. *A student shall not be placed on probation more than twice during his residence, but instead of a third probation shall be required to withdraw from the Institute.*

A student on probation is not permitted to be a candidate for or to hold any elective or appointive office; or to serve as editor, assistant editor, business manager, or assistant business manager of any college publication.

Special Probation. At its discretion, the Committee on Examinations and Standing may apply the rules of special probation to an individual student. Special probation requires that a student shall refrain from the extracurricular activities closed to other students on probation (see immediately above) and shall have no grade less than III[1] during the period of his special probation, and, further, that he must remain off probation thereafter; or he shall be permanently dropped.

[1] Grade symbols have the following meanings: I, very high standing; II, high standing; III, satisfactory standing; IV, poor standing; V, failure.

[2] In the evaluation of year grades, the grades of one-semester courses in *both* semesters shall be taken into account.

Enforced Withdrawal. A student shall be required to withdraw from the Institute:

(1) If he fails to fulfill all the terms of special probation, as outlined just above.

(2) If he earns passing semester grades[1] in 50 per cent or less of his full schedule in any semester. This clause shall not apply to an undergraduate student at the end of his first semester at the Institute; instead, probation shall be applied.

(3) If he earns passing year grades[1] in 50 per cent or less of his full schedule in any academic year.[2]

(4) If he has already been placed on probation twice and his semester or year grades,[2] at any subsequent time, are such as would result in a third probation.

Voluntary Withdrawal and Readmission. Any student desiring to withdraw voluntarily from the Institute must do so in person or by letter at the Registrar's Office. A student who withdraws voluntarily while not on probation or special probation will ordinarily be readmitted within three years. However, if the withdrawal occurs within five weeks of the beginning of any semester examination period, his grades[1] as of the date of withdrawal may be used to determine his eligibility for readmission.

Removal of Deficiencies. With the approval, *in advance,* of the Committee on Examinations and Standing, deficiencies may be removed by work of high quality in an approved summer school, but *future courses of a student's schedule may not be anticipated* by work done in summer school.

Change of Curriculum. Following the completion of a student's work in each of his first two years, the Committee on Examinations and Standing, at its discretion, may require a change of curriculum if, in the judgment of the Committee, the student's work in essential basic courses is such as to render him unsuited for further training in his originally chosen field of study.

Any proposed change of curriculum, whether or not the result of

[1] Grade symbols have the following meanings: I, very high standing; II, high standing; III, satisfactory standing; IV, poor standing; V, failure.

[2] In the evaluation of year grades, the grades of one-semester courses in *both* semesters shall be taken into account.

Committee action as mentioned above, is subject to the approval of the Committee on Examinations and Standing.

Approval of Major. In the second semester of the Sophomore year, each student is required to submit to the Committee on Examinations and Standing his choice of major. In determining whether this choice can be approved, the Committee will be guided by (1) aptitude shown in the individual record during the first two years of the curriculum which the applicant has been pursuing, and (2) limitations of departmental facilities for receiving students in the various major programs. Until a student's choice of major has been approved by the Committee on Examinations and Standing, he can not be registered for the Junior courses of that curriculum.

Promotion. A student who goes on probation at the end of any year is not promoted.

No student attains Junior standing or is allowed to register for courses of the Junior year without having satisfied a spelling requirement. For students (including Freshman and Sophomore transfers) who have not passed the spelling test given in English 100, tests based on a set list of words are available on announced dates during the second semester.

After obtaining the degree of Bachelor of Arts, a student of engineering or architecture will be permitted to proceed toward a professional degree only with the approval of the department concerned and by permission of the Committee on Examinations and Standing, granted on the basis of satisfactory achievement in his previous work. The same regulation applies to a graduate wishing to return for a program not leading toward an additional degree.

Graduation. To be recommended for any bachelor's or professional degree, a student must have earned year grades of III or better[1] in at least 50 per cent of his work prescribed for that degree,[2] and must not go on probation at the end of the year in

[1] Grade symbols have the following meanings: I, very high standing; II, high standing; III, satisfactory standing; IV, poor standing; V, failure.

[2] In the evaluation of year grades, the grades of one-semester courses in *both* semesters shall be taken into account.

which he is a candidate. A student who goes on probation at the end of this year but who is eligible to reregister may obtain his degree by earning grades, in a program of at least four additional courses, that remove him from probation.

LECTURES AND PUBLICATIONS

PUBLIC LECTURES

THE Rice Institute undertakes to provide frequent public lectures for the benefit of the citizens of Houston as well as for its students. These serve to supplement the more formal exercises of instruction and to present subjects of timely interest from all domains of learning.

THE FACULTY LECTURES

A series of Sunday afternoon lectures by members of the faculty is regularly scheduled during the fall months. Announcement of the subjects and dates is made a few weeks before the lectures are delivered. The series normally begins in October and continues in successive weeks.

THE SHARP LECTURES

The first lectureship at the Rice Institute was established by Mrs. Estelle B. Sharp, of Houston, and had to do primarily with topics in the social sciences. The Sharp Lectureship was inaugurated in the autumn of 1918 by a course of lectures on "The Obligations and Privileges of Citizenship—a plea for the study of social science," by Professor Sir Henry Jones, F.B.A., of the University of Glasgow. Subsequent lectures have been delivered by Professor Andrew C. McLaughlin, of the University of Chicago, by Dr. T. R. Glover, of Cambridge University, by Sir Robert Falconer, of the University of Toronto, and by Professor Edwin G. Conklin, of Princeton University.

THE GODWIN LECTURES

The Godwin Lectures were established in 1919 by Mr. Herbert Godwin, of Houston, and were devoted initially to subjects of public concern during the period of reconstruction after World War I. The lectures were inaugurated in 1920 by the Hon. William Howard Taft. Later lectures have been delivered by Sir Auckland Geddes, British Ambassador to the United States, and by President A. Lawrence Lowell, of Harvard University.

THE MUSIC LECTURES

A series of lectures dedicated to the promotion of interest in music both in the Rice Institute and in the community was founded anonymously in 1922 by a citizen of Houston. The series was inaugurated in the spring of 1923 by a course of lectures on music in the life of the community and of the nation, delivered by Mr. John Powell, the American composer and pianist. Other lectures have been delivered by Mlle. Nadia Boulanger, of Paris, by Sir Henry Hadow, Vice-Chancellor of the University of Sheffield, by MM. Maurice Ravel and A. Honegger, of Paris, by Professor George D. Birkhoff, of Harvard University, and by Mr. Harold Morris.

THE ROCKWELL LECTURES

These lectures were inaugurated by Sir Robert Alexander Falconer in April, 1938. Later lectures have been delivered by Dr. Harris Elliot Kirk, by Dean Roscoe Pound, by Dr. Joseph Richard Sizoo, by Professor William Ernest Hocking, by Dr. Robert Russell Wicks, by Dr. Ralph W. Sockman, by Dr. George A. Buttrick, by Professor Charles W. Hendel, by Professor Kenneth S. Latourette, by Mr. Charles P. Taft, by Dr. Henry P. Van Dusen, and by Professor George Finger Thomas.

THE RICE INSTITUTE LECTURES

From time to time the Rice Institute invites scholars of distinction to lecture for varying periods of time. In most cases these lectures are open to the public as well as to the faculty and student body.

PUBLICATIONS OF THE RICE INSTITUTE

Among the publications of the Rice Institute are included a booklet of general information, a student handbook presented to students at the beginning of each academic year, a weekly Calendar of Events announcing forthcoming campus activities, and The Rice Institute Pamphlet (quarterly). The January number of the Pamphlet contains, in alternate years, the *General Announcements* or *Graduate Announcements* of the Institute.

LIBRARY AND LABORATORIES

THE FONDREN LIBRARY

THE new Fondren Library houses all of the Institute's library materials, except those working tools which must be maintained adjacent to laboratories. This building, designed and built after several years of consultation with many librarians and architects, reflects the most recent trends in library architecture, while retaining in its external design conformity with the other buildings on the campus. Completely air-conditioned, it provides both for the comfort of those using the library and for the preservation of the books. Its open-stack system allows easy access to the entire collection. The facilities provided include twelve seminar rooms, twenty-seven faculty studies, fifty-three individual carrels for graduate students, a projection room, a map room, six individual listening booths equipped with phonographs, a lecture lounge equipped with radio, phonograph, and projection equipment, an exhibition gallery, and booths for the use of microfilm readers and for typing. A section of the basement with separate entrance provides temporary quarters for a student recreational lounge, the Co-operative Bookstore, and a snack bar.

It has been the policy of the Institute in building up the library, first, to supply such books as are necessary to supplement the courses of instruction; second, to acquire material as it is needed to support the research work of the faculty and graduate students. The additional facilities of the new building now make it possible for the library to provide also books for general reading and a collection of phonograph records which will broaden the cultural experience of the students. Besides nearly two thousand current literary and scientific journals, the library contains about seventy-five thousand back files of important serial publications, the fields of science and technology being very completely represented among these holdings. The book collection at present, including bound periodicals, contains about 215,000 volumes.

LABORATORY INSTALLATION

THE laboratories for physics and biology are located on the north side of the academic court, adjoining Lovett Hall, and are connected with the latter by a continuation of the original cloister. The buildings are constructed of brick and marble, corresponding in their design to the style defined in Lovett Hall, but of a simpler character expressing their purpose as laboratories. The main building is 275 x 56 feet, with two stories and a basement. It is connected to a building 121 x 72 feet, containing a large lecture room seating about 300.

Physics

The physics department occupies space in the physics building, in Lovett Hall, and in the high-voltage laboratories. There are three large laboratories, twenty-five rooms fitted for research in physics, a battery room in which a battery of 100 Edison storage cells of 300 ampere-hours' capacity has been installed, a switchboard room, motor generators for charging the batteries and supplying direct current to the lecture rooms and laboratories, a large air compressor, two constant-temperature rooms for research, a preparation room, three darkrooms, a well-equipped workshop, and a students' workshop. Elevators for moving heavy apparatus are provided. The physics laboratories now contain a fine collection of modern apparatus suitable for teaching and research in all branches of physics. The equipment includes apparatus for research in atomic and nuclear physics, in physics of low temperatures, in magnetic phenomena, and in electronics. For work on nuclear physics, a 6,000,000 volt Van de Graaff accelerator will be installed in 1952 in a new high-voltage laboratory which is being built between the physics building and the Abercrombie Engineering Laboratory; also available are a 200,000 volt source, a 2,000,000 volt electrostatic generator, auxiliary equipment such as radium and mesothorium sources, gamma-ray spectrographs, a large magnetic analyzer, linear amplifiers, scaling circuits, proportional counters, Geiger counters, and cloud expansion chambers. A large electromagnet with poles 20 centimeters in diameter, a large permanent magnet with poles 12 centimeters in diameter, a large Weiss electromagnet, and a

large Pye magnet are available for research. A helium liquefier of new design, capable of producing two liters of liquid helium per hour, provides facilities for extensive research at extremely low temperatures. The optical instruments includes a Hilger's wave-length spectrometer, a monochromatic illuminator, a spectrophotometer, and a quartz spectrograph; there is also a set of interferometers of various types. Several X-ray generators are available for research. Four instrument makers, one of whom is a glass blower, are employed in the construction of special apparatus for research. The Fondren Library contains all important textbooks and handbooks, and complete sets of American and foreign journals.

Biology

The department of biology is for the present situated in the west end and basement of the main building of the physics laboratories. It has laboratories capable of seating one hundred and fifty students; lecture rooms with lantern for microscopic and other forms of projection; research rooms, photographic darkroom, preparators' room, animal quarters, storerooms, etc. Laboratory work is available in all the courses offered, and modern and fully equipped microscopes are provided. Included also is a fully equipped radiation laboratory for training in and experimental use of radio-isotopes. This laboratory includes special "hot" chemical rooms, cold room, counting room, animal room, operating room, and individual research rooms. Special apparatus includes a dental X-ray machine, Warburg apparatus, spectrophotometer, refrigerators, centrifuges, fine balances, ovens for dehydrating and ashing, incubators, *p*H meter, photo-colorimeter, Beckman flame photometer, autoclaves, Geiger counters, and other special radiation instruments. Facilities are available for advanced research work in such subjects as parasitology, medical entomology, physiology, endocrinology, genetics, and radiobiology. The department is also equipped with an extensive series of specimens, microscope slides, casts, and charts. Binocular microscopes, microtomes of various kinds, thermostats, embedding baths, and considerable accessory equipment, including physiological apparatus, are available for research work. Most

of the important current biological and zoological periodicals are to be found in the Fondren Library.

Chemistry

The laboratories for the department of chemistry are housed in a three-story building of maximum rectangular dimensions of 307 and 181 feet, with ample attic and basement accommodations, built around several open courts facing the south. Of brick and stone, steel and concrete construction, the building embodies the prevailing architectural beauty and simplicity of technical plan exhibited in the earlier science laboratories of Rice. Provision is made for adequately equipped, separate laboratories for both research and instruction in the half-dozen major branches of chemistry, with an even larger number of smaller laboratories for corresponding work in the more highly specialized subjects of the science. In all the laboratories there is an abundance of natural light, while an elaborate system of artificial ventilation removes all fumes through a central draft tower, so designed as to constitute of itself one of the architectural features of the building. Careful consideration has been given both to the anticipated growth of the institution and to the normal departmental development. The department is well equipped with modern apparatus and materials for research and for lecture room and laboratory work in inorganic, organic, analytical, physical, colloid, electro-, and physiological chemistry. Each laboratory room is equipped with the necessary conveniences, such as water, gas, alternating and direct current, air blast, hoods, and suction pumps. The lecture rooms are suitably arranged for the illustration of lectures by experiment and lantern projection. In the Fondren Library are found the more important journals, works of reference, and standard textbooks on different branches of chemistry and chemical engineering. These books and periodicals are accessible to all students.

Some of the more special chemistry equipment consists of several X-ray diffraction units including one with Geiger counter for recording intensities, electron diffraction equipment, polarographic instruments, a Geiger counter unit with scaler, automatically controlled equipment for the determination of adsorp-

tion isotherms including facilities for simultaneous magnetic susceptibility measurements on the adsorbent, spectrophotometers, a recording microphotometer, automatically controlled equipment for low-temperature calorimetric work, and apparatus for resistance measurements at high temperatures. A machinist and a glass blower are available for construction of special research equipment and apparatus.

Psychology

The psychology department is situated in the Fondren Iibrary. The psychological laboratory and its facilities include a large experimental classroom, four small individual experimental laboratories, a seminar room, a shop, and the departmental offices. Here, also, are located the standard laboratory instruments, equipment, and materials for construction of apparatus for demonstration purposes and research. Above the laboratory in the Fondren Library proper are the books and periodicals of the department, including the collection of books of the library of Edward Bradford Titchener.

Architecture

The department of architecture is located on the second floor of Anderson Hall. It consists of two large general drafting rooms for students beyond the first year and a large studio well equipped for advanced work in freehand drawing and water color. These rooms are lighted in the most modern manner. Adjacent to the drafting rooms and studio are the offices of the faculty and a plate library well selected for drafting room use. The instruction in elementary drawing and in construction work is now conducted in a large, air-conditioned area in the basement of the main library building, which is connected to Anderson Hall by means of cloisters. The construction area consists of drafting room, model room, materials museum with files, and adjacent offices for members of the faculty.

In each drafting room throughout the department, every student has a large individual drafting table. At the fifth- and sixth-year levels the student is provided with two drafting tables.

While the plate library adjoins the main drafting room, the departmental library for architecture occupies a generous area in the main library building convenient to the department. The architectural library is equipped with standard architectural publications necessary for reference and research, and very complete files of past years. The department possesses a well-arranged room for its large collection of lantern slides and photographs. The classrooms and lecture rooms are new and complete, and are equipped for the showing of lantern slides and the presentation of 16 mm. films of both silent and sound type. The department possesses the projectors for each of these purposes. It also possesses models for elementary instruction and for teaching of classes in construction and materials.

Engineering

The engineering laboratories and school power plant are housed in two large buildings and an annex. The Mechanical Laboratory Power Plant Building is one of the original group erected in 1911. In this building are found the steam laboratory equipment and boiler, the steam generating plant for campus use, a stand-by electric power plant in case of city power failure, and several drafting rooms. The annex holds the heavy testing equipment of the civil engineering department and the Freshman and Sophomore drafting rooms. The Abercrombie Laboratory is one of the newest buildings on the campus and, although of modern design, is carefully adapted to blend with the more traditional buildings on the campus. The electrical engineering laboratories occupy one wing; the mechanical shops and internal-combustion engine laboratory, another; a third is devoted to graduate research in all fields of engineering. This building also has two large drafting rooms on the second floor and parts of it are air-conditioned for the protection of delicate instruments.

Engineering Drawing

Drafting rooms for instruction in engineering drawing are located at present in the mechanical laboratory and its annex, and are equipped like the best industrial installations. Instruction is

given in the use of blueprinting machines, in photostating, and in accessories such as universal drafting machines and planimeters.

Chemical Engineering

The chemical engineering equipment includes an experimental double-effect Swenson evaporator with vertical and horizontal effects, a Buflovak standard vacuum shelf drier, Sperry plate-and-frame and Kelly filter presses, experimental humidification, dehumidification, and air-conditioning apparatus, a redwood water cooling tower, a 15-plate Stokes experimental fractionating column and distillation apparatus complete, equipment for crushing and grinding including jaw, roll, disc, and ball mills, Tyler screening equipment with "Ro-Tap" sieve shaker, heat and fluid flow equipment, an experimental rotary drier, an experimental cabinet drier, a stoneware-packed absorption tower, an adsorption tower, a flotation unit, a spiral scraper thickener with "Lightnin" direct-drive mixer, a Pyrex flanged-pipe hydraulic separator with Jeffrey-Traylor electric vibrator feeder, a Kane gas-fired automatic steam boiler, a Sargent calorimeter, Orsat flue gas apparatus, a throttling calorimeter, a stoneware suction filter, water softening and water treating equipment, gas and electric furnaces, a Reichert metallographic microscope, etc.

Facilities for graduate instruction and research in chemical engineering have been housed since the late fall of 1948 in the Abercrombie Laboratory. There are three offices with adjoining laboratories, together with a large bench-scale research laboratory on the second floor, a chemical engineering shop and a P-V-T-X laboratory on the first floor, and a large two-story laboratory to give increased headroom for large equipment. All laboratories have air, gas, water, high- and low-pressure steam, and 110 volt and 220 volt power; and all are equipped with laboratory-type benches, tables, and equipment storage cabinets. A feature of this central wing of the Abercrombie Laboratory is an expanse of unallocated laboratory space, both upstairs and down, to be assigned to engineering research problems as the need arises.

The chemical engineering research equipment located in the Abercrombie Laboratory building includes (1) shop equipment: lathes, drill press, both arc and gas welding equipment, and

tools for forming both wood and metal; (2) P-V-T-X equipment: cell, pump, isothermal bath, and gages; (3) two fluidized powder units with auxiliary equipment for research on catalysis and reaction rate; (4) a fixed-bed catalytic converter for similar research; and (5) Beckman IR-2 infrared spectrophotometer with auxiliaries housed in air-conditioned space. Also in use are balances, indicating and recording potentiometers, high- and low-temperature ovens, glass-blowing equipment, fractionation columns, gas density balance, Bausch & Lomb precision oil refractometer, etc.

Civil Engineering

The civil engineering laboratory is equipped with the usual surveying instruments: transits, levels, compasses, and plane tables of a wide variety of standard American makes. There is also a large assortment of the necessary auxiliary equipment such as tapes, rods, and range poles. The drafting room is fully equipped with instruments not required by each individual student, such as planimeters, protractors, special slide rules, railroad curves and irregular curves consisting of splines and weights, and calculating machines. The materials testing laboratory of this department is equipped with one 50,000 pound Riehlé universal machine, one 60,000 pound Riehlé hydraulic testing machine, one Olsen 15,000 pound universal machine, one 100,000 pound Olsen universal machine, one 200,000 pound Olsen universal machine, one 60,000 inch-pound Riehlé torsion machine, a Riehlé standard paving brick rattler, a Riehlé two-gang Deval abrasion machine, a Bureau of Standards flow table, suitable equipment for tension tests of belting, an Olsen-Boyd 1000 pound automatic briquette testing machine, a Tyler "Ro-Tap" testing sieve shaker, and the necessary auxiliary apparatus for making the usual tests. Two R. R. Moore endurance testing machines and a Riehlé universal impact machine have been added recently. The hydraulics laboratory is equipped with a Worthington 200 gallon per minute, 100 ft. head volute centrifugal pump with a directly connected slip ring motor; a simplex Venturi meter; trapezoidal, triangular, and rectangular weirs; a Pelton-Doble impulse wheel; and necessary gages and other usual equipment.

Electrical Engineering

The equipment of the electrical engineering laboratories is ample for a thorough study of direct and alternating current circuits, machines, and controls, as well as for investigations in the electronics and communications fields. In the power laboratories, examples of a wide variety of rotating machinery, transformers, control devices, industrial electronic devices (including mercury arc power rectifiers and X-ray equipment), servomechanisms, and instruments are available; among these are examples of the practice of each of the leading manufacturers, and in some instances where trends are worthy of note, older equipment is available to allow comparison with more modern products. The electronics laboratory is equipped for investigations in voice recording, wire communication, radio, and microwave fields, and for basic studies of electronic tubes and their circuits. Instruments, other measuring apparatus, and standards are sufficient to make any measurements likely to be needed, and are maintained on the level of current practices and advancements in the fields to which they apply.

Power supplies and switching facilities are flexible, with ample test tables and lighting provided. Permanent setup of apparatus is an exception, occurring only in the case of equipment too large to be moved conveniently, the greater part being individually mounted in such a manner that the student may have an opportunity to develop initiative and self-reliance in its arrangement for investigations without taking appreciable time from the investigation itself. Plug-and-jack connections are used extensively.

In addition to being a part of the communications laboratory equipment, a 1 kilowatt short-wave transmitter, with several of the latest communications and broadcast receivers, affords opportunity for electrical engineering students to become proficient in the operation of these facilities as an extracurricular activity.

Mechanical Engineering

The graduate and undergraduate mechanical engineering laboratories occupy the ground floor of the central and northeast wings of the Abercrombie Laboratory. The second floor is available for classrooms and a large machine design drawing room which will seat approximately eighty students.

A large modern and well-lighted machine shop, consisting of several lathes, milling machines, planers, shapers, internal and external grinding machines, drill presses, etc., is available to both undergraduate and graduate students for instruction and the building of research apparatus. A tool room is situated adjacent to the machine shop where sufficient auxiliary tools, instruments, etc., are provided to equip completely some forty major machines in the machine shop. Additional instruments housed in an air-conditioned room include gage blocks, optical comparators, surface plates, depth gages, snap gages, numerous sets of micrometers, and a variety of special precision measuring instruments.

Adjacent to the machine shop are a small aluminum foundry, a pattern shop, and a gas and electric-arc welding shop. Here equipment is available whereby the undergraduate may obtain the necessary basic fundamentals and techniques in a variety of manufacturing methods.

The internal-combustion engine laboratory consists of several types of engines individually mounted and instrumented for testing purposes. There is also provided a large double-ended dynamometer where special engines may undergo extensive tests. A fuels laboratory adjacent to the internal-combustion engine laboratory is equipped with various calorimeters, furnaces, instruments, etc., to determine the heat content of solid, liquid, and gaseous fuels.

A metallurgical and heat-treating laboratory may be used for the polishing and etching of metals; also sufficient apparatus is available for producing photomicrographs. A large, well-equipped darkroom adjoins the metallurgical laboratory. Several types of both gas and electric furnaces, with the necessary controls, instruments, etc., are provided for both instructional and research purposes.

A mechanical vibrations laboratory is equipped to carry out research on turbine blades, beams, plates, etc. Heavy steel tables 3 inches thick, 30 inches wide, and 6 feet long are used for the necessary test setups. Several pieces of research equipment in the central wing of the Abercrombie Laboratory are provided for ultrasonic research in the field of gases and gas mixtures over a temperature range from 80 F to 700 F and from high vacuum to 15,000 lbs. per sq. in. This research laboratory is equipped with

compressed air, gas, water, low- and high-pressure steam, and 110, 220, 440 volt alternating and direct current in special receptacles. Adequate space and research facilities are provided for the graduate student to carry out original investigations.

The steam laboratory is housed in the main mechanical engineering building adjoining the Abercrombie Laboratory. A special two-drum, high-pressure, gas-fired steam generator complete with the necessary controls and instruments is used by the students in running the various engines, turbines, and other equipment.

A General Electric turbo-generator set, consisting of two turbines, two generators, condensers, vacuum pumps, 60 hp. synchronous motor, and hydraulic water brake complete with controls and properly instrumented, is used for undergraduate instruction. All high-pressure steam piping valves, auxiliary steam headers, boiler feed pump, and deaerator lines are welded, to accord with modern practice.

These laboratories were designed with sufficient care to provide the necessary room and lighting around each piece of equipment; and, where necessary, individual concrete foundations were constructed to provide ease in operation of the equipment by the student. A color scheme was evolved in order to identify various lines throughout the laboratories, both to help the student and to produce a pleasing effect.

STUDENT ACTIVITIES

ORGANIZATIONS AND PUBLICATIONS

ALL students, upon matriculation, become members of the Student Association, which organizes and directs the various activities named below and through its officers, who form the Student Council, represents the students to the faculty, administration, and other institutions. The special problems of the women students on the campus are the concern of the Women's Council.

Each of the five classes, Freshman, Sophomore, Junior, Senior, and Class B Graduate,[1] has an organization for its government and for the solution of special problems.

The various activities, covering cultural, professional, and avocational needs, comprise publications: *The Campanile* (annual), *RI Magazine,* and *The Thresher* (weekly); the Elizabeth Baldwin, Owen Wister, Pallas Athene, Sarah Lane, Chaille Rice, Mary Ellen Lovett, Olga Keith, and Virginia Cleveland Literary Societies; musical groups: the Band and the Choral Club; foreign-language clubs; technical societies: the Architectural Society, the Engineering Society, the Student Affiliates of the American Chemical Society, and the student branches of the American Institute of Chemical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, and the American Society of Mechanical Engineers; and other specialized organizations including the Rally Club, the Premedical Society, the Forum Committee, the Rice Rostrum, A.P.O., the Rice Sextant, the Radio Club, R and Quill, the Film Society, and the Dramatic Club. There are also several religious clubs, organized under a Student Religious Council.

Through the generosity of the late Mrs. James L. Autry, as a memorial to her husband, the late James L. Autry, of Houston, the Diocese of Texas of the Protestant Episcopal Church is maintaining Autry House in the immediate vicinity of the Rice Institute, as a social and religious center. The cornerstone of Autry House was laid during the commencement ceremonies of the

[1] Composed of students of architecture and engineering working toward a professional degree, following award of the B.A. degree.

Class of 1921. To this community group of the Episcopal Church, the late Mrs. E. L. Neville, of Houston, in memory of her brother, Edward Albert Palmer, contributed the beautiful Edward Albert Palmer Memorial Chapel, which was dedicated November 27, 1927. All the opportunities of these establishments are available to the students of the Rice Institute irrespective of religious affiliation. Other religious bodies have intimated that they are considering future provision for similar undertakings in the neighborhood of the Rice Institute.

In the Fondren Library an area is furnished to provide students an opportunity for relaxation. Adjacent to this Student Lounge are the offices of the Student Association and of the student publications, forming the campus hub of extracurricular activities.

SERVICE AWARD

In memory of Hugh Scott Cameron, first Dean of Students at the Rice Institute, the Student Association annually presents the Rice Institute Service Award, in the form of a bronze plaque, to those currently enrolled or former students who have been most exemplary in rendering distinguished service to the school and to the student body. This coveted honor is sparingly bestowed after careful consideration of possible recipients by a committee of faculty and students appointed by the Association.

HONOR SYSTEM

Examinations are conducted under a student honor system, which is administered by an Honor Council whose members are elected annually from and by the student body. This council is responsible to the faculty, through the Associate Dean for Students, for the validity of all examinations and for the investigation and prosecution of cases of violation of the system.

HONOR SOCIETIES

PHI LAMBDA UPSILON

Phi Lambda Upsilon, an honorary chemical society, has as its purpose "the promotion of high scholarship and original investigation in all branches of pure and applied chemistry." The Alpha Alpha chapter was installed at the Rice Institute in 1927.

THE PHI BETA KAPPA SOCIETY

The Senate of the United Chapters of Phi Beta Kappa at its meeting in December, 1927, voted to recommend the establishment of a chapter at the Rice Institute, and at a meeting of the National Council held in September, 1928, the institution of the Rice, or Beta of Texas, chapter was duly authorized. The chapter was formally installed on March 1, 1929, by the secretary of the United Chapters.

THE PI DELTA PHI SOCIETY

The Pi Delta Phi Society, organized to interest students of French in competing for high standing in scholarship, authorized in May, 1930, the formation of a chapter of the Society at the Rice Institute. The Theta chapter was formally installed in that year by a delegate of the national organization.

THE SOCIETY OF THE SIGMA XI

The Society of the Sigma Xi, for the promotion of research in science, on the occasion of its thirty-eighth annual convention in December, 1937, acting upon the recommendation of the Executive Committee, duly authorized the establishment of a chapter of the Society at the Rice Institute. The formal installation of the Rice chapter by the president of the national organization took place on March 23, 1938.

THE TAU BETA PI ASSOCIATION

The Tau Beta Pi Association, organized to interest engineering students in competing for high standing in scholarship, authorized at its annual convention in October, 1940, the establishment of a chapter of the Association at the Rice Institute. The Rice chapter, the Gamma of Texas, was formally installed on December 18, 1940, by the national secretary of the Association.

DELTA PHI ALPHA

Delta Phi Alpha, German national honorary society, was founded to promote among university students an interest in the German language and literature. The National Council in April, 1949, authorized the organization of the Gamma Xi chapter at the Rice Institute.

SUBJECTS OF INSTRUCTION

THE courses listed below have been given in recent years or have been announced for the near future. Not all are repeated annually, and modifications or additional courses are likely to be introduced from time to time. Offerings for each academic session are shown on the printed time schedule distributed at the September registration. At all other times, the latest information about future offerings can be secured from the Office of the Registrar or from department heads.

The numbers designating the courses have the following significance: courses having numbers beginning with 1 are open to all students of the Institute; beginning with 2, open to Sophomores, Juniors, and Seniors; beginning with 3 open to Juniors and Seniors; beginning with 4, Senior courses; beginning with 5 or 6, designed primarily for graduates.

Figures entered in parentheses at the left below the description of each course signify the number of class hours per week, the number of laboratory hours per week, and the number of semester hours' credit for the completed course.[1] Thus, the entry (3–0–3) under Mathematics 320a means that the course meets three times per week, has no laboratory, and (being a one-semester course) is worth three semester hours' credit. (The letters "a" and "b" after course numbers indicate first-semester and second-semester courses, respectively.) The entry (3–3–8) below Physics 100 means that the course meets three hours per week, has three hours of laboratory work per week, and (being a two-semester course) is worth eight semester hours' credit.

Instructors of courses, as named at the lower right of the descriptions, are subject to change.

[1] Credit in terms of semester hours is normally the sum of the number of class hours per week and one-third the number of laboratory hours per week, multiplied by the number of semesters of the course. In certain courses, however, the laboratory work carries no credit or less than full credit.

COURSES IN ARTS AND SCIENCES

Biology

Biology 100. *General Biology.* An introductory course in biology on the general principles underlying living things. A general vertebrate type is considered first, and this is used as a basis for an introduction to physiology, immunology, embryology, cytology, genetics, ecology, and classification. Structure and function are, when possible, considered together; emphasis is placed on the former in the laboratory, and the more dynamic aspects are presented in lecture with the aid of demonstrations and motion pictures. Plants are briefly considered in comparison with animals. The latter part of the course deals with various animal forms and their evolution, with emphasis on progressive differentiation of structure and adaptation to environment.
(3–3–8) *Mr. Davies*

Biology 220. *Parasitology, and the Biology of Public Health.* The first part of the year is devoted to a study of the relation of insects and their allies to the spread of disease, with special emphasis on such important disease transmitters as mosquitoes and flies. Following this the parasitic worms and Protozoa are studied, especially those of local importance, causing hookworm disease, malaria, syphilis, etc. Particular attention is given to the biology of the parasites as it affects epidemiology, diagnostic methods, and control. May be taken as a cultural course by academic students. Recommended for premedical students in the Senior year.
(3–3–8) *Mr. Chandler*

Biology 240. *General Zoology.* A course, following the General Biology course, for students preparing to teach biology or zoology in high schools, and for students desiring a cultural course in the subject. The various phyla of animals are considered from the standpoint of their general organization in relation to their habits, and special attention is given to their natural history, life cycles, ecological relationships, and economic and conservational importance. Such subjects as biology of populations, social life, eco-

logical communities, migration, artificial cultivation, and identification are considered. The laboratory work is supplemented by field trips. Prerequisite: Biology 100.
(3–3–8) *Mr. Talmage*

Biology 330a. *Comparative Anatomy of Vertebrates.* The lectures consist of discussions dealing with the structural and functional aspects of vertebrate evolution, and provide a background for an understanding of human anatomy. In the laboratory detailed dissections will be made of the shark, necturus, turtle, and cat. This work will be supplemented by demonstrations and examinations of other vertebrate types. Recommended for biology majors and Junior premedical students. Prerequisite: Biology 100.
(3–6–5) *Mr. Daugherty*

Biology 330b. *General Physiology.* Consideration is given to the physical and chemical characteristics of protoplasm in relation to the microscopic and submicroscopic organization of cells, and to the roles of colloids, O-R potentials, *p*H, buffers, and ions in the physiology of cells and tissues. Intermediary metabolism, cellular respiration, and the kinetics of cell function are dealt with in detail. In the laboratory one afternoon a week is devoted to general experiments supporting the lecture material. Several additional laboratories are scheduled where small groups will become acquainted with recent techniques involving chromatography, bioelectric potentials, electrophoresis, photometry, and manometric apparatus. Recommended for biology majors and Junior premedical students. Prerequisites: Biology 100, Chemistry 120, and Chemistry 220 (may be taken concurrently).
(3–6–5) *Mr. Daugherty*

Biology 360. *Evolution.* The genetical basis of evolution is first briefly considered. The study of evolution itself is then taken up, with chief emphasis on palæontology. It includes a consideration of cosmic and geological evolution, the succession of animal and plant forms in time, including man's place in this process and his present and possible future evolution. Prerequisite: Biology 100 and Junior standing.
(3–2–7) *Mr. Altenburg*

Biology 390. *Anatomy and Public Health.* A course of lectures and laboratory work for students of physical education. The first term is devoted to the study of human anatomy and physiology and the physiology of exercise. The second term covers health legislation, social problems, vital statistics, epidemiology, care of water, milk, and other foods, sewage disposal, housing, and ventilation, including trips to study the health practices and conditions of public utilities.
(3–3–8) *Dr. Welsh*

Biology 410. *Genetics and Eugenics.* This course is devoted to a study of heredity, with frequent references to human material. Prerequisite: Biology 100 and Junior standing.
(3–2–7) *Mr. Altenburg*

Biology 460. *Vertebrate Embryology and Histology.* In the first semester the development of the vertebrate type is considered. Early development and germ layer formation are compared in the frog, chick, and mammal. The chick is also studied intensively in connection with the development of the various organs. The formation of the extraembryonic membranes is studied in the mammal, together with different types of placentation. In the laboratory the student is taught the technique of staining and mounting embryos, and also the paraffin section technique. In the second semester the histological structure of the organs is considered in detail. In the laboratory the student is taught the celloidin section method and various staining techniques. Given in even-numbered years; alternates with Biology 470. Prerequisites: Biology 100 and Junior standing.
(3–3–8) *Mr. Davies*

Biology 470. *General Bacteriology and Immunology.* Sterilization, preparation of media, and methods of cultivation; disinfection; nature and relationships of various types of micro-organisms; introduction to bacteriology of air, soil, water, sewage, dairy products and other foods, and important human, animal, and plant diseases; the principles of immunology and their application to preventive and curative medicine. Special emphasis on

public health and hygienic aspects of the subject. Prerequisites: Biology 100, Chemistry 120, and Junior standing. Given in odd-numbered years; alternates with Biology 460.
(3–3–8) *Mr. Chandler*

Biology 480a. *Radiobiology.* An introductory study of the applications of nuclear radiations to biological problems. The lectures and laboratory attempt to acquaint the student with characteristics of nuclear emissions, problems of health physics, an introduction to radiochemistry, study of radiation effects, and the use of isotopes as biological tracers, as well as to review as far as possible pertinent work done in this field. Prerequisites: at least one year each of mathematics, physics, and chemistry; Comparative Anatomy; and General Physiology. Size of class limited by facilities.
(3–3–4) *Mr. Talmage*

Biology 480b. *Endocrinology.* A study of the function, morphology, and comparative anatomy of the glands of internal secretion. From limitations of time, only the well-recognized endocrine glands of mammals will be considered in detail. The lectures are supplemented wherever possible by demonstration. No laboratory. Prerequisites: Comparative Anatomy and General Physiology.
(3–0–3) *Mr. Talmage*

Graduate Courses in Biology

Except by special permission of the instructors, courses numbered 500 and higher are open only to graduate students. The 600, 700, and 800 courses are continuations, in successive years, of the 500 courses; e.g., Research in Parasitology is numbered 596 in the first year, 696 in the second, etc. No distinction is made as to whether these courses are leading to M.A. or Ph.D. theses. In Biology 500 (Special Work) and in Biology 590–597 (research courses), the number of credit hours for lectures and laboratory work may vary for individual students, but the number of credit hours will be shown on the official record and on transcripts.

In the other graduate courses, consisting of advanced work in

various subjects, regularly scheduled lectures or assigned laboratory periods usually are not given. The instructor meets his students as often as he deems necessary per week for conferences or discussions on what has been accomplished during the preceding week, and to assign the work in library, laboratory, or field for the succeeding week. Ordinarily these regular discussion periods will occupy a minimum of one and a half to two hours once a week, but more frequent conferences may be required at the discretion of the instructor. Not all the advanced courses for graduates will be given every year; usually they will be offered in alternate years. Biology 560, 570, and 580 usually will be given in rotation every three years. Graduate students in biology always should arrange their schedules with members of the department before registering.

Biology 500. *Special Work.* Advanced work in special fields of biology, adapted to the needs of individual graduate students. Registration permitted only with the consent of the instructor.

Biology 510. *Advanced Genetics.* Reading and conferences.
(3–0–6) *Mr. Altenburg*

Biology 530. *Advanced Radiobiology.* Reading, conferences, and laboratory work.
(2–6–8) *Mr. Talmage*

Biology 540. *Advanced Endocrinology.* Reading, conferences, and laboratory work.
(2–6–8) *Mr. Talmage*

Biology 550. *Advanced General Physiology.* Reading, conferences, and laboratory work.
(2–6–8) *Mr. Daugherty*

Biology 560. *Medical Entomology.* Classification, taxonomy, identification, life cycles, and control of arthropod parasites, disease vectors, and poisonous species. For students specializing in parasitology.
(2–6–8) *Mr. Chandler*

Biology 570. *Helminthology.* Classification, taxonomy, identification, and life cycles of parasitic worms, and a study of economic importance, treatment, and control of helminthic diseases of man and animals. For students specializing in parasitology.
(2–6–8) *Mr. Chandler*

Biology 580. *Protozoology.* Classification, taxonomy, identification, life cycles, and technical methods in the study of Protozoa, with special reference to parasitic forms. For students specializing in parasitology.
(2–6–8) *Mr. Chandler*

Biology 590. *Research in Genetics.*
Mr. Altenburg

Biology 591. *Research in Embryology.*
Mr. Davies

Biology 592. *Research in Histology.*
Mr. Davies

Biology 593. *Research in Physiology.*
Mr. Daugherty

Biology 594. *Research in Radiobiology.*
Mr. Talmage

Biology 595. *Research in Endocrinology.*
Mr. Talmage

Biology 596. *Research in Parasitology or Microbiology.*
Mr. Chandler

Biology 597. *Research in Medical Entomology.*
Mr. Chandler

Biology 599. *Biology Seminar.* The staff and graduate students meet once a week, for papers and discussions on special topics or on current research. Each candidate for an advanced degree will be expected to attend and to give one or two papers a year.
(1–0–2)

Biology 700. *Summer Graduate Research.* Open only to students already admitted as candidates for an advanced degree. At least forty hours of laboratory work per week.

Business Administration, Economics, and Sociology

Business Administration 200. *Elementary Accounting.* Fundamental concepts and procedures of the financial record-keeping and financial reporting systems of the modern economy. An initial purpose of the course is that of building a sound philosophy in accordance with which to develop the principles of modern accounting. The course then follows the generally accepted theory that the study of accounting principles and methods furnishes the most satisfactory approach to an understanding of the mechanics of the modern business world. While the course is basically accounting, the organization and procedures of business are emphasized throughout.
(3–0–6) *Messrs. Mackey and Simons*

Business Administration 320. *Accounting Survey.* A one-semester course planned along the same lines as Business Administration 200, condensed and modified to meet the needs of the engineering student who can give but one semester to the subject. Given in both fall and spring semesters. Not open to academic students.
(3–0–3) *Mr. Mackey*

Business Administration 390a. *Intermediate Accounting.* Further development of accounting as a tool of the business executive. Construction of financial and operating statements; interpretation of financial and operating statements; corporations; valuation of assets and liabilities; funds and reserves; application of funds. While the course is basically accounting, the organization and procedures of the modern business world are emphasized throughout. Prerequisite: Business Administration 200.
(3–0–3) *Mr. Simons*

Business Administration 395b. *Cost Accounting.* The methods of accounting for the various elements of manufacturing costs

are treated with special emphasis on the use of cost information in administration and control. Job order, process, and standard cost procedures. Prerequisite: Business Administration 200 or approval of the instructor.
(3–0–3) *Mr. Mackey*

Business Administration 410. *Income Tax Accounting.* A study of the Federal income tax laws as they apply to the various types of business units. A course designed primarily for Seniors who are desirous of taking the examination for the C.P.A. certificate. Prerequisite: registration in Business Administration 420a and 425b.
(2–0–4) *Mr. Reader*

Business Administration 420a. *Auditing.* Financial examination theory and procedure as practiced by the independent certified public accountant; internal control; working papers and reports. Largely based on integrated case study. Prerequisite: Business Administration 390a.
(3–0–3) *Mr. Mackey*

Business Administration 425b. *Advanced Accounting.* Partnerships; consignment, installment, and branch sales; insurance; actuarial science; statement of affairs; receiverships; parent and subsidiary accounting; consolidations, mergers, and financing; foreign exchange; estates and trusts; budgets. Prerequisite: Business Administration 390a.
(3–0–3) *Mr. Simons*

Business Administration 460b. *Industrial Management.* Industrial organization; financial structure of enterprise; internal organization of manufacturing plants; production planning and control; introduction to personnel management and employee relations; labor legislation; wage and salary administration. Prerequisites: Business Administration 200, Economics 200, and approval of the instructor.
(3–0–3) *Mr. J. Hodges*

Economics 100. *Introduction to Business and Economics.* A survey course designed to introduce the student to the social setting and the economic bases of modern industry. Planned for students of physical education.
(3–0–6) *Mr. Young*

Economics 200. *Elements of Economics.* Introduction to economic theory and an analysis of the operation and problems of our modern economic system.
(3–0–6) *Mr. Giles*

Economics 300. *Money and Banking.* The functions of money in a modern economy; the monetary system of the United States and its history; commercial banking; the Federal Reserve System; the mechanism of international payments; recent developments in monetary theory and their relation to the problem of business prosperity. A one-semester course. Prerequisite: Economics 200 or 360.
(3–0–3)

Economics 310. *Public Finance and Taxation.* The principles and history of government finance; government revenues and expenditures; general theories of taxation; shifting and incidence of taxes; the American tax system; government enterprises; governmental borrowing and indebtedness; debt management; fiscal policy and the maintenance of full employment; fiscal policy and its relation to inflation. A one-semester course. Prerequisite: Economics 200 or 360.
(3–0–3)

Economics 330. *Comparative Economic Systems.* An examination of the social and economic organizations of representative types: capitalist, socialist, utopian, fascist, and communist; the history of such economies and the economic theory upon which they are based; social and economic consequences of the various systems. A one-semester course.
(3–0–3) *Mr. Cookenboo*

Economics 350. *Elements of Statistical Method.* Collection, classification, and presentation of data; use of graphic methods; analysis of frequency distributions; introduction to the theory of sampling and statistical inference; analysis of time series; index numbers; correlation; industrial applications of statistical principles; use of statistics in the control of business enterprise. A one-semester course.
(3–2–3) *Mr. J. Hodges*

Economics 355. *Business Finance.* Instruments of finance; the financial structure of corporations; financial policies; investment banking and the regulation of investment credit; organization and functions of the stock exchange. A one-semester course. Prerequisite: Economics 200 or 360.
(3–0–3) *Mr. J. Hodges*

Economics 360. *Engineering Economics.* Introduction to economic theory and an analysis of the operation and problems of our modern economic system; business organization and finance; labor and industrial relations; money, banking, and the Federal Reserve System; national income and its fluctuations; behavior of costs and prices.
(3–0–6) *Mr. J. Hodges*

Economics 370a. *Economic Analysis.* A rigorous analysis and appraisal of the theory of the market and price mechanism; marginal analysis; equilibrium concepts; comparison of the dynamic with the static type of economic analysis; monopolistic competition; national income approach to economics. Prerequisite: Economics 200 or 360.
(3–0–3) *Mr. Giles*

Economics 370b. *Business Fluctuations and Public Policy.* A survey of major theories of business cycles; business barometers and forecasting; the theory of secular stagnation; a critical evaluation of governmental policies for "full" employment. Prerequisite: Economics 370a or approval of the instructor.
(3–0–3) *Mr. Giles*

Economics 410a. *Labor Economics.* A survey of the history and current status of the labor movment in the United States; organization and structure of labor unions; wage theory. Prerequisite: Economics 200 or 360.
(3–0–3)

Economics 410b. *Labor Relations and Public Policy.* Trends in labor legislation; collective bargaining and the settlement of labor disputes; social insurance; current labor problems. Prerequisite: Economics 200 or 360.
(3–0–3)

Economics 420. *International Trade and Finance.* The theory of international specialization and exchange; the gains from trade; economic development and international trade; national income and the balance of payments; commercial policy; the role of the state in international monetary relations; international finance and capital movements; the problem of industrializing underdeveloped areas; intergovernmental coöperation to promote world trade. Prerequisites: Economics 200 or 360, and 300.
(3–0–6)

Economics 430a. *Structure of the American Economy.* A survey of the industrial organization of the economy including a study of monopoly, oligopoly, monopolistic competition, and pure competition; an evaluation of the economic and social consequences of monopoly and competition.
(3–0–3) *Mr. Cookenboo*

Economics 430b. *Government and Business.* A study of government regulation of business in the United States since the Civil War with special reference to government regulation of manufacturing industry; an investigation of the history and possible future course and consequences of actions under the Sherman, Robinson-Patman, Clayton, Federal Trade Commission, and allied statutes with reference to the common law origins of monopoly regulation; an examination of government regulation of business in other economies, especially the British Socialist, the Soviet Communist,

and the German Nazi systems. Prerequisite: Economics 430a.
(3–0–3) *Mr. Cookenboo*

Economics 470. *Transportation and Public Utility Economics.* A study of the economic factors influencing the development of the transportation system for the national economy and the world economy; the impact of transportation upon industrial location and development; analysis of the economic and legal peculiarities of public utilities and other industries with similar characteristics; the evolution of social control of utilities; public and private ownership of utilities. A one-semester course. Prerequisite: Economics 200 or 360.
(3–0–3) *Mr. Giles*

Sociology 200. *An Introduction to Sociology.* The course includes an analysis of the geographical and biological factors in social evolution, social psychology, and a study of the functions of citizenship. The subject matter involves a rapid survey of modern social problems and their relation to a changing technological and institutional framework.
(3–0–6) *Mr. Giles*

Sociology 400. *Seminar.* The development of modern social patterns of thought, and their effects in economics and politics and upon theology and ethics. A seminar for students qualified by study of biology, economics, and history. Prerequisite: approval of the instructor.
(3–0–6) *Mr. Slaughter*

Chemistry

Chemistry 100. *Introductory Chemistry.* Laboratory fortnightly. A course in general chemistry planned for the needs of architects, students of physical education, and academic students who expect to take no more than one or two courses in chemistry. It satisfies the preparatory requirements for Chemistry 200.
(3–2–7) *Mr. Nicholas*

Chemistry 120. *General Inorganic Chemistry and Qualitative*

Analysis. A general introductory course dealing with the fundamental phenomena and principles of the science. During the first half-year the laboratory exercises are arranged to verify and illustrate the principles and facts which are discussed in the lectures. During the last half-year the laboratory work deals with the general principles and methods of qualitative analysis. This course is required of science-engineering students, and is also open to academic students who may wish to proceed beyond the Sophomore year in chemistry. Chemistry 120 is one of the prerequisites for Chemistry 220.
(3–4–8) *Messrs. Nicholas and Waser*

Chemistry 200. *Introductory Physical and Physiological Chemistry.* This course is open to academic students who wish to elect a second course in chemistry, and to premedical students desiring another chemistry course in addition to those specifically recommended. The lectures and laboratory work of the first half-year deal with the physical properties of gases, liquids, and solids; solutions; etc. The lectures and laboratory work of the second half-year are devoted to a study of the physiological processes of the animal body, such as digestion, metabolism, and nutrition, and to blood and urine chemistry. Prerequisite: Chemistry 100 or 120.
(3–3–8) *Mr. Nicholas*

Chemistry 220. *Quantitative Analysis.* The course aims to familiarize the student with the fundamental principles of analytical chemistry and, by laboratory and problem work, with the application of these principles to a variety of representative analytical processes. Special emphasis is placed on chemical mathematics and stoichiometry, and throughout the work attention is given to general analytical technique. Prerequisites: Chemistry 120 and Physics 100.
(3–4–8) *Mr. Smith*

Chemistry 230. *Analytical Chemistry.* A laboratory course required of and open only to Junior chemistry majors. This course is designed to supplement and extend the previous work in analytical chemistry in order to meet certain professional requirements.

During the first semester six hours of laboratory work each week will be devoted to quantitative analysis. The second semester will require one three-hour laboratory period weekly directed to the study of qualitative analysis.

(0–4½–3) *Mr. Smith (first semester) and Mr. Nicholas (second semester)*

Chemistry 300A. *Organic Chemistry.* The course is designed to give a thorough survey of aliphatic and aromatic chemistry with an introduction to the heterocyclic compounds, and to present the theories relating to their structure and reactions. Prerequisite: Chemistry 220.

(3–4–8) *Mr. Richter*

Chemistry 300B. *Organic Chemistry.* A course arranged primarily for premedical students and academic students not specializing in chemistry. This course differs from Chemistry 300A only in the type of laboratory preparations. The laboratory work is devoted chiefly to the synthesis of typical examples of general and local anesthetics, disinfectants, analgesics, biological preparations, alkaloids, and dyes. Prerequisite: Chemistry 220 or special permission from the department of chemistry.

(3–4–8) *Mr. Richter*

Chemistry 310. *Physical Chemistry.* A quantitative study of theoretical and physical chemistry dealing with the forms of matter, changes of state and energy, kinetics, equilibria, electrochemistry, photochemistry, and atomic structure. Prerequisites: Chemistry 220 and Physics 200.

(3–4–8) *Mr. Garrison*

Chemistry 400a. *Advanced Organic Chemistry.* A course in the newer methods of organic synthesis.

(3–0–3)

Chemistry 410a. *Colloid Chemistry.* An introductory course dealing with the theories of colloid chemistry and their applications. Prerequisites: Chemistry 300 and 310.

(3–4–4) *Mr. Milligan*

Chemistry 420b. *Advanced Physical Chemistry.* Statistical and kinetic theory. Properties of gases, liquids, and solids. Structure of matter. Experimental methods of physical chemistry.
(3–0–3) *Mr. Milligan*

Chemistry 430a. *Special Topics in Physical Chemistry.* The course is designed to give a more thorough treatment to selected phases of the subjects introduced in Chemistry 310.
(3–0–3) *Mr. Smith*

Chemistry 440b. *Advanced Organic Chemistry and Qualitative Analysis.* This course embodies a systematic procedure for the separation and identification of pure organic compounds. It aims to review, by actual laboratory contact, many important reactions of the main series of organic substances. (Owing to limitations of space, enrollment will be limited to thirty-five students.)
(2–6–4) *Mr. Lewis*

Chemistry 450a. *Thermodynamics.* Relation of heat and work to chemical and physical systems. A consideration of free energy, entropy, and fugacity as applied to equilibria. Especial attention to the treatment of solutions.
(3–0–3) *Mr. Kilpatrick*

Chemistry 460b. *Inorganic Chemistry.* A study of selected topics in inorganic chemistry presented from the physical chemical viewpoint.
(3–0–3) *Mr. Smith*

Chemistry 470. *Experimental Problems.* Students who are specializing in chemistry may elect in their Senior year at least nine hours weekly during the first or second half-year, or both, in experimental problems under the direction of some member of the staff of instruction.

Chemistry 480a. *Chemistry of Natural Products.* A study of important types of natural products of current interest to biology and chemistry.
(3–0–3) *Mr. Turner*

Graduate Courses in Chemistry

Courses numbered 500 and 600 are open only to students of graduate standing. Senior courses in chemistry and chemical engineering (courses numbered 400) may be taken by graduate students with the approval of the department.

Chemistry 500. *M.A. Thesis.* Graduate students who are working toward the M.A. degree in chemistry are expected to elect at least nine hours a week in research under the direction of some member of the staff of instruction.

Chemistry 510. *Chemistry of the Steroids.* A theoretical consideration of the reactions and stereochemistry of the steroids, including a discussion of the physiological importance of these compounds.
(3–0–6) *Mr. Turner*

Chemistry 520b. *Theory of Adsorption of Gases.* An advanced treatment of modern theories of adsorption of gases on solids.
(3–0–3) *Mr. Milligan*

Chemistry 530b. *Heterogeneous Equilibrium.* A study of the problems of heterogeneous equilibrium from the standpoint of the phase rule.
(2–0–2) *Mr. Smith*

Chemistry 540a. *Advanced Organic Chemistry.* A consideration of some of the theoretical aspects of organic chemistry with particular reference to such topics as geometrical and optical isomerism.
(2–0–2) *Mr. Richter*

Chemistry 545. *Physical-organic Chemistry.* A study of the structure of organic compounds and the mechanism of organic reactions, including the application of the methods of physical chemistry to these problems.
(3–0–6) *Mr. Lewis*

Chemistry 550a. *Reaction Kinetics.* A consideration of the rates of reactions with emphasis on the homogeneous kinetics as a tool in the study of reaction mechanisms.
(3–0–3) *Mr. Lewis*

Chemistry 560b. *Electrochemistry.* The application of thermodynamics to the study of electrolytic cells. Prerequisite: Chemistry 450a.
(3–0–3) *Mr. Kilpatrick*

Chemistry 570b. *Advanced Organic Chemistry.* Selected topics in organic chemistry with special emphasis on the relation of structure to ultraviolet and infrared absorption spectra.
(3–0–3) *Mr. Ettlinger*

Chemistry 600. *Ph.D. Thesis.* Graduate students who are working toward the Ph.D. degree in chemistry are expected to elect at least twelve hours a week in research under the direction of some member of the staff of instruction.

Chemistry 610. *Applications of X-ray Diffraction Methods.* Application of X-ray diffraction methods to inorganic and physical chemistry. Identification of solid phases, determination of crystal size, X-ray analysis of simple types of structures. Electron diffraction. Principles and operation of modern X-ray apparatus. This course alternates with Chemistry 660.
(3–0–6) *Mr. Milligan*

Chemistry 620. *Molecular Structure Determination.* Theory and practice of various physical methods of molecular structure determination. Theory of the chemical bond.
(3–0–6) *Mr. Waser*

Chemistry 630b. *Statistical Thermodynamics.* A development of the principles of thermodynamics from the standpoint of statistical mechanics. The relation of the structure of molecules to their thermodynamic properties. Prerequisites: Chemistry 450a and Mathematics 300 or 310.
(3–0–3) *Mr. Kilpatrick*

Chemistry 640. *Heterocyclic Chemistry.* A consideration of the chemistry of heterocyclic systems.
(2–0–4) *Mr. Richter*

Chemistry 650. *Quantum Mechanics.* A study of simple mechanical systems from the point of view of wave mechanics. The application of these concepts to the chemical bond. The energy states of polyatomic molecules. Prerequisite: Mathematics 300 or the equivalent.
(3–0–6) *Mr. Kilpatrick*

Chemistry 660. *X-ray Crystal Structure Analysis.* Crystals, X-rays, and their interaction. Experimental methods. Symmetry and space groups. Fourier methods. Dynamic theory of X-ray diffraction. This course alternates with Chemistry 610.
(3–0–6) *Mr. Waser*

Chemistry 700. *Summer Graduate Research.* Open only to students already admitted as candidates for an advanced degree. At least forty hours of laboratory work per week.

In addition to the general requirements for advanced degrees given on pages 74–75 and 77–78, the following specific requirements must be met by candidates taking their major work in chemistry:

(1) For admission to graduate standing, candidates for advanced degrees must possess a reading knowledge of scientific German; and must have completed general courses equivalent to Chemistry 120, 220, 300A, and 310 of the Rice Institute, and at least one full-year course of more advanced work equivalent to the corresponding 400 courses in chemistry of the Rice Institute.

(2) For admission to graduate standing in chemistry, preference will be given to applicants who earn high scores on the Graduate Record Examination, including the advanced test in chemistry. (See page 41.) A new graduate student who has not taken the Graduate Record Examination may be required to do so at the earliest examination time during his first semester of residence.

(3) A candidate for the degree of Master of Arts is required to

complete, in addition to a thesis, three approved full-year courses; and, also, he must pass a final public oral examination.

(4) During the first two weeks of each academic year, comprehensive written examinations in physical, inorganic, and organic chemistry will be given to all graduate students beginning their second year of work. The results of these examinations will determine whether the student will be permitted to continue in graduate work beyond the master's degree.

(5) A candidate for the degree of Doctor of Philosophy must have met the course requirements for the master's degree in chemistry; in addition he must complete three advanced full-year courses approved by the department, together with the doctoral thesis. He must satisfy the Institute language requirements (see page 78) by demonstrating a reading knowledge of scientific French and scientific German. Also, he must pass a final public oral examination.

Graduate assistants and fellows who devote as much as six hours per week to teaching will, in general, be expected to spend two years in residence for the master's degree and four years in residence for the doctor's degree.

Economics: *see* Business Administration, Economics, and Sociology

Education

Education 310. *The History of Education.* First semester: a survey of educational thought and practice from ancient to modern times. Second semester: a continuation of the history of modern education. Recommended: Philosophy 300 or one course in history.

(3–0–6) *Messrs. Black and Young*

Education 410. *Basic Principles of Secondary Education.* First semester: an examination of the theory, philosophy, principles, methods, and practice in American education since 1900. Second semester: a more intensive examination of the principles of secondary education, including the organization and administration

of schools, methods of instruction, curriculum, and educational psychology. Recommended: Psychology 210 or 300, or Philosophy 300.

(3–0–6) *Messrs. Black and Young*

The State of Texas will grant the following teachers' certificates:

1. ELEMENTARY FOUR-YEAR or HIGH SCHOOL TWO-YEAR CERTIFICATE requires

   30 hours of college credit, including
   6 hours in education,
   6 hours in English, and
   A course in Texas and Federal Constitutions.[1]

2. ELEMENTARY SIX-YEAR CERTIFICATE requires

   60 hours of college credit, including
   12 hours in education,
   6 hours in English, and
   A course in Texas and Federal Constitutions.[1]

3. HIGH SCHOOL FOUR-YEAR CERTIFICATE requires

   60 hours of college credit, including
   12 hours in education, 6 of which are secondary,
   6 hours in English, and
   A course in Texas and Federal Constitutions.[1]

4. HIGH SCHOOL SIX-YEAR CERTIFICATE requires

   90 hours of college credit, including
   18 hours in education, 6 of which are secondary,
   6 hours in English, and
   A course in Texas and Federal Constitutions.[1]

5. PERMANENT HIGH SCHOOL CERTIFICATE requires *either*

   (A) 120 hours of college credit (a standard degree), including
   24 hours in education, 8 of which are secondary,

[1] Students planning to teach should take Education 310 and 410 and also Political Science 210, which fulfills the requirement for a course in Texas and Federal Constitutions.

6 hours in English,
Practice teaching, and
A course in Texas and Federal Constitutions;[1] *or*

(B) A minimum of three sessions (aggregating 27 months) of teaching experience subsequent to conferring of degree, provided the record shows
12 hours in education, 6 of which are secondary,
6 hours in English, and
A course in Texas and Federal Constitutions.[1]

6. PERMANENT ELEMENTARY CERTIFICATE requires *either*

(A) Completion of the prescribed schedule of studies in a Texas State Teachers College; *or*

(B) A minimum of five sessions (of at least 6 months each) of teaching in the elementary grades during the validity of an elementary six-year certificate.

Students desiring to teach in the Houston Independent School District and other large school systems are required to take a course in practice teaching.

Secondary school teachers are required to teach only in their major or minor field of preparation. Consequently, Rice students desiring to teach should carefully plan their course of study, consulting the department offering the work of their primary interest.

By September 1, 1954, regular classroom teachers in accredited elementary schools who will have had fewer than eight years of teaching experience at the elementary level, and who do not have a major in elementary education from an approved teacher education institution, must have earned at least 24 hours of professional elementary education.

After September 1, 1954, all persons beginning to teach the elementary grades in accredited school systems for the first time must have a major in elementary education from an approved teacher education institution. The major may be at the bachelor's or master's level and must include the required 12 semester hours of professional elementary education, but otherwise is to be de-

[1] Students planning to teach should take Education 310 and 410 and also Political Science 210, which fulfills the requirement for a course in Texas and Federal Constitutions.

termined by the college or university which awards the degree in which the elementary education major is completed.

All Texas teacher certificates and certificates of approval are issued by the Certification Section of the Division of Professional Standards, Texas Education Agency. Applicants for certificates are required to submit:

1. An application form obtainable from the Agency, or from the Registrar of any Texas college or university.
2. A transcript of the applicant's college credits and any other records necessary to show that all qualifications have been met.
3. A certification fee of $1.00 in the form of a postal money order payable to the Texas Education Agency.[1]

English

English 100. *English Composition; Study of Fundamental Literary Forms.* The primary purpose of the course is to give students the command of written English which is necessary for later work in college. A secondary but still important purpose is to examine the chief types of prose and poetry, as a foundation for further courses in literature or for private reading. Required of Freshmen.
(3–0–6) *Messrs. Camden, Dowden, Gallegly, Parish, Whiting, Williams, and others*

English 200. *Outlines of the History of English Literature.* Collateral reading of major authors representative of the various periods.
(3–0–6) *Messrs. Camden, Williams, and others*

English 210. *Argumentation and Public Speaking.* Practical training in the fundamentals of effective speech, written argument, and debate. Designed to prepare the student for the ordinary demands of business life. Platform speaking, themes, conferences. This course is planned for students of physical education.
(3–0–6) *Mr. Gallegly*

[1] A $2.00 fee is charged when *any part* of the credentials for such certificate is earned in out-of-state institutions.

English 220. *Composition and Expression.* Primarily for science-engineering students. Letters, reports, and argumentation. Study and discussion of selected prose readings.
(3–0–6) *Messrs. Gallegly, Thomas, and others*

English 230. *Selected Great Books of European Literature.* Readings, lectures, discussions, and reports.
(3–0–6) *Mr. McKillop*

English 300. *English Drama from Its Beginnings to 1642.* The development of the drama will be traced from the miracle plays and the moralities through the plays of Shakespeare and his contemporaries to the closing of the theaters. Some emphasis will be placed upon the development of Shakespeare as a dramatist, and upon the indebtedness of Shakespeare to the earlier drama.
(3–0–6) *Mr. Camden*

English 310. *Modern British and American Poetry.* A survey of poetic development in Great Britain and America from 1890 to date: the revolt of the 1890's, the Irish Renaissance, the Georgians, the poetry of the two World Wars, the "new" American poetry.
(3–0–6) *Mr. Williams*

English 320. *Modern Drama.* Special study of Ibsen, Strindberg, Shaw, Barrie, Galsworthy, O'Neill, and Anderson; reading of representative recent English, American, and Continental plays; lectures upon theatrical history, acting, and dramatic tendencies.
(3–0–6) *Mr. Whiting*

English 330. *Advanced Writing.* The writing of essays, stories, plays, and novels. Time is given also to problems of marketing manuscripts. Stories will be read and analyzed, and critical theories discussed. Frequent conferences. Open to Juniors and Seniors, and to Sophomores upon recommendation of an instructor.
(3–0–6) *Mr. Williams*

English 340. *The English Novel.* Major novelists of the eighteenth, nineteenth, and early twentieth centuries.
(3–0–6) *Mr. McKillop*

English 350. *Poetry and Prose of the Romantic Period.* Study of the poetry from Blake to Keats; reading of selected prose from Lamb to Carlyle.
(3–0–6) *Mr. Dowden*

English 360. *English Drama from 1660 to 1900.* This course begins with the opening of the theaters after the Puritan Revolution and covers the drama of the Restoration, the eighteenth century, and the nineteenth century.
(3–0–6) *Mr. Camden*

English 370. *Milton and His Contemporaries.* Special study of Milton and some of the minor writers of the seventeenth century, including Donne, Herbert, Cowley, Bunyan, Pepys, and Dryden.
(3–0–6) *Mr. Whiting*

English 390. *Major American Writers.* A number of American books of the nineteenth and twentieth centuries are studied in relation to the background of American thought. The novel is the form to which most attention is given, and the primary emphasis is placed on literary qualities.
(3–0–6) *Mr. Dix*

English 400. *Shakespeare.* A close study of certain of the comedies, histories, and tragedies, with lectures on the interpretation of these plays in the light of the Elizabethan mind. Open only to Seniors.
(3–0–6) *Mr. Camden*

English 420. *Victorian Literature.* Poetry, nonfictional prose, precursors of modern drama.
(3–0–6) *Mr. Whiting*

English 430. *Eighteenth Century Prose and Poetry.*
(3–0–6) *Mr. McKillop*

English 500. *Chaucer.* Extensive reading in the *Canterbury Tales* and *Troilus and Criseyde.*
(3–0–6)

English 510. *Old English: "Beowulf."*
(3–0–6)

English 530a. *Bibliography and Methodology.* This course is designed to acquaint students with the bibliographical guides and aids to literary research. Attention will also be given to methods of preparing papers, theses, and dissertations.
(3–0–3) *Mr. Dowden*

English 530b. *Literary Criticism.* A study of the principles of classical, romantic, and realistic literature as formulated by the major critics from Plato to the present day.
(3–0–3) *Mr. Dowden*

English 540. *Topics in English Literary History.* Graduate research.

Requirements for a major in English: four courses in English; one course in a modern language, preferably French, German, or Italian; two other approved collateral courses, usually in philosophy or history (one course in education may be counted); all to be Junior or Senior courses.

French: *see* **Romance Languages**

German

German 100. *Elementary German.* Pronunciation, grammar, dictation, conversation, composition. Extensive reading.
(3–0–6) *Staff*

German 200. *Intermediate German.* Reading of several works of literary excellence. Outside reading.
(3–0–6) *Staff*

German 210. *Scientific German.* (The work of the first semester is identical with that in German 200.)
(3–0–6) *Staff*

German 300. *Classical Literature.* Chiefly Lessing, Goethe, and Schiller. Given in alternate years.
(3–0–6) *Mr. Louis*

German 310. *Nineteenth Century Literature.* Given in alternate years.
(3–0–6) *Mr. MacLean*

German 320. *Writing and Speaking.*
(3–0–6) *Staff*

German 410. *Special Topics.* Registration by permission of the instructor. Given in alternate years.
(3–0–6) *Mr. Lyle*

German 420. *Goethe.* Including the study of *Faust.* Given in alternate years.
(3–0–6) *Mr. Lyle*

German 440. *German Literature from Luther to Klopstock.* Given in alternate years.
(3–0–6) *Mr. MacLean*

German 500. *Middle High German.*
(3–0–6) *Mr. Louis*

German 550. *Topics in German Literary History.* Graduate research and thesis.
Staff

History and Political Science

History 100. *Foundations of Western Civilization.* This course is intended to provide an historical background for the various humanistic branches of study. It includes a survey of human achievement from prehistoric times through antiquity and the Middle Ages to the eighteenth century. The main emphasis is placed upon those formative influences which constitute the basis of the modern

world structure. Much attention is given to historical geography.
(3–0–6) *Mrs. Drew*

History 110. *American History.* A survey of the growth of the American nation, with considerable attention to its European background. It stresses such major developments as the establishment of the Federal republic, westward expansion and the dominance of frontier attitudes, the growth of democracy, the triumph of nationalism over sectionalism, the transition from agrarianism to industrialism, the emergence of America as a world power, and the present involvement in Europe and Asia. Much attention is given to historical geography. Recommended as fulfilling the requirements of prelegal and premedical students and constituting a basic course in history for Freshmen.
(3–0–6) *Mr. Masterson and others*

History 300. *Cultural History of the United States.* This course deals with the primary trends in the social and intellectual life of the American people from colonial times to the present, and seeks to interpret them as expressions of the American national spirit. Prerequisite: History 110.
(3–0–6) *Mr. Lear*

History 310. *The Early National Period.* A study of the society and thought of America from the late colonial period to 1850. The chronological limitation is intended to permit a close study of the personalities and characteristics of the nation in its formative years. Prerequisite: History 110.
(3–0–6) *Mr. Masterson*

History 320. *Trends in European Culture during Antiquity and the Middle Ages.* This course traces selected aspects of European thought from Periclean Athens to the later Middle Ages, with special reference to Greco-Roman influences. Hellenistic, Byzantine, and Mohammedan contributions to the Latin West are considered. Religious, philosophical, and scientific implications are examined in some detail. Prerequisite: History 100.
(3–0–6) *Mr. Lear*

History 330. *The Making of Modern Europe.* A survey of European culture and politics from the decline of feudalism and the rise of the national monarchies to the French Revolution (1200–1789). The purpose of this course is to trace the development of those institutions in Western Europe which have been important in the modern period. The course treats of the revival of commerce and the development of capitalism, the growth of the national monarchies, the disappearance of the medieval ideal of universitality with its conception of the union of the secular and spiritual arms of government, the revival of Roman law and the expansion of the power of the state, the Renaissance and Reformation, and the first signs of social revolt.
(3–0–6) *Mrs. Drew*

History 350. *Europe Since 1789.* This course emphasizes the revolutions against autocracy, the spread of democracy, the completion of nationalism, and the development of imperialism. Much attention is given to the antecedents of the world wars and revolutions of the present century, the history of this period, and the current situation in Europe.
(3–0–6) *Mr. Craig*

History 360. *British History.* A survey tracing the development of the British people, with special emphasis on the period from the beginning of the sixteenth century to the present. Imperial expansion and the evolution of those social, economic, and political forms and concepts which have basically influenced Western civilization are considered in detail. This course is recommended to students preparing for the study of law.
(3–0–6) *Mr. Craig*

History 365. *History of the British Commonwealth Nations.* The history of Canada, Australia, New Zealand, South Africa, and India is presented in this course, with special emphasis given to the study of comparative frontiers. The relations of the dependencies to the mother country and the development of the British Commonwealth of Nations structure are also carefully studied.

The course deals with areas which are destined to play enormous roles in the future.
(3–0–6) *Mr. E. Phillips*

History 370. *Naval and Military History.* The course includes a survey, from ancient times, of war as an instrument of national policy. Attention is given to the causes of wars, the principles of strategy and tactics, the personalities of great commanders, and Admiral Mahan's doctrine of the influence of sea power upon history.
(3–0–6) *Mr. Craig*

History 380. *Economic History of the United States.* This course studies the historical development of America's industrial economy from its earlier colonial, agricultural stage. Primary emphasis is given to the influence of noneconomic factors on economic problems and to the influence of economic factors on American history. The second semester is devoted to historical study of the economic problems of the twentieth century in America. Prerequisite: History 110.
(3–0–6) *Mr. E. Phillips*

History 390. *History of the American West.* This course traces the Westward Movement from its beginnings on the east coast to its culmination on the Pacific coast. Most attention is given to the history, romance, and problems of the Trans-Mississippi West, with special emphasis on Texas and the Great Plains.
(3–0–6) *Mr. E. Phillips*

History 395. *A History of the South.* A study of the life and economy of the Southern people from the colonial period. Attention is given to such topics as the frontier, the plantation, slavery, sectionalism, and agrarian, social, and industrial problems. Primary emphasis is placed on the institutions and history of the ante-bellum period. Prerequisite: History 110.
(3–0–6) *Mr. Masterson*

History 420. *Medieval Sources.* Survey and translation of typical medieval Latin sources. The selections are studied from the

point of view of historical significance and of literary appreciation. Attention is given also to the role of the Latin language in the Middle Ages, the preservation of letters in manuscripts and libraries, and the evolution of the medieval scripts. This course is intended for students of history and the modern languages who desire some familiarity with ordinary medieval Latin texts. Prerequisite: three or four years of high school Latin.
(3–0–6) *Mr. Lear*

History 430. *Topics in Classical and Medieval Letters.* This course deals with selective phases of classical and medieval literature, including satire, chronicles and histories, the romances and epic cycles, and lyric poetry. The literary sources are interpreted as historical documents. Also, intensive reading and reports on special topics in medieval literature and intellectual history. Open only to advanced students after consultation with the instructor.
(3–0–6) *Mr. Lear*

History 450. *Contemporary History.* A survey of current world affairs, with lectures and readings on the background of present-day policies and events.
(3–0–6) *Mr. Craig*

History 480. *American Politics.* An advanced survey of American political history. This course examines the patterns of American political expression from the colonial period to the 1930's. Emphasis placed on the relationship of politics to economic and social events. Prerequisite: History 110.
(3–0–6) *Mr. Masterson*

History 500. *Topics in American History.* Graduate research. Master's thesis.
(3–0–6)

History 510. *Topics in Medieval History.* Graduate research. Master's thesis.
(3–0–6)

History 520. *Topics in Renaissance History.* Graduate research. Master's thesis.
(3–0–6)

History 530. *Topics in Modern History.* Graduate research. Master's thesis.
(3–0–6)

History 540. *Topics in American Constitutional and Political History.* Research in the fields of American political history and constitutional development. Open to properly qualified students after consultation with the instructor.
(3–0–6) *Mr. Masterson*

History 550. *Great Britain in the Napoleonic Era.* A study of the internal politics, foreign policy, and war effort of Great Britain during the Napoleonic wars, including the peace settlement of Vienna. Open to properly qualified students after consultation with the instructor.
(3–0–6) *Mr. Craig*

History 570. *The First World War.* A study of the causes of World War I, the course of the war itself, and the peace settlement of Versailles. Open to properly qualified students after consultation with the instructor.
(3–0–6) *Mr. Craig*

History 590. *Seminar in Western American History.* This course includes a study of the leading authorities in Western American history, training in the critical examination of source material, and original research in selected topics of Western history. Open to graduate students, and to Seniors who show a proficiency in history, after consultation with the instructor.
(3–0–6) *Mr. E. Phillips*

Requirements for a major in history: History 100 and History 110; four advanced courses in history or political science in the

Junior and Senior years; two approved collateral courses in the Junior and Senior years.

Political Science 210. *American Government.* A study of the history and operation of constitutional government in the United States with special emphasis on the historical background of the Federal government, the structure of the government, the formation of public policy, and the conduct of public business. For additional background and for contrast, reference is made to English constitutional history and to the present structure of the English government. This year course in American government, planned for the general student of government, is also designed to enable prospective lawyers, physicians, and teachers to meet the state requirement of a course in "Constitutions."
(3–0–6) *Mr. Hudspeth and others*

Political Science 310. *Law and Society.* The study of law as a part of cultural anthropology and the history of organized society. Emphasis is placed upon the sources of legal doctrine, specifically illustrated by case law and legislation in the field of contracts, torts, commercial transactions, and domestic relations.
(3–0–6) *Messrs. Hudspeth and Perry*

Political Science 340. *Foundations of National Power.* A study of the basic factors in political geography and international politics, stressing such elements of national power as geographical location, population, resources, technology, ideology, military strategy, and geopolitical theory.
(3–0–6) *Mr. Lear*

Political Science 410. *Ancient and Medieval Political Theory.* A survey of the main trends in politics and law from antiquity into the later Middle Ages, with special emphasis upon such important conceptions as god-kingship, legalized absolutism, the organic state, natural law, personality of law, custom and feudal contract, majesty and sovereignty, allegiance, and constitutionalism. Open

only to advanced students after consultation with the instructor.
(3–0–6) *Mr. Lear*

Political Science 520. *Topics in Legal History and Political Theory.* Much attention is given to methods, materials, and the recent literature in this field. Instruction is based on the translation of several primary sources in Roman and Germanic law, as well as reports on such topics as sovereignty and allegiance. Open to properly qualified students after consultation with the instructor.
(3–0–6) *Mr. Lear*

Italian: *see* **Romance Languages**

Mathematics

Mathematics 100. *Elementary Analysis.* Trigonometry, analytic geometry, and elementary calculus. This course is required for Freshmen because it forms a necessary introduction to work in mathematics and pure and applied science, and assists the students in developing habits of self-criticism in thinking and writing. As one of the most modern of sciences and, at the same time, one of the most ancient of humanities, mathematics is regarded as an integral part of any general education. Science-engineering sections meet four hours per week.
(3–0–6) or (4–0–8) *Staff*

Mathematics 200. *Differential and Integral Calculus.* Derivatives, differentials, definite integrals, infinite series, and their applications, especially to mechanics. This course continues the work of Mathematics 100 in calculus and analytic geometry, with applications to Newton's laws of motion and calculation of moments of forces and of inertia, centers of gravity, etc. Prescribed for all science-engineering majors who do not take Mathematics 210. Students who have considerable facility in mathematical reasoning should register for Mathematics 210.
(3–0–6) *Staff*

Mathematics 210. *Differential and Integral Calculus.* This course covers the ground of Mathematics 200 but is more complete and goes further. It is open to students who obtain high grades in Mathematics 100, or otherwise satisfy the instructor of their fitness to take the course.
(3–0–6) *Staff*

Mathematics 300. *Advanced Calculus and Differential Equations.* Multiple integrals, infinite series, and partial differentiation, with many applications, and the geometry of three dimensions; differential equations. This course, or Mathematics 310, is prescribed for all engineering students. Open also to other students who have passed Mathematics 200 or 210, or otherwise satisfy the instructor of their fitness to take the course.
(3–0–6) *Staff*

Mathematics 310. *Advanced Calculus and Differential Equations.* Students with considerable facility in mathematical reasoning should take this course instead of Mathematics 300, the ground of which it covers. Opportunity to write theses is given.
(3–0–6) *Staff*

Mathematics 320. *Analytical Mechanics.* Vector analysis; reduction of systems of forces and conditions for equilibrium. Dynamics of systems of particles; rigid bodies. Prerequisites: Mathematics 200 and 300. (The latter may be taken concurrently.)
(3–0–6) *Mr. MacLane or Mr. Ulrich*

Mathematics 320a. *Analytical Mechanics.* The first part of Mathematics 320.
(3–0–3) *Mr. MacLane or Mr. Ulrich*

Mathematics 330. *Introduction to Higher Algebra.* Properties of determinants and matrices. Theory of linear dependence. Bilinear and quadratic forms. Polynomials. Invariants. Lambda matrices and applications.
(3–0–6) *Staff*

Mathematics 340. *Differential Geometry.* Theory of curves and

surfaces. Geodesics. Mapping of surfaces. The absolute geometry of a surface.
(3–0–6)

Mathematics 350. *Introduction to the Theory of Numbers.* The fundamental theorem of arithmetic, congruences, quadratic residues, Diophantine equations, quadratic forms, and other topics in the elementary theory of numbers. The second half of the course includes an introduction to the theory of algebraic numbers.
(3–0–6) *Mr. Durst*

Mathematics 400. *Theory of Functions of a Complex Variable.* This course is fundamental in analysis. Besides giving an introduction to basic concepts of analysis, it includes the study of analytic functions of a complex variable, the Cauchy-Riemann equations, Cauchy's Integral Theorem, Taylor's series, calculus of residues, and conformal mapping. Prerequisite: Mathematics 310.
(3–0–6) *Mr. Ulrich*

Mathematics 410. *Differential Equations and Introduction to the Calculus of Variations.* Prerequisite: Mathematics 300.
(3–0–6) *Mr. Agmon, Mr. MacLane, or Mr. Ulrich*

Mathematics 420. *Mechanics.* Topics selected from the following: Dynamics of systems. Principle of d'Alembert. General equations of analytical dynamics. Principles of Hamilton. Hydrostatics. General theorems of perfect fluids. Theory of elasticity, elastic equilibrium, interior motions. Equations of the motion of a viscous fluid.
(3–0–6)

Mathematics 430. *Introduction to Modern Geometry.* Synthetic and algebraic geometry. The group of projective transformations and certain subgroups of the group of projective transformations. The geometries defined by these groups. Projective correspondences. Projective theory of conics.
(3–0–6)

Mathematics 440. *Algebra and Topology.* Groups, rings, fields, vector spaces. Topological spaces, fundamentals of homology theory, homotopy and covering spaces, classification of surfaces. Riemann surfaces.
(3–0–6)

Mathematics 500. *Theory of Functions of a Complex Variable.* Entire and meromorphic functions. Theorems of Hadamard and related theorems. Theorems of Valiron. Distribution of values. Theorem of Denjoy-Carleman-Ahlfors. Theorems of Milloux. Theorems of Nevanlinna. Deficiency relation. Applications to Riemann surfaces.
(3–0–6) *Messrs. Mandelbrojt and Ulrich*

Mathematics 501. *Theory of Functions of a Complex Variable.* A study of special analytic functions of importance in mathematical physics. The course is usually given as a seminar.
(3–0–6) *Mr. Ulrich*

Mathematics 502a. *Topological Groups.*
(3–0–3)

Mathematics 510. *Theory of Functions of a Real Variable.* Theory of real numbers. Summable functions, Lebesgue and Stieltjes integrals, general integrals, functions of point sets and of plurisegments, Fourier series.
(3–0–6) *Mr. Bray*

Mathematics 515. *Probability and Statistics.*
(3–0–6)

Mathematics 520. *Trigonometric Series and Related Topics.* Series expansions in terms of orthogonal systems of functions. Trigonometric series. Fourier transforms and integrals. The course is based upon Mathematics 510.
(3–0–6) *Mr. Agmon or Mr. Bray*

Mathematics 530. *Laplace Transformations.* Theory of the La-

place transformation with particular reference to the properties of the transform as a function of a complex variable. Applications to the solution of difference equations, integral equations of the convolution type, and ordinary differential systems. Boundary value problems. Certain Sturm-Liouville systems. Abelian and Tauberian theorems. Asymptotic representations.
(3–0–6) *Mr. Ulrich*

Mathematics 535a. *Fourier Transforms in the Complex Domain.* Properties of the class of Fourier transforms of functions of class (L). Properties of the solution of the integral equation of convolution type with special reference to the Fourier transforms of the kernel, together with a study of the complex transform of the solutions. General Tauberian theorems. The Paley-Wiener theorem. Applications.
(3–0–3) *Mr. Mandelbrojt*

Mathematics 535b. *Analytic Continuation and Infinitely Differentiable Functions.* Topics selected from the following: regularization of sequences, problem of equivalence of classes, quasi-analyticity, Watson's problem, applications to Fourier series, singularities of Taylor series, relationship between singularities of Taylor series and quasi-analyticity. The course will be based on a general theory of asymptotic series.
(3–0–3)

Mathematics 536a. *Theory of Composition.* Properties of functions defined by composition of convolution type in relation to the component functions. Applications to the study of functions defined by Taylor series and Dirichlet series. Applications to asymptotic series and quasi-analyticity.
(3–0–3) *Mr. Mandelbrojt*

Mathematics 536b. *General Problem of Moments.* The Stieltjes, Hausdorff, and Hamburger problems. Connections with the theory of Stieltjes continued fractions. Connection with the theory of functions holomorphic in a half-plane. Applications. General related problems.
(3–0–3)

Mathematics 540. *Mathematical Foundations of Linear Physics.* Matrix algebra; coupled systems and normal coördinates. Differential and integral equations; orthogonal functions; vibrating systems. The Fourier integral and the problem of heat flow. The Schrödinger equation.
(3–0–6)

Mathematics 545b. *Hydrodynamics.* Selected topics in the theory of incompressible fluid motion. Introduction to the problems of compressible flow.
(3–0–3)

Mathematics 550. *Advanced Theory of Riemann Surfaces:* topological properties, theory of entire and meromorphic functions, problem of type.
(3–0–6) *Mr. Ulrich*

Mathematics 551a. *Conformal Mapping.* The fundamental mapping theorem. Correspondence between boundary elements.
(3–0–3)

Mathematics 551b. *Univalent Functions.* Functions univalent in a circle. Deformation theorems. Evaluation of functions and their derivatives on concentric circles. The coefficient problem. Typically real functions.
(3–0–3)

Mathematics 555. *Seminar.* Recent developments in the theory of Riemann surfaces.
(3–0–6)

Mathematics 562. *Theory of Linear Vector Spaces and Its Applications to Analysis.* Function spaces. The theory of Hilbert space and its applications. Prerequisite: Mathematics 510.
(3–0–6)

Mathematics 570a. *Analytical Theory of Numbers.* General theory of Dirichlet series. The Riemann zeta function. Study of various functions of number theory, Euler-Mangoldt function, Möbius-Landau functions. Theorems of Hadamard and de la

Vallée Poussin on the number of prime numbers less than a given number.
(3–0–3) *Mr. Mandelbrojt*

Mathematics 580a. *General Closure Theorems.* Banach spaces. Linear functions. Tauberian theorems. Approximation of a function by polynominals with a weight function. E-moment problems.
(3–0–3) *Mr. Mandelbrojt*

Mathematics 590. *Thesis.*

Mathematical Colloquium. The colloquium usually meets one afternoon every other week in order to allow the exposition of original investigations by its members.

Besides the courses listed above, others will be given from time to time to fit the needs of students. Reading courses are also offered in other fields of analysis in connection with research.

Philosophy

Philosophy 210. *Introduction to Philosophy.* Ethics: an introductory study of the development of moral ideas and of the problems of morality in our civilization. Logic: the principles according to which evidence is weighed and right conclusions are drawn in everyday thought as well as in the systematic thinking of science and philosophy.
(3–0–6) *Messrs. Black, Fulton, and Tsanoff*

Philosophy 220. *Principles of Philosophy.* Man's search for the universal principles governing his life and giving meaning to it. Topics: human nature, personal ethics, social and political philosophy, the meaning of religion, the nature and value of knowledge, and a total view of things.
(3–0–6) *Mr. Fulton*

Philosophy 300. *History of Philosophy.* An historical survey of

the essential features and main currents of philosophical thought, ancient, medieval, and modern.
(3–0–6) *Mr. Tsanoff*

Philosophy 310. *History of Religions.* An introductory study of the historical development of the principal religions.
(3–0–6) *Mr. Nielsen*

Philosophy 320. *American Philosophy.* A survey of the philosophical ideas in America from the colonial period to the present.
(3–0–6) *Mr. Nielsen*

Philosophy 340. *Philosophy of Science.* The nature and development of the modern scientific view of the world. The conditions and limits of scientific knowledge; its meaning and value in man's life and thought.
(3–0–6) *Mr. Fulton*

Philosophy 410. *Philosophy of Religion.* An examination of the basic ideas and problems of religious thought.
(3–0–6) *Mr. Nielsen*

Philosophy 420. *Types of Philosophical Theory.* First semester: the universal significance of Greek thought presented through reading and discussion of selected writings of Plato and Aristotle. Second semester: problems in æsthetics, and a study of creative intelligence, especially in poetry.
(3–0–6) *Messrs. Fulton and Tsanoff*

Philosophy 430. *Modern Philosophical Classics.* Reading and discussion of selected masterpieces of modern philosophy.
(3–0–6) *Messrs. Fulton and Tsanoff*

Philosophy 440. *Contemporary Philosophy.* A critical study of the development of philosophical thought during the last hundred years.
(3–0–6) *Mr. Tsanoff*

Philosophy 510. *Graduate Philosophical Research and Thesis.*

Physics

Physics 100. *Heat, Light, Mechanics, Sound, Magnetism, and Electricity.* A course of three experimental lectures and three hours of practical work per week. This course is intended for those who wish to obtain some general knowledge of the principles of natural philosophy on which the modern applications of science to human activities are based. The scientific method of dealing with facts and theories is explained and made familiar by numerous experimental demonstrations and laboratory exercises. For the practical work thirty-two complete sets of apparatus are available. Students taking Physics 100 must have taken or be taking Mathematics 100.
(3–3–8) *Mr. Heaps*

Physics 200. *Electricity and Magnetism.* A course of three lectures and three hours of practical work per week. This course with Physics 100 makes up a complete course on the principles of physics which is required of science-engineering students. In this second course the fundamental principles of electrical theory are explained and illustrated, including the elementary theory of direct and alternating currents, electric transmission of power, electronics, and electrical theory of matter. Certain parts of dynamics required for the electrical theory are also included. In the laboratory the students are taught how to make measurements of all the important electrical quantities such as current, resistance, potential, capacity, inductance, magnetic intensity, magnetic properties of iron and steel, electro-chemical equivalents, and characteristics of triodes. Thirty complete sets of apparatus are available for this work. Students taking Physics 200 must have completed Mathematics 100 and must take Mathematics 200 or 210 at the same time as Physics 200.
(3–3–8) *Mr. Bonner*

Physics 300. *Intermediate Electricity and Electronics.* Electrostatics. Elements of vector analysis. D.C. and A.C. circuits. Inductance. Capacity. Thermionic vacuum tubes and vacuum tube circuits. Transmission lines. Ultra-highfrequency techniques. Three hours of laboratory weekly during the first semester only.
(3–1½–7) *Mr. G. Phillips*

Physics 310. *Atomic and Nuclear Physics.* Outline of the principal experiments upon which the quantum theory is based. Particle-like properties of light and other electromagnetic radiation. Wave-like and particle-like properties of the electron. Optical spectra and energy levels. X-rays. Radioactivity. Properties and spectra of alpha, beta, and gamma rays. Elementary facts of nuclear structure. Three hours of laboratory weekly during the second semester only.
(3–1½–7) *Mr. Risser*

Physics 400. *Introduction to Mathematical Physics.* A systematic review of the principal subjects in mechanics and electrodynamics. Mathematical methods, including differential equations and vector analysis, will be applied to the solution of problems in particle dynamics, vibrating systems, dynamics of rigid bodies, electrostatics, magnetostatics, and the electromagnetic field. Three class hours and two problem hours weekly.
(3–2–7) *Mr. Houston*

Physics 410. (a) *Vibration and Sound.* Forced oscillations, resonance, and complex motional impedance. Waves on a string and a membrane. Sound waves. Acoustic impedance. Horns, speakers, microphones.

(b) *Physical Optics.* Electromagnetic waves, boundary conditions at dielectric interface, polarization, refraction, interference, diffraction. Optical instruments. Electromagnetic radiation from a dipole. Heat radiation.
(3–3–8) *Mr. Squire*

Physics 420a. *Thermodynamics.* Energy, entropy, enthalpy, free energy. Equations of state. Vapor pressure, specific heat. Introduction to statistical mechanics.
(3–0–3)

Physics 430. *Special Problems.* Especially qualified students can occasionally arrange with a member of the faculty to carry on reading or experimental study of a minor research problem. Credit will depend on the work accomplished.

Physics 440. *Physics Colloquium.* One meeting a week at which present-day researches in physics will be discussed.

Graduate Courses in Physics

Physics 500. *Electron Theory.* Conduction of electricity in gases, including ionization and recombination, motion of ions in electric and magnetic fields, the glow discharge, the arc, and the spark. Conduction of electricity in metals and semi-conductors. The dielectric constant. Theories of paramagnetism, diamagnetism, ferromagnetism, and antiferromagnetism. Galvanomagnetic phenomena.
(3–0–6) *Mr. Heaps*

Physics 510a. *Advanced Dynamics.* The general equations of analytical dynamics. Orbit theory and the central force problem. The kinematics of rigid bodies. Canonical transformations. Hamilton-Jacobi theory.
(3–0–3) *Mr. Heaps*

Physics 520. *Principles of Quantum Mechanics.* A deductive presentation of the principles of quantum mechanics with applications to various problems in spectroscopy, collisions of atomic particles, molecular binding, etc.
(3–0–6) *Mr. Houston*

Physics 530b. *Electromagnetic Theory.* Field equations, boundary conditions, tensors. Electrostatic field. Magnetostatic field. Plane waves. Cylindrical waves. Spherical waves. Radiation. Micro-wave transmission.
(3–0–3) *Mr. Risser*

Physics 540. *Nuclear Physics.* Radioactivity; alpha, beta, and gamma radiations and their interaction with matter; properties of nuclei; theory of nuclear structure; nuclear magnetic moments and spins; beta disintegrations; artificial disintegration of nuclei; nuclear scattering; fission; cosmic rays.
(3–0–6) *Mr. Bonner*

Physics 550. *Special and General Theories of Relativity.*
(2–0–4) *Mr. Wilson*

Physics 560. *Structure of Solids.* A review of the structure and vibration of crystals, and the motions of electrons in them, based on quantum mechanics.
(3–0–6) *Mr. Houston*

Physics 570. *Low-temperature Physics.* Production and measurement of extremely low temperatures. Properties of liquid helium. Superconductivity. Magnetism and low temperatures. Specific heats. Recently published research. Laboratory techniques and participation in research problems (Physics 590).
(2–0–4) *Mr. Squire*

Physics 580. *Physics Colloquium.* One meeting a week at which results of researches in physics will be discussed.
(1–0–2) *Staff*

Physics 590. *Research Work.*

Physics 600. *Special Topics in Solid State Physics.*
(2–0–4) *Messrs. Houston and Squire*

Physics 610. *Neutron and Reactor Physics.*
(2–0–4) *Mr. Risser*

Physics 630b. *Statistical Mechanics.* A quantum mechanical treatment. Darwin-Fowler derivation, statistical matrix, grand partition function, applications of current interest. Prerequisite: Physics 520.
(3–0–3) *Mr. Pitkanen*

Physics 640a. *Advanced Quantum Mechanics.* Transformation theory, scattering problems, relativistic wave equations, introduction to field theory. Prerequisite: Physics 520.
(3–0–3)

Physics 650b. *High Energy Physics.* Theoretical nuclear physics, both field theoretical and phenomenological. A discussion of

recent experimental developments in the fields of cosmic ray and accelerator physics. Prerequisite: Physics 640a.
(3–0–3) *Mr. Walker*

Physics 700. *Summer Graduate Research.* Open only to students already admitted as candidates for an advanced degree. At least forty hours of laboratory work per week.

Attention is invited to the fact that many opportunities exist at the present time for persons possessing adequate training in physics and mathematics to engage in industrial research. A large number of industrial corporations now maintain research laboratories for the carrying on of such work. Among these may be mentioned the General Electric Company, the Bell Telephone Company, the Eastman Kodak Company, the National Bureau of Standards, the petroleum companies in this vicinity and in other sections of the country, and the several laboratories of the Atomic Energy Commission. Students desiring to qualify for positions in such establishments should, if possible, take a graduate course in physics leading to the M.A. or the Ph.D. degree. However, positions in research laboratories, in the exploration work of the oil industry, and at the National Bureau of Standards are open to men who have taken the B.A. degree with a major in physics.

Political Science: *see* History and Political Science

Psychology

Psychology 210. (a) *General Psychology.* This course is intended primarily for students who plan to major in psychology. It is an introduction to the study of human behavior, in which the scientific method in psychological research is emphasized. Among the psychological processes considered are learning, memorizing, techniques of study, thinking, emotional behavior, and perceiving. Two lectures and one section meeting per week.
(3–0–) *Mr. Hudson*

(b) *Survey of Problems in Human Development.* This course is designed to familiarize the student with the way in which psychology studies problems in human development, as well as

problems of adulthood which arise from living in a highly industrialized society.
(3–0–6) *Mr. Wann*

Psychology 300. (a) *General Psychology.* This course is an introduction to the study of human behavior, in which the scientific method in psychological research is emphasized. Among the psychological processes considered are learning, memorizing, techniques of study, thinking, emotional behavior, and perceiving. Two lectures and one section meeting per week.
(3–0–) *Mr. Hudson*

(b) *Survey of Problems in Human Development.* This course is designed to familiarize the student with the way in which psychology studies problems in human development, as well as problems of adulthood which arise from living in a highly industrialized society.
(3–0–6) *Mr. Wann*

Psychology 310. (a) *History of Psychology.* This course reviews the history of Western scientific psychology with special reference to the background of contemporary theory.
(3–0–) *Mr. Hudson*

(b) *Experimental Psychology.* This course is an introduction to experimental methods in psychological research, presented in the context of its historical antecedents and interpreted in terms of modern psychological theory. In lectures, and in laboratory experiments and demonstrations, psychological concepts and methods will be developed and examined experimentally. Prerequisite: Psychology 210.
(2–4–6) *Mr. Hudson*

Psychology 320. (a) *Elementary Statistics.* An introduction to the theories and techniques of the statistical method as applied to problems in psychological research. The course will be concerned with means of describing distributions of scores or measures, the

normal curve and probabilities, sampling and statistical inference, and correlation. Prerequisite: Psychology 210 or 300.
(3–0–) *Mr. Wann*

(b) *Advanced Statistics.* Continuation of Psychology 320a. This course proceeds with more advanced correlational techniques, frequency comparisons, small sample methods, analysis of variance, and further consideration of sampling and statistical inference.
(3–0–6) *Mr. Wann*

Psychology 410. (a) *Developmental Psychology.* The year course presents three major topics: adolescence, comparative social psychology, and theories and problems of social psychology. The first semester is designed to acquaint the student, from the point of view of adolescence, with the physical, social, and emotional processes that go into the making of an adult.
(3–0–) *Mr. Wann*

(b) *Social Psychology.* The second semester is a continuation of the above topics, giving greater emphasis to social processes. These are viewed from the vantage point of comparative social psychology and the wide varieties of behaviors possible for human beings; and from the point of view of theories and problems, giving a background for critical evaluation of present-day social problems.
(3–0–6) *Mr. Wann*

Psychology 430. (a) *Individual Differences.* This course is designed to familiarize the student with the techniques for measuring individual differences. Critical reviews will be made of various theories of individual differences in intelligence and personality. Prerequisites: Psychology 310 and 320.
(3–0–) *Mr. Wann*

(b) *Perception and Learning.* This course considers theories of perception and learning with emphasis upon contemporary re-

search that relates these areas of study to the broader aspects of psychology. Prerequisites: Psychology 310 and 320.
(3–0–6) *Mr. Hudson*

Psychology 450. *Psychological Research.* An introduction to research for the well-qualified upper-division student in which, under the direction of a member of the staff, a minor research problem will be undertaken. Prerequisites: Psychology 310, 320, 410 and 430. Hours and credit to be arranged.
Staff

Romance Languages[1]

French 100. *First-year French.* Oral exercises, dictation, grammar, composition, and study of French texts.
(3–0–6) *Staff*

French 200. *Second-year French.* Oral exercises, dictation, review of grammar, composition, study of representative authors, and supplementary reading under the supervision of the instructor.
(3–0–6) *Staff*

French 205. *French Composition and Oral Practice.*
(3–0–6) *Staff*

French 230. *Scientific French.* A course in rapid reading for science students.
(3–0–6) *Staff*

French 300. *Third-year French.* Composition and study of modern French texts, with special emphasis on the syntax and the difficulties of the French language. A considerable amount of outside reading will be required. Reports and essays in French.
(3–0–6) *Staff*

French 310. *French Composition,* with intensive oral practice.
(3–0–6) *Staff*

[1] Before registering for graduate courses, students should consult the department of Romance languages.

French 320. *Main Currents in French Literature from the Beginnings to 1700.* The Middle Ages, the Renaissance, the seventeenth century.
(3–0–6) *Staff*

French 400. *French Literary Currents and Personalities in the Eighteenth and Nineteenth Centuries.*
(3–0–6) *Staff*

French 460. *The French Novel.* A study of the French novel in the eighteenth and nineteenth centuries. Alternates with French 490.
(3–0–6) *Staff*

French 490. *The French Drama.* A study of the French drama in the eighteenth and nineteenth centuries. Alternates with French 460.
(3–0–6) *Staff*

French 500. *Main Currents in French, Italian, and Spanish Literatures.* Alternates with French 510.
(3–0–6) *Staff*

French 510. *Methods of Research and French Literary Criticism.* Alternates with French 500.
(3–0–6) *Staff*

French 520. *French Classicism.*
(3–0–6) *Staff*

French 530. *The Development of French Thought in the Eighteenth Century.* Alternates with French 540.
(3–0–6) *Staff*

French 540. *Franco-British Literary Relations from 1700 to 1850.* Alternates with French 530.
(3–0–6) *Staff*

French 550. *The French Romantic Movement.* Alternates with French 560.
(3–0–6) *Staff*

French 560. *The Evolution of French Poetry from Ronsard to Valéry.* Alternates with French 550.
(3–0–6) *Staff*

French 570. *The Contemporary French Drama.* Alternates with French 580.
(3–0–6) *Staff*

French 580. *The Contemporary French Novel.* Alternates with French 570.
(3–0–6) *Staff*

French 590. *A Study of the Development of Realism in the French Novel between 1830 and 1900:* Stendhal, Balzac, Flaubert, Maupassant.
(3–0–6) *Staff*

Italian 300. *Elementary Italian.* Open to students who have had at least two years of French, Spanish, or Latin. Oral exercises, grammar, composition, and reading of representative Italian authors.
(3–0–6) *Staff*

Italian 480. *Dante.* Alternates with Italian 490.
(3–0–6) *Staff*

Italian 490. *Masters of Italian Literature.* Alternates with Italian 480.
(3–0–6) *Staff*

Spanish 100. *First-year Spanish.* Oral exercises, grammar, composition, and study of elementary Spanish texts.
(3–0–6) *Staff*

Spanish 200. *Second-year Spanish.* Oral exercises, dictation, grammar, composition, translation, and study of modern Spanish texts. Open to students who have had two years of high school Spanish or Spanish 100.
(3–0–6) *Staff*

Spanish 300. *Third-year Spanish.* Open to students who have completed Spanish 200. Review of grammar, composition, essays, study of representative authors, collateral readings, and reports. Conducted in Spanish.
(3–0–6) *Staff*

Spanish 320. *A survey of the History of Spanish Literature.* Open to Juniors and Seniors who have taken Spanish 300 and to Sophomores upon special recommendation.
(3–0–6) *Staff*

Spanish 410. *Hispano-American Life and Civilization.* A general survey of the conditions in Spain and in Latin-American countries. Open to students who have already taken Spanish 300 or 320.
(3–0–6) *Staff*

Spanish 440. *The Spanish Drama of the Golden Age.* Alternates with Spanish 450.
(3–0–6) *Staff*

Spanish 450. *The Spanish Novel.* Major novelists of the eighteenth, nineteenth, and twentieth centuries. Alternates with Spanish 440.
(3–0–6) *Staff*

Sociology: *see* **Business Administration, Economics, and Sociology**

COURSES IN PHYSICAL TRAINING AND PHYSICAL EDUCATION

THE facilities of the Rice gymnasium make provision for systematic physical training and education on the part of the students of the Rice Institute. These facilities are used by intercollegiate athletic teams, and for faculty and alumni recreation. Facilities in or near the gymnasium are available for swimming, basketball, handball, football, track, volleyball, and many other recreative games.

Physical Training

Students entering the Institute for the first time are required to take a year's course in physical training. This course, Physical Training 100, is also open to any other students in the Institute. The course offers a program of games and intramural sports for all students so that they may benefit from desirable recreation, exercise, and athletic competition. Students participating in intercollegiate athletics receive appropriate credit for the duration of their participation.

The certificate of medical examination required of a student on admission will determine in a large measure the character of the work that the individual student is permitted to take, but a supplementary physical examination may be required. In cases where the student is physically or organically incapable of participation in the normal program of physical activity, he will be assigned to an adaptive exercise group where special activities will be used to serve his needs.

A gymnasium fee, payable at registration time, is required, and entitles the student to the use of a complete gymnasium uniform (except for gymnasium shoes, which are also required), towel, and laundry service for the preceding items of equipment.

Physical Training 100. This course is designed to teach the student skill in various forms of recreative and athletic games and contests. Required of Freshmen and of transfers who have not had the equivalent elsewhere. Two two-hour periods each week. (0–4–0) *Staff*

Physical Education

The Rice Institute offers a four-year course in health, physical education, and recreation leading to the degree of Bachelor of Science in Physical Education. This course is designed to prepare men for careers in health and physical education, including coaching, in high schools and colleges, in municipal recreation departments, and in other similar organizations. Each of its four years includes at least one required theory and laboratory course in physical education, and in the last two years courses are offered in education and government which are necessary for a state teacher's certificate. The required work in biology and chemistry not only serves as a basis for the work in physical education, but also affords further subjects for high school teaching. Considerable emphasis is placed on economics and business administration for the benefit of those who go into business. Students looking forward to medicine or law are permitted to make substitutions enabling them to meet the ordinary premedical and prelegal requirements.

For schedules of the curriculum in physical education, see pages 73–74.

Physical Education 100. *Introduction to Health, Physical Education, and Recreation.* An introductory course to the professional study of health, physical education, recreation, and camping. Units include orientation, vocational analysis, educational and scientific background, personal hygiene, normal physical diagnosis, and first aid.

(3–0–6) *Mr. Hermance*

Physical Education 125. Laboratory periods devoted to intensive instruction and study in the activities of touch football, soccer and speedball, basketball, tumbling, swimming, and an indoor activity program.

(0–6–4) *Mr. Barker*

Physical Education 200. *Fundamentals of Health, Physical Education, and Recreation.* This course deals with units in intramural athletics, playground and community recreation, training

room procedure, safety education, and the history of physical education.
(3–0–6) *Mr. Plumbley*

Physical Education 225. Laboratory periods devoted to intensive instruction and study in the activities of tennis, volleyball, handball, archery, fencing, boxing, and apparatus.
(0–6–4) *Mr. Edwards*

Physical Education 300. *Advanced Fundamentals of Health, Physical Education, and Recreation.* This course includes units in student teaching and supervision, testing and measuring in health and physical education, kinesiology and body mechanics, and corrective and individual physical education.
(3–0–6) *Mr. McDougle*

Physical Education 325. Laboratory periods devoted to intensive instruction and study in the activities of squash, badminton, fishing, softball, golf, wrestling, swimming, and Red Cross life saving.
(0–6–4) *Mr. McDougle*

Physical Education 400. *Principles and Methods of Health, Physical Education, and Recreation in Elementary and Secondary Schools.* This course deals with the principles, organization, administration, methods, and materials of the elementary and secondary school programs of health, physical education, and recreation.
(3–0–6) *Mr. Hermance*

Physical Education 425. Laboratory periods devoted to intensive instruction in the activities of the basic physical activity program, practice teaching, program visitation, and theory of teaching and coaching of football, basketball, baseball, and track.
(0–6–4) *Mr. McDougle*

Physical Education 410. *Health and Physical Education for Teachers of Elementary and Secondary Schools.* This course is

designed for prospective teachers who desire to meet the health and physical education requirements for certification by the State of Texas. The course includes a study of the purpose, content, and methods of instruction in a program of health and physical education in the elementary and secondary schools. Offered in case of sufficient demand.

(3–3–8) *Staff*

COURSES IN ENGINEERING

COURSES are offered in chemical, civil, electrical, and mechanical engineering. The curriculum in each of these branches extends over five years. A student who has successfully completed the work of the first four years will be awarded the degree of Bachelor of Arts. If recommended by his department and approved by the Committee on Examinations and Standing, he may then be admitted to the fifth-year program, on successful completion of which he will be awarded the degree of Bachelor of Science in a specified branch of engineering.

Students having high standing are encouraged to apply to the Committee on Graduate Instruction for admission to the sixth year, which leads to the degree of Master of Science in a specified branch of engineering. However, no student will be admitted to a sixth-year schedule without the approval of the head of the department in which he is specializing. Students in the department of chemical engineering may apply for graduate work leading to the degree Doctor of Philosophy.

It is intended in the engineering courses to pay special attention to the theoretical side, because experience has shown that theoretical knowledge is difficult to obtain after leaving the university, and without it a rapid rise in the profession of engineering is almost impossible. It is recommended that students obtain employment in engineering work during the summer vacations, for it should be remembered that no amount of university work can take the place of practical experience in engineering establishments and in the field. The courses in engineering are not intended to take the place of learning by practical experience, but are designed to supply a knowledge of the fundamental principles and scientific methods on which the practice of engi-

neering is based and without which it is difficult, if not impossible, to succeed in the profession. The work of the first year is alike for all branches, in order that students may defer final choice of a particular engineering course as long as possible.[1]

The work of the first three years consists chiefly of courses in pure and applied mathematics, physics, chemistry, and other subjects, an adequate knowledge of which is absolutely necessary before the more technical courses can be pursued with advantage. Technical work is begun in the fourth year with courses of a general character in mechanical engineering, civil engineering, and electrical engineering. All three of these branches are taken by all engineering students, with certain differences of program for those in chemical engineering. In the fourth year instruction of students in mechanical and electrical engineering is begun in shopwork. The object of these classes is not primarily to train students to become skilled mechanics, but to provide such knowledge of shop methods as is desirable for those who may be expected as engineers to design machinery, to employ mechanics, and to superintend manufacturing processes.

The Southwest affords ample opportunities for the practice of engineering in its several branches, but these opportunities call for well-informed and thoroughly trained scientific workers. It is with such a double object in view that the engineering courses described below have been designed and developed through actual experience over many years. These programs of study and training have justified themselves, for the engineering graduates, chemical, civil, electrical, and mechanical, of this institution are successfully engaged in professional work in many parts of the country, and especially in the Southwest.

In particular, for example, more than half of the Rice Institute graduates in engineering are identified with some phase of the petroleum industry and allied industrial enterprises. Nor is this surprising, and for two reasons: first, the petroleum industry is by far the major industry of this vicinity, and second, the courses in science and engineering offered at the Rice Institute have been

[1] In every instance, the choice must be approved by the Committee on Examinations and Standing. See "Change of Curriculum" and "Approval of Major" on pages 81-82.

found to provide first-rate preparation for the practice of petroleum engineering. Such successful application of these courses was to have been anticipated because the petroleum industry's problems of exploration and discovery call for physics and electrical engineering, those of production and manufacture for mechanical engineering, those of transportation and storage for civil engineering, while chemist and chemical engineer man the research laboratories of the industry from which issue its processes of refining and the manufacture of its manifold by-products.

For schedules of the engineering curricula, see pages 68–72 and 75–77.

Engineering

Engineering 130. *Engineering Drawing.* Development of skill in the use, as well as a theoretical understanding, of the graphic language. Includes the use of drafting instruments, lettering, geometrical constructions, theory of orthographic projection, freehand or shop sketching, auxiliary views, sections, pictorial systems of drawing, dimensioning, tracing, and reproduction. Skill in lettering, dimensioning, and inking must meet a standard generally acceptable to industry.

(1–3–4) *Mr. Wyatt*

Engineering 250. *Plane Surveying.* (Semester course.) The study of the theory of plane surveying and practice in the uses of surveying instruments and of office methods. Problems to familiarize the student with transit, level, tape, compass, and plane table. Plotting of notes and computation of courses, areas, and volumes of earthwork. Prerequisites: Engineering 130 and Mathematics 100.

(3–6–5) *Mr. Marsh*

Engineering 280. *Descriptive Geometry.* Fundamental concepts of descriptive geometry, including relationships of points, lines, and planes; fundamental problems of position, of perpendicularity and measurement, and of perspective; and the orthographic projections and graphical solutions of such problems. Various surfaces and solids, their intersections and developments. Includes

one hour of instruction weekly throughout the year in the theory and use of the slide rule.
(2–3–6) *Mrs. Jordan*

Engineering 300. *Engineering Mechanics.* Statics and dynamics. Concurrent and non-concurrent force systems in a plane and in space, by algebraic and graphical methods. Centroids and moments of inertia of areas and bodies. Friction, work, and energy. Applications of Newton's second law in problems of translation, rotation, and plane motion of rigid bodies. Impulse and momentum. Prerequisites: Engineering 130 and 280, Physics 100, Mathematics 200 or 210, and registration in Engineering 360 and Mathematics 300 or 310.
(3–3–8)

Engineering 330a. *Applied Mechanics.* The same subject material as in Engineering 300 through statics. For chemical engineers only. Prerequisites: Physics 100, Engineering 130, and Mathematics 300 or 310.
(3–0–3)

Engineering 330b. *Strength of Materials.* Theory of beams, columns, and shafts. Stresses and deformations due to tensile, compressive, and shearing forces; distribution of shears and bending moments; deflection; torsion. Physical tests of metals and concrete in the laboratory. For chemical engineers only. Laboratory fortnightly. Prerequisites: Physics 100, Engineering 130, and Mathematics 300 or 310.
(3–1½–3)

Engineering 360. *Kinematics of Machines.* (Semester course.) The study of relative motion of parts of machines, instant centers, velocities, gearing and wrapping connectors. Prerequisites: Engineering 130 and 280, Physics 100, Mathematics 200 or 210, and registration in Engineering 300.
(3–3–4) *Mr. Chapman*

Engineering 400. *Seminar.* A course devoted to the purpose of training engineering students in collecting and presenting orally

formal papers and discussions on topics of general engineering interest. The papers and discussions are given by the students, using acceptable material secured from technical periodicals. The course meets weekly and is conducted in the form of an engineering society meeting. Required of all civil, electrical, and mechanical engineering students in the year they are candidates for a bachelor's degree in engineering.
(1–0–2) *Staff*

Engineering 420. *Engineering Analysis.* The analysis of engineering problems with emphasis on the interpretation of results and analogies among the problems in different fields.
(3–0–6) *Mr. Pfeiffer*

Chemical Engineering

Chemical Engineering 305b. *Chemical Engineering Fundamentals.* Application of mathematical and stoichiometric principles to the more important chemical processes. Prerequisites: Chemistry 220 and full third-year standing.
(3–0–3) *Mr. Kobayashi*

Chemical Engineering 405. *Unit Operations.* This course deals with the principles upon which the mechanical operations involved in the chemical manufacturing industries depend, and with the types of equipment available for such operations and the kind of work for which each is best adapted. The application of the principles is illustrated both by discussion in the classroom and by the solution of typical problems. Among the subjects considered are: evaporation, humidification and dehumidification, air conditioning, drying, distillation and fractionation, filtration, absorption and adsorption, extraction, crystallization, crushing, grinding, separation, agitation, and transportation of solids, liquids, and gases. Prerequisite: Chemical Engineering 305b.
(3–0–6) *Mr. Hartsook*

Chemical Engineering 445a. *Plant Inspection.* The work consists of: (1) a critical examination, in conference, of processes, equip-

ment, and problems of each industrial plant to be visited; (2) the inspection of the plant supplemented by discussions by plant officials; (3) a comprehensive report, by squads, consisting of flowsheets, individual unit descriptions, and general specifications of interest. Types of industries inspected are: sewage, sugar, petroleum refining, cement, brewing and malting, steel pouring, plastics, heavy chemicals, fertilizers, etc. Prerequisite: Chemical Engineering 405 or registration in 405.
(1–3–2) *Mr. Hartsook*

Chemical Engineering 450. *Fuels and Combustion Laboratory.* The work consists of the testing and analysis of gas, oil, coal, and water, and the measurement of fundamental physical quantities; and the application of these methods in developing stoichiometric relations and energy balances. Prerequisites: Chemical Engineering 305b and full fourth-year standing.
(0–3–2) *Mr. Kobayashi*

Chemical Engineering 505a. *Chemical Engineering Thermodynamics.* A course in theoretical and applied thermodynamics. Prerequisite: Chemistry 310.
(3–0–3) *Mr. Akers*

Chemical Engineering 510b. *Chemical Engineering Thermodynamics.* A continuation of theoretical and applied thermodynamics. Prerequisite: Chemical Engineering 505a.
(3–0–3) *Mr. Garrison*

Chemical Engineering 515b. *Chemical Engineering Mathematics.* Applications of mathematical principles to problems in fluid dynamics, heat transfer, mass transfer, and thermodynamics.
(3–0–3) *Mr. Kobayashi*

Chemical Engineering 520b. *Advanced Topics in Chemical Engineering (I): Fluid Dynamics and Heat Transfer.* An advanced study of the flow of compressible and incompressible fluids, with emphasis upon velocity and pressure distribution and momentum transfer; followed by a consideration of thermal transfer in both

compressible and incompressible fluids, with emphasis upon the analogy between the transfer of momentum and transfer of heat.
(3–0–3) *Mr. McBride*

Chemical Engineering 525a. *Chemical Literature.* The course is devoted to study of the arrangement of chemical literature and its use in industrial and research work. A topic will be assigned to each student every week for a thorough library investigation.
(1–0–1) *Mr. Bonn*

Chemical Engineering 530b. *Plant Design.* The lectures consider the development of chemical manufacturing processes and the design of chemical manufacturing plants from the point of view of location, building, equipment, economics, and organization. The laboratory work consists of calculating and drawing up fundamental data, qualitative and quantitative flowsheets, specifications, plant layout, and cost estimates for typical processes. Prerequisite: Chemical Engineering 405.
(2–6–4) *Mr. Akers*

Chemical Engineering 550. *Unit Operations Laboratory.* Laboratory work in unit operations as follows: crushing, grinding and screening, hydraulic separation, thickening, flotation, filtration, flow of gases, flow of liquids, flow of heat, humidification, water cooling, adsorption, absorption, liquid-liquid extraction, evaporation, drying, distillation, and rectification. Prerequisite: Chemical Engineering 405.
(0–6–4) *Mr. Hartsook*

Chemical Engineering 555a. *Chemical Reaction Kinetics.* A study of the principal facts and theories relating to the rates at which chemical reactions take place, including a study both of elementary reactions and of the way in which over-all rates of complex reactions are related to the rates of the individual steps.
(3–0–3) *Mr. Akers*

Chemical Engineering 560b. *Reservoir Mechanics.* Physical properties of hydrocarbons at elevated pressures and temperatures,

flow of fluids through porous media, estimating size of petroleum reservoirs, and optimum production procedures.
(3–0–3) *Mr. Akers*

Chemical Engineering 565a. *Advanced Topics in Chemical Engineering (II): Mass Transfer.* Consideration of material transfer in fluid systems under turbulent flow conditions, with emphasis upon development from fundamental principles and upon analogy between transfer of mass and transfer of momentum. This course includes a study of the development of special relations for the industrially important mass transfer operations.
(3–0–3) *Mr. McBride*

Chemical Engineering 570a. *Distillation.* A study of the rectification of binary and multicomponent mixtures and of the methods of computing the performance of both plate and packed towers.
(3–0–3) *Mr. Kobayashi*

Chemical Engineering 580b. *Chemical Process Design.* The application of thermodynamics and unit operations to the design of chemical equipment and plants. Prerequisites: Chemical Engineering 405, 505a, and 510b.
(3–0–3) *Mr. Akers*

Chemical Engineering 585. *Research and Thesis.* At least nine hours of work weekly under the direction of a member of the staff on a problem of chemical engineering importance. Four copies of the accepted report will be required: two for deposit in the Institute library and two for the chemical engineering department.

Chemical Engineering 590b. *Seminar.* A course for training chemical engineering students in the preparation and oral presentation of formal papers and discussions on topics of engineering interest. The papers and discussions are given by the students, using acceptable material secured from technical publications. This course is required of all chemical engineers.
(1–0–1) *Staff*

Chemical Engineering 700. *Summer Graduate Research.* Open only to students already admitted as candidates for an advanced degree. At least forty hours of laboratory work per week.

In addition to the general requirements for advanced degrees given on pages 74–75 and 77–78, the following specific requirements must be met by candidates taking their major work in chemical engineering:

(1) A candidate for the degree Master of Science in Chemical Engineering is required to complete, in addition to a thesis, three approved full-year courses; and, also, he must pass a final public oral examination.

(2) A candidate for the degree Doctor of Philosophy must have met the course requirements for the master's degree in chemical engineering; in addition he must complete three advanced full-year courses approved by the department, together with the doctoral thesis. He must meet the Institute language requirements (see page 78) by demonstrating a reading knowledge of scientific French and scientific German. Also, he must pass a final public oral examination.

Civil Engineering

Civil Engineering 300a. *Strength of Materials.* Stresses and deformations due to tensile, compressive, and shearing forces; distribution of shears, bending moments, deflections, torsional stresses, and combined stresses. Theory of beams, columns, and shafts. Laboratory physical tests of cast iron, steel, wood, cement, bricks, and concrete. Prerequisites: Physics 100, Mathematics 300 or 310, Engineering 300, and full fourth-year standing. Laboratory fortnightly.

(3–1½–3) *Mr. Ryon*

Civil Engineering 300b. *Mechanics of Liquids.* Principles of hydrostatics and hydrodynamics; the flow of liquids through orifices, pipes, nozzles, in open channels, and over weirs. Laboratory tests of weirs, Venturi meters, and simple hydraulic machinery. Prerequisite: Civil Engineering 300a. Laboratory fortnightly.

(3–1½–3) *Mr. Ryon*

Civil Engineering 320a. *Advanced Surveying.* Determination of meridian; stadia; plane table. Topography. Simple, compound, reversed, and vertical and horizontal easement curves for railway and highway use. Mass diagrams and earthwork. Prerequisite: Engineering 250 and full fourth-year standing.
(2–6–4) *Mr. Sims*

Civil Engineering 320b. *Graphic Statics and Stresses in Framed Structures.* Algebraic and graphic statics applied to beams and trusses. Fixed and moving loads. Load systems. Influence diagrams. Portals; transverse bents; determination of design load stresses in roof and bridge trusses. Prerequisites: Engineering 300, Civil Engineering 300a, and full fourth-year standing.
(3–6–5) *Mr. Sims*

Civil Engineering 331b. *Materials Testing for Architects.* A series of standard tests of common building materials for architectural students registered in Architecture 330. Laboratory fortnightly.

Civil Engineering 420. *Municipal Engineering.* (a) Water supply hydrology: reservoirs, pipe lines, pumps, distribution systems. (b) Sewerage: storm and sanitary systems. Design, construction, and maintenance of sewers and sewage disposal systems. (c) Highways, road systems, city streets: pavement types and subgrade studies. Demand studies and methods of financing. Prerequisites: Civil Engineering 300a and 300b, and full fourth-year standing.
(3–3–8) *Mr. Pauw*

Civil Engineering 440. *Concrete Structures.* A study of concrete and concrete aggregates. Theory and design of reinforced concrete slabs, beams, and columns. A study of foundations and design of a retaining wall. A study of current building codes. Design of typical parts of buildings. Prerequisites: Civil Engineering 300a, registration in Civil Engineering 460 and 480a, and full fifth-year standing.
(3–3–8) *Mr. Sims*

Civil Engineering 460. *Steel and Timber Structures.* Design of tension and compression members and of riveted and welded connections. Design of roof trusses, simple bridge trusses, plate girders, and mill building frames. Detailed drawings and estimates of cost and weight. Prerequisites: Civil Engineering 300a, 300b, and 320b, and registration in Civil Engineering 440 and 480a.
(3–6–10) *Mr. Ryon*

Civil Engineering 465. *Elementary Structural Design.*
(3–3–8)

Civil Engineering 480a. *Introduction to Statically Indeterminate Structures.* A study of the stresses and deflections of such structures as continuous spans, rigid frames, and arches by the methods of least work, slope deflection, and moment distribution. Analysis of trussed structures with redundant members; analysis of secondary stresses in trusses. Theory of rings. Williot-Mohr diagrams. Three lectures and two three-hour computation periods per week. Prerequisites: Civil Engineering 320b and registration in Civil Engineering 440 and 460.
(3–6–5)

Civil Engineering 480b. *Soil Mechanics and Foundations.* A study of the physical characteristics of soils and of the mechanics of soil masses subjected to loads. Earth pressures and stability. Design of foundations for buildings, bridges, and other major structures. Prerequisites: registration in Civil Engineering 420 and 440.
(3–3–4)

Civil Engineering 500. *Statically Indeterminate Structures and Advanced Structural Design.* A study of stresses and deflections in indeterminate structures such as continuous spans, rigid frames, and arches by the classical and modern methods of analysis. Design of a rigid-frame structure. Theory of design and methods of construction of masonry structures. Special problems in bend-

ing, torsion, and buckling of bars and thin plates and shells. Three lectures and one design period a week. Prerequisite: Civil Engineering 460 and 480a, or their equivalents.
(3–3–8)

Civil Engineering 505. *Graduate Seminar.*
(1–0–2)

Civil Engineering 510a. *Advanced Problems in Soil Mechanics and Foundations.* A continuation of Civil Engineering 480b. Stress conditions for failure in soils; plastic equilibrium; arching in ideal soils. Application to retaining wall problems and stability of slopes. Earth pressure on supports in cuts, tunnels, and shafts; anchored bulkheads. Theory of consolidation; mechanics of drainage. Problems involving subgrade soil or pile reaction. Vibration problems.
(3–3–4)

Civil Engineering 510b. *Foundation Design and Construction.* A study of foundation design and construction procedures. Site investigation; methods of soil exploration. Footing, raft, and pile foundations. Settlement due to exceptional causes. Cofferdams and other aids for open excavations; caissons. Bridge piers and abutments. Underpinning. Prerequisites: Civil Engineering 480b and 510a.
(3–3–4)

Civil Engineering 520. *Numerical and Approximate Methods of Structural Analysis.* Methods of successive approximations. Numerical procedures for the solution of complex problems with applications to bridges, buildings, and aircraft structures. Method of successive relaxation of constraints; energy methods; difference equations; numerical integration procedures. Vibrations of structures including earthquake effects. Action of simple structural elements and of more complex structures subjected to dynamic loads. Elastic and inelastic instability of bars, plates, and stiffened plates.
(3–0–6)

Civil Engineering 530. *Research and Thesis.* This will consist of an original investigation along some approved line of civil engineering work, an original design, or a critical review of existing work. In every case three complete typewritten or printed reports will be required: two for deposit in the Institute library and one for the civil engineering department.

Civil Engineering 540. *Introduction to the Mathematical Theory of Elasticity.* Fundamental concepts of the theory of elasticity. The differential equations of equilibrium and the equations of strain compatibility. Solution of two-dimensional problems in rectangular and polar coördinates. Strain energy methods. Analysis of stress and strain in three dimensions. Torsion and bending of prismatic bars. Analogies: the photo-elastic analogy, the membrane analogy, the electric analogy. Propagation of waves in elastic mediums. Bending of laterally loaded plates with various boundary conditions. Elastic stability of plates. Membrane theory of shells. General theory of shells. Prerequisites: Mathematics 300 or the equivalent, Civil Engineering 500 or current registration in that course, and full graduate standing.
(3–0–6)

Civil Engineering 550. *Analytical Study of Experimental Work in Reinforced Concrete.* Critical reviews of experimental and analytical investigations. Behavior of reinforced concrete structural members: beams and columns subjected to flexure, axial compression, combined axial compression and flexure, and combined flexure and shear. Behavior of reinforced concrete structures: frames, floor slabs, column footings, and highway bridge floors. Prerequisites: Bachelor of Science in Civil Engineering with undergraduate courses in structures and reinforced concrete design.
(3–0–6)

Civil Engineering 560a. *Steel Design.* Design of steel members; codes and specifications for buildings; riveted and welded construction; evolution of bridge specifications; loads and working stresses; economic proportions.
(3–3–4)

Civil Engineering 560b. *Design of Lightweight Structures,* Analysis and design of structures and structural members of minimum weight. Prerequisites: Civil Engineering 460 and 480a, or their equivalents.
(3–3–4)

Civil Engineering 570. *Mathematical Methods in Engineering.* A course in the mathematical treatment of problems in civil engineering. Solution of ordinary differential equations by standard techniques, power series, and Fourier series. The differential equations of the theory of structures; beams on elastic foundations; theory of the suspension bridge. Fourier series applied to structural problems. Problems leading to special functions such as Bessel functions and Legendre functions. Partial differential equations and boundary value problems. Vector analysis; equations of hydrodynamics. Complex variables and conformal mapping. Prerequisites: Mathematics 300 and full graduate standing.
(3–0–6)

Civil Engineering 580. *Continuous, Movable, and Long-span Bridges.* Influence lines and maximum moment curves. Continuous-beam and rigid-frame bridges. Continuous-truss bridges. Movable bridges. Vertical-lift, bascule, and swing bridges. Long-span bridges. Cantilever bridges. Suspension bridges. Prerequisites: Civil Engineering 460 and 480a.
(3–0–6)

Electrical Engineering

Electrical Engineering 300. *Introduction to Direct and Alternating Current Machinery and Circuits.* The fundamental principles of electrical engineering for electrical, civil, and mechanical engineering students. Prerequisites: full fourth-year standing, Engineering 300, Electrical Engineering 340, Physics 200, and Mathematics 300 or 310. Laboratory fortnightly.
(3–1½–7) *Messrs. Gentile and Waters*

Electrical Engineering 330. *Introduction to Direct and Alternating Current Machinery and Circuits.* The fundamental principles

of electrical engineering designed to meet the needs of chemical engineering students. Prerequisites: full fourth-year standing, Physics 200, and Mathematics 300 or 310. Laboratory fortnightly.
(2–1½–5) *Mr. McEnany*

Electrical Engineering 340. *Elementary Electronics.* The fundamental principles of vacuum tubes, gaseous conduction tubes, and their associated circuits, together with the common applications of this apparatus. Prerequisites: full third-year standing, Physics 200, and Mathematics 200 or 210. One semester.
(3–3–4) *Mr. McEnany*

Electrical Engineering 400. *Advanced Electrical Circuits and Transmission Lines.* Circuit theory applied to lumped and distributed constant circuits; the generalized four-terminal network; transmission lines; filter circuits; transient analysis; symmetrical components. Prerequisites: full fifth-year standing and Electrical Engineering 300 and 340.
(3–0–6) *Mr. McEnany*

Electrical Engineering 410. *Advanced Electrical Machinery.* Theory of electrical machinery and controls; calculation of characteristics; application of electronic and magnetic controls and circuits; servo-mechanisms; power rectifiers. Must be accompanied or preceded by Electrical Engineering 400 or 430 and accompanied by Electrical Engineering 450.
(3–0–6) *Mr. Waters*

Electrical Engineering 420. *Electrical Design.* The application of magnetic, electrostatic, and heat transmission theory to the design and calculation of characteristics of electrical apparatus. Illumination. Must be accompanied or preceded by Electrical Engineering 400 or 430, and 410.
(3–4–8) *Mr. Gentile*

Electrical Engineering 430. *Advanced Electrical Circuits and Transmission Lines.* A more complete mathematical treatment of the electrical phenomena than is given in Electrical Engineering 400: open to students who show capacity in mathematics

and electrical theory. Prerequisites: full fifth-year standing, Electrical Engineering 300 and 340, and Mathematics 310. Must be accompanied or preceded by Engineering 420.
(3–0–6)

Electrical Engineering 440. *Electronics Engineering.* The theory and application of vacuum tubes and circuits in wire and radio communication, and related fields. Antennæ, radiation, wavè guides, and measurements. Must be accompanied or preceded by Electrical Engineering 400 or 430, and 410.
(3–4–8) *Mr. Wischmeyer*

Electrical Engineering 450. *Advanced Laboratory Measurements.* Laboratory studies of direct and alternating current machinery and power rectifiers, electronic and magnetic control devices and circuits, and servo-mechanisms; electrical measurements. Must be accompanied by Electrical Engineering 410.
(1–8–7) *Messrs. Gentile and Waters*

Electrical Engineering 490. *Electrical Engineering Problems.* Under certain favorable conditions, an electrical engineering major with at least full fifth-year standing may elect an approved investigation of some electrical engineering problem under the direction of a member of the electrical engineering staff.
(0–9–6) *Staff*

Electrical Engineering 500. *Advanced Circuit Analysis.* Dynamic behavior of linear, lumped constant systems; use of transform and other mathematical methods; general network and transmission system theorems; phase and amplitude relations; relation of frequency response and transient behavior.
(3–4–8) *Mr. Pfeiffer*

Electrical Engineering 505. *Graduate Seminar.*
(1–0–2) *Staff*

Electrical Engineering 510. *Servo-mechanisms.* Analysis of steady state and transient response of servo-mechanisms. Design of

amplifiers, modulators, phase discriminators, and synchronizing circuits. Design of complete servo-mechanisms.
(3–4–8) *Mr. Pfeiffer*

Electrical Engineering 520. *Advanced Electrical Power Engineering.* Power plants and substations. Transmission and distribution systems. Power system stability.
(3–4–8) *Mr. Gentile*

Electrical Engineering 530. *Research and Thesis.* A thorough report on an electrical engineering investigation selected and carried out by the individual student under the direction of a member of the staff of the electrical engineering department. Three copies of the accepted report will be required: two for deposit in the Institute library and one for the electrical engineering department.

Electrical Engineering 540. *Advanced Electronics Engineering.* Electromagnetic theory and wave propagation. Microwaves: electro-acoustical systems.
(3–4–8) *Mr. Wischmeyer*

Electrical Engineering 550. *Theory of Electrical Machines.* Treatment of electrical machinery from the concepts of generalized circuit theory and energy flow.
(3–4–8)

Mechanical Engineering

Mechanical Engineering 300. *Thermodynamics and Heat Engines.* A general course of lectures, recitations from text, and laboratory covering elementary thermodynamics and the characteristics, fields of usefulness, operation, and tests of fuels, steam engines and turbines, boilers, pumps, condensers, and auxiliaries; properties of steam; internal-combustion engines and accessories. Numerous problems illustrate the theory discussed. Prerequisite: full fourth-year standing. Laboratory fortnightly.
(3–1½–7) *Messrs. Chapman and Woodburn*

Mechanical Engineering 320. *Mechanical Vibrations.* Theory of harmonic vibrations with several degrees of freedom. Applications to balancing of rotating machinery, vibration isolation, and the calculation of critical speeds of rotating shafts. Prerequisite: Mathematics 300 or the equivalent. One semester.
(3–0–3) *Messrs. Diboll and Szego*

Mechanical Engineering 330a. *Heat Machinery.* A half-year course for chemical engineering students only. Applications of thermodynamics to the properties of vapors and the characteristics of power plant equipment. Prerequisites: full third-year standing and Physics 100. Laboratory fortnightly.
(3–1½–3) *Mr. Paslay*

Mechanical Engineering 340. *Heat Transfer.* A general course of lectures and recitations from text covering a basic study of the laws of heat transfer by conduction, convection, and radiation. Prerequisites: Physics 100, Mathematics 300 or 310, and Mechanical Engineering 300. One semester.
(3–0–3) *Mr. Chapman*

Mechanical Engineering 350. *Mechanical Processes.* Laboratory instruction dealing with welding, heat-treating, foundry and machine shop practice, and their effects on machine design. Practice with a variety of bench and machine tools, carefully selected for their fitness in affording actual contact with machine work and in developing a certain degree of skill and resourcefulness in the student. Plant inspection trips. Prerequisites: full fourth-year standing in engineering, and Engineering 300 and 360.
(0–6–4)

Mechanical Engineering 410. *Machine Design.* Recitations from text and references, with the calculations and drafting involved in the complete design of machine parts, including elementary stress and strain at a point and strain gage applications. Considered are both the theory and modifications due to such factors as shop practice and economic considerations. Design of

several complete assemblies. Prerequisites: Engineering 300 and 360, Mechanical Engineering 350, and Civil Engineering 300a and 300b.
(3–6–10) *Mr. Diboll*

Mechanical Engineering 420. *Power Plants; Heating; Ventilation; Air Conditioning.* Fundamental applications of thermodynamics to the design, selection, or operation of modern central power stations, steam turbines, steam generators, gas turbines, and their auxiliaries; the principles of refrigeration and air conditioning; fundamental applications to heating, ventilating, and cooling systems, and the selection of equipment. Prerequisite: Mechanical Engineering 300.
(3–6–10) *Mr. Woodburn*

Mechanical Engineering 440. (a) *Materials and Metallurgy.* The metallurgy, physical properties, applications, and commercial forms of metals, alloys, protective coatings, and important nonmetallic materials.

(b) *Internal-combustion Engines and Fuels.* A study of the theory, characteristics, and operation of gasoline, gas, and oil-burning engines for automotive, stationary, and marine service, including the production and characteristics of the fuels used.

Must be accompanied or preceded by Mechanical Engineering 420 and Civil Engineering 300a and 300b.
(3–3–8) *Messrs. Diboll and Paslay*

Mechanical Engineering 460b. *Industrial Management.* Engineering specifications and estimates; engineering ethics; industrial organization; financial structure of enterprise; internal organization of manufacturing plants; production planning and control; introduction to personnel management and employee relations; labor legislation; wage and salary administration. Prerequisites: Mechanical Engineering 350, Business Administration 200 or 320, and Political Science 310.
(3–0–3) *Mr. J. Hodges*

Mechanical Engineering 490. *Mechanical Engineering Problems.* If conditions are favorable, mechanical engineering students may elect at least nine hours a week in approved investigations or designs under the direction of a member of the staff.

Mechanical Engineering 505. *Graduate Seminar.*
(1–0–2) *Staff*

Mechanical Engineering 510. *Advanced Power Engineering.* Design and operation of industrial and central steam stations; heat balance studies; economic selection of boilers, turbines, condensers, and auxiliaries. One semester.
(3–0–3) *Mr. Woodburn*

Mechanical Engineering 520. *Steam and Gas Turbines.* Design of component parts of steam and gas turbines; governing and control mechanisms; plant cycles and performance. One semester.
(3–0–3) *Mr. Woodburn*

Mechanical Engineering 535. *Advanced Vibration Theory.* General theory of harmonic vibrations with the use of generalized coördinates. Vibration of elastic bodies. Introduction to nonlinear and self-excited vibrations. Applications to the calculation of natural frequencies, vibration and shock insulation, and the use of vibration absorbers. Prerequisite: Mathematics 300 or the equivalent. One semester.
(3–0–3) *Mr. Szego*

Mechanical Engineering 540. *Advanced Metallurgy.* An advanced study of metallurgy and metallurgical applications in engineering for both normal and high-temperature conditions.
(3–0–6)

Mechanical Engineering 550. *Research and Thesis.* A report on an engineering investigation carried out by the individual student under the direction of a member of the staff in mechanical engineering. Nine hours of research weekly. Three copies of the

accepted report will be required: two for deposit in the Institute library and one for the mechanical engineering department.

Mechanical Engineering 555. *Advanced Stress Analysis.* Theory of elasticity with applications to two-dimensional problems, to the torsion of bars, and to the determination of stress concentration factors. Theory of plates, shells, and buckling. Special problems in the bending of beams and curved bars. Introduction to plasticity. Prerequisites: Mathematics 300 and Civil Engineering 300a, or their equivalents.
(3–0–6) *Mr. Szego*

Mechanical Engineering 581. *Advanced Thermodynamics.* A continuation of the study of the principles of thermodynamics. Primarily a thorough course in the fundamental concepts of thermodynamics not usually covered in undergraduate courses. A detailed consideration of energy and its transformations, the laws of thermodynamics, reversibility, entropy, and examples of applications to various fields. One semester.
(3–0–3) *Messrs. Chapman and Woodburn*

Mechanical Engineering 582. *Advanced Heat Transfer.* Advanced work in the field of heat transfer and application of mathematic principles to conduction, convection, and radiation. A mathematical treatment of heat conduction problems in the steady and transient states; applications of the methods of similarity to free convection, forced convection, and boiling and evaporation; and investigation of radiant heat exchange by black bodies, non-black bodies, and luminous gases. One semester.
(3–0–3) *Mr. Chapman*

Mechanical Engineering 590. *Advanced Gas Dynamics.* Analysis of the general equations of fluid flow. Properties of compressible fluids. Subsonic and supersonic flow in the steady and non-steady states and in one, two and three dimensions. Shock waves and other phenomena connected with high-velocity flow. Analysis of the general properties of quasi-linear hyperbolic differential equations.
(3–0–6) *Mr. Chapman*

COURSES IN ARCHITECTURE

To students of architecture the Institute offers a course leading to a Bachelor of Arts degree at the end of the fourth year and to the professional degree of Bachelor of Science in Architecture at the end of the fifth year. It is the purpose of the course to lead students during their residence to an understanding of the art of modern building. It seeks to acquaint them with the history of architecture and to develop within them an appreciation of those conceptions of beauty and utility which are fundamental in the art of design.

In the arrangement of courses, it will be observed that there are included certain indispensable elements of a liberal education as well as such technical subjects as are necessary to the general education of a practicing architect. Of the strictly architectural subjects, design and construction are given the largest place. The courses in history and those in freehand drawing and water color seek to create in the student an appreciation of architectural refinement and to increase his ability to express architectural form.

Particular emphasis is being given to the continuity of instruction in construction and structural engineering, in an effort to prepare the student for the practice of his profession.

A student who has successfully completed the work of the first four years in architecture may, upon recommendation of the department and approval of the Committee on Examinations and Standing, be admitted to the fifth-year program and candidacy for the professional degree.

To be admitted to candidacy for the degree of Master in Architecture, a candidate must have completed the work required for the professional degree and have a high scholastic record.

For schedules of the curriculum in architecture, see pages 72–73 and 77.

Architecture 100. *Architectural Drawing,* including shades and shadows and perspective, with instruction in basic composition and sketching.
(1–5–5) *Messrs. Leifeste and Todd*

Architecture 200. *Design.* Problems embracing the design and

construction of small buildings, with drafting room practice and working drawings pertinent to small structures.
(1–12–10) *Messrs. Leifeste and Todd*

Architecture 210. *A History of Architecture, Sculpture, and Painting of the Ancient World,* with studio hours in freehand drawing and water color. Emphasis is placed upon the correlation of the arts and their reflection in Renaissance and contemporary developments.
(3–4–8) *Messrs. Chillman and Todd*

Architecture 220b. *Theoretical Mechanics.*
(3–0–3) *Mr. Leifeste*

Architecture 300. *Design.* Buildings of moderate requirements and dimensions. Problems averaging five weeks in duration, with sketch problems between major problems.
(0–14–9) *Mr. Dunaway*

Architecture 310. *A History of the Architecture, Sculpture, and Painting of the Middle Ages,* with studio work in freehand and water color. During the first term the emphasis will be placed upon the architectural monuments of the Middle Ages and the development of their structural systems. The second term will stress the development of painting, sculpture, and the decorative arts of the same period.
(3–4–8) *Messrs. DeZurko and Watkin*

Architecture 330. *Strength and Properties of Materials.* Theory of beams, columns, and other structural elements. Students taking this course must take Civil Engineering 331b concurrently.
(3–0–6) *Mr. Morehead*

Architecture 400. *Design.* Problems averaging six weeks in duration of commercial and public buildings or groups of buildings, with sketch problems between major problems.
(0–16–10) *Messrs. Chillman and DeZurko*

Architecture 410. *A History of the Architecture of the Renais-*

sance and Its Subsequent Developments to the Present Time, with studio work in water color.
(3–4–8) *Mr. DeZurko*

Architecture 420. (a) *Materials and Methods of Construction,* with assigned construction details.

Mr. Morehead

(b) *Organization and Preparation of Architectural Specifications.*

Mr. Lent

Laboratory hours devoted to problems in architectural details.
(3–4–8) *Mr. Leifeste*

Architecture 430. (a) *Practical Construction Design in Steel,* covering beams, connections, plates, girders, columns, trusses, steel joists. A study of steel structural systems, including a major problem to be solved by the use of steel, with appropriate construction drawings.

(b) *Practical Construction Design in Reinforced Concrete* of beams, slabs, columns, footings. A study of reinforced concrete systems, including a major problem to be solved in reinforced concrete with appropriate construction drawings.
(3–0–6) *Mr. Morehead*

Architecture 440. *Contemporary Principles of City Planning.*
(2–4–6) *Mr. Dunaway*

Architecture 450. *Great Works of Architecture and Its Related Arts.* A history of art from 500 B.C. to modern times. Masterpieces of architectural composition which combine sculpture and painting. Examples: the Acropolis at Athens and the cathedral at Chartres. Lectures, discussions, and papers. Open to Juniors, Seniors, and graduate students. (Alternates with Architecture 455.)
(3–0–6) *Mr. Chillman*

Architecture 455. *The Art of the Fourteenth and Fifteenth Centuries in Italy.* A history of the development of Renaissance

art with emphasis upon painting and sculpture. This course is a complement of, but not dependent upon, Architecture 450. Lectures, discussions, and papers. Open to Juniors, Seniors, and graduate students. (Alternates with Architecture 450.)
(3–0–6) *Mr. Chillman*

Architecture 500a. *Advanced Design.* Problems of major proportions of five to eight weeks' duration.
(0–15–5) *Messrs. Lent and Watkin*

Architecture 510b. *Thesis Design.* The problem for the architectural thesis shall be chosen by the student with the approval of the faculty. Presentation shall consist of a written program and complete presentation drawing with written analysis of the solution, accompanied by explanatory working drawings of important construction details.
(0–12–4) *Messrs. Lent and Watkin*

Architecture 520a. *Contemporary Housing,* including problems with study of appropriate sites and types.
(3–6–5) *Mr. Dunaway*

Architecture 530. *Mechanical and Electrical Equipment.* Plumbing, heating, electric work, and acoustics, with laboratory hours in preparation of complete working drawings.
(3–4–8) *Mr. Leifeste*

Architecture 540b. *Contracts and Professional Practice.* Legal and ethical phases of architecture.
(3–0–3) *Mr. Watkin*

Architecture 550. *Seminar.* A course devoted to the purpose of training architects in collecting and presenting formal papers and conducting discussions on topics of architectural interest.
(1–0–2) *Staff*

Architecture 600. *Postgraduate Design.* A course for students who have received the degree of Bachelor of Science in Architecture. Advanced study and research in architectural design or

city planning. The subject of study for the thesis shall be chosen with the approval of the faculty, and a written thesis presenting the results of the study will be required. Three hours of conference, fifteen hours of drawing and research.
(3–15–16) *Messrs. Dunaway, Lent, and Watkin*

Architecture 610. *Postgraduate Architectural History.* A course for students who have received the degree of Bachelor of Science in Architecture. An advanced course of study and research in the field of architectural history. Three hours of conference, six hours of research.
(3–6–10) *Messrs. Chillman and DeZurko*

Architecture 630. *Postgraduate Construction.* A course for students who have received the degree of Bachelor of Science in Architecture. An advanced course of study in the field of architectural construction. Three hours of conference, nine hours of drawing and research.
(3–9–12) *Messrs. Leifeste and Morehead*

COURSES IN NAVAL SCIENCE

THE Naval Reserve Officers' Training Corps program was inaugurated by the U. S. Navy in the fall of 1926 with the establishment of six units at selected schools and colleges. Today there are fifty-two such units with departments of naval science at institutions of higher learning throughout the country.

The department of naval science at the Rice Institute was established in the fall of 1941 and is an integral part of the organization of the Institute. It is administered by a U. S. Naval Officer designated as the Professor of Naval Science. He is assisted in his administrative and instructional duties by officers and men of the U. S. Navy and Marine Corps.

The mission of the Naval Reserve Officers' Training Corps is to provide, by a permanent system of training and instruction in essential naval subjects at civil educational institutions, a source from which qualified officers may be obtained for the U. S. Navy

and the U. S. Marine Corps, and the U. S. Naval Reserve and U. S. Marine Corps Reserve.

The N.R.O.T.C. program provides opportunities for fully qualified and selected young men within prescribed quotas to obtain commissions in either the Navy or Marine Corps for active or inactive duty upon graduation from college. There are two categories of N.R.O.T.C. Students: (1) Regular; (2) Contract.

Regular Students

A Regular N.R.O.T.C. Student is appointed a Midshipman, U. S. Naval Reserve, and receives retainer pay at the rate of six hundred dollars per year for a maximum of four years, with all fees, books, and equipment paid for by the government. Required uniforms are furnished. He is required to complete twenty-four semester hours of naval science subjects (one course per term) and other training prescribed during the summer months, and upon graduation with a baccalaureate degree to accept a commission as Ensign in the U. S. Navy or Second Lieutenant in the U. S. Marine Corps, if offered, and serve on active duty for a period of two years unless sooner released by the Secretary of the Navy. He may remain as a career officer in the Regular Navy or Marine Corps. In the event of termination of such a commission, the N.R.O.T.C. Student must agree to accept a commission in the organized United States Naval Reserve, or Marine Corps Reserve, and not to resign from that Reserve prior to the sixth anniversary of the date of rank stated in his original commission in the U. S. Navy or Marine Corps.

Appointments as Midshipman, U. S. Naval Reserve, are made on a nation-wide competitive basis. Information bulletins and application blanks concerning this part of the N.R.O.T.C. program are distributed in the fall to the deans of all accredited colleges and universities, principals of high schools, professors of naval science, and offices of naval officer procurement throughout the United States. Candidates for selection as Regular N.R.O.T.C. Students are to be notified of their status by the Bureau of Personnel of the Navy Department in the spring.

Students certified by the Navy Department as fulfilling all the requirements for appointment as Midshipman, U. S. Naval Re-

serve, will be considered for admission to the Rice Institute in accordance with established policies and procedures which are applicable to other students on the same competitive basis. Those admitted will be within quotas of students as may be prescribed for the Rice Institute and the N.R.O.T.C. Units.

Selection by the Navy as a Regular N.R.O.T.C. Student does not give any special rights or privileges to the selectee not common to any other student applying for admission to the institution. It is the responsibility of the selectee to apply for and gain admission to the school of his choice.

Contract Students

A Contract Student is not entitled to the compensation and benefits paid Regular N.R.O.T.C. Students except that necessary uniforms are issued and naval science textbooks are provided. During the final two years of college, commutation of subsistence is furnished, currently at the rate of about one dollar per day.

The Contract Student is required to complete twenty-four semester hours of naval science subjects (one course per term) and to participate in only one summer training period of about three weeks' duration. Upon graduation with a baccalaureate degree and satisfaction of the Naval Training requirements, he is required to accept a commission, if offered, in the U. S. Naval Reserve or Marine Corps Reserve. Active duty is not required except in case of a national emergency, but may be necessary to fulfill requirements of the Universal Military Training and Service Act of 1951. However, if he desires, and if his services are needed, he may apply for a commission in the U. S. Navy, and, if accepted, be entitled to the same benefits and options of service as a Regular Student.

Applications for enrollment as Contract Students and additional information may be obtained upon request from the Professor of Naval Science at the Rice Institute.

U. S. Marine Corps

N.R.O.T.C. Students, either Regular or Contract, may apply for transfer to the Marine Corps during the second term of the Sophomore year. Those selected will complete twelve semester

hours of the Marine Corps Curriculum in lieu of the naval science courses prescribed for Navy officer candidates.

Other Pertinent Information

Students enrolled in the N.R.O.T.C. are required to provide their own board and lodging and may live wherever they choose.

Military control over N.R.O.T.C. Students is limited to the time that the students are under Navy instruction. This is less than one hour per day during the college year.

Any student dropped by the Rice Institute for academic failure or other cause shall be immediately disenrolled from the N.R.O.T.C. Any student performing unsatisfactory work in naval science courses, or who possesses unsatisfactory officer-like qualities, may be disenrolled from the N.R.O.T.C. regardless of the quality of his academic work.

Students taking five-year courses are considered eligible for enrollment at the beginning of either their first or second year.

Students who have completed one year of college work are eligible, provided that they agree to take subjects that will require four years to complete from date of enrollment in the N.R.O.T.C.

Enrollment in the N.R.O.T.C. program at the Rice Institute is made at the beginning of the fall term only.

Eligibility Requirements

To be eligible for either category of N.R.O.T.C. Students (Regular or Contract), a candidate must:

(a) Be a male citizen of the United States.
(b) Be not less than 17 or more than 21 years of age on July 1 of the year of enrollment.
(c) Be eligible for admission to the N.R.O.T.C. college of his choice in accordance with its entrance requirements.
(d) If a minor, have the consent of his parents or guardian at the time of his enrollment.
(e) Agree to accept a commission in the United States Navy or Marine Corps or the Reserves thereof, if offered; and if the commission is in the Regular Navy or Marine Corps and is terminated after two years of active duty, to accept a commission in the organized Reserves and thereafter not to resign before the sixth anniversary of the date of rank of his original commission.
(f) Be unmarried and agree to remain unmarried until commissioned.

(g) Be physically qualified:
(1) Be physically sound and well formed, and have a robust constitution.
(2) Vision 20/20 each eye uncorrected.
(3) Heart, lungs, hearing normal.
(4) Height 65½ to 76 inches.
(5) Weight in proportion to height.
(6) Twenty vital serviceable teeth meeting definite specifications.

Course of Training

The N.R.O.T.C. course of training consists of those courses, practice periods, and exercises prescribed by the Navy Standardized Curriculum currently in effect, together with such training duty or training cruises as may be prescribed. A Midshipman (Regular or Contract N.R.O.T.C. Student) pursuing a normal four-year college course will be required to carry a minimum of one naval science course per semester unless otherwise authorized by the Professor of Naval Science.

Naval science courses as described below will be taken in succession, as listed:

Naval Science 101 (first half-year). *Naval History and Orientation.* History of sea power, with emphasis on the history of the United States Navy.
(3–2–3)

Naval Science 102 (second half-year). *Naval History and Orientation.* Presents a brief description of the traditions, customs, mission, and organization of the Navy. Basic seamanship. Types and characteristics of naval vessels.
(3–2–3)

Naval Science 201 (first half-year). *Naval Weapons.* Introduction to naval weapons. Ammunition. Gun assemblies. Major and intermediate caliber installations. Antiaircraft and fire control systems.
(3–2–3)

Naval Science 202 (second half-year). *Naval Weapons.* Fire control systems. Sonar systems. Basic principles of radar. Combat

Information Center. Shore bombardment. Guided missiles. Anti-submarine warfare. Nuclear explosives.
(3–2–3)

Naval Science 301 (first half-year). *Navigation.* Magnetic and gyrocompasses. Piloting. Rules of the road. Weather. Maneuvering problems. Tactical publications.
(3–2–3)

Naval Science 302 (second half-year). *Navigation.* The navigator's work at sea. Motion of celestial bodies. Time. The sextant. Observations for position.
(3–2–3)

Naval Science 401 (first half-year). *Naval Machinery and Diesel Engines.* Introduction to naval machinery. Feed water systems. Fittings. Fuel oil systems. Distilling plants. Auxiliary machinery. Main propulsion. Diesel engines. Accessories and controls. Aircraft engines.
(3–2–3)

Naval Science 402 (second half-year). *Ship Stability, Naval Justice, and Leadership.* Hull design and warship construction. Piping systems. Stability characteristics. Effect of weight shifts and flooding. Repair of damage. Naval justice. Leadership.
(3–2–3)

N.R.O.T.C. Students who desire to be commissioned as Second Lieutenants in the U. S. Marine Corps or Marine Corps Reserve, and whose applications for transfer are accepted, will substitute the following courses during the final four terms:

Naval Science 301M (first half-year). *History of the Art of War.* Significance of military power. Classic principles of war, analyzed as a foundation for further understanding of military operations by a study of famous battles.
(3–2–3)

Naval Science 302M (second half-year). *American Military History and Policy.* Military history of the United States from the colonial wars through World War II.
(3–2–3)

Naval Science 401M (first half-year). *Amphibious Warfare.* History of amphibious warfare. Development of amphibious tactics. Gunfire support. Planning. Logistics. Administration.
(3–2–3)

Naval Science 402M (second half-year). *Amphibious Warfare, Leadership, and the Uniform Code of Military Justice.* Study of selected modern amphibious operations. Development of leadership techniques through a study of the basic psychology of leadership. Uniform Code of Military Justice.
(3–2–3)

The Navy Standardized Curriculum presently in effect prescribes additional course requirements for N.R.O.T.C. Students as follows:

1. By the end of the Sophomore year every student must have satisfactorily completed one year of college physics.
2. By the end of the Sophomore year every student must have satisfactorily completed mathematics courses through trigonometry.
3. Every student must achieve proficiency in written and oral expression. The Rice Institute will prescribe standards of proficiency and determine procedures necessary to achieve them.
4. Physical training and swimming requirements also are prescribed.

Special arrangements may be made for certain modifications of any curriculum leading to a bachelor's degree, in order that the required courses in naval science and other subjects may be taken.

COURSES IN MILITARY SCIENCE

THE Department of the Army established a Corps of Engineers R.O.T.C. unit at the Rice Institute in the fall of 1951. The unit functions under the department of military science and tactics, an integral part of the organization of the Institute administered by a U. S. Army Officer designated as the Professor of Military Science and Tactics. He is assisted in his administrative and instructional duties by officers and men of the U. S. Army.

The mission of the Army Reserve Officers' Training Corps is to train college students as junior officers having the attributes essential to their professional development in a component of the United States Army, particularly in the Reserve components, i.e., the Organized Reserve Corps and the National Guard. The R.O.T.C. also provides a major source of procurement of junior officers for the Regular Army through the recurring selection of a number of distinguished military graduates from senior units for direct Regular Army appointment.

The Army R.O.T.C. offers a four-year program consisting of two main subdivisions: the Basic Course and the Advanced Course. Students electing the R.O.T.C. do so for only two years at a time. The first election is for the two-year Basic Course, after which, if the student is recommended for further training, he may elect the Advanced Course. Completion of the Advanced Course is a requirement of the student's contract and a requirement for academic graduation by virtue of the fact that the Institute has, pursuant to Section 40a, National Defense Act (39 Statute 91; 10 U. S. C. 385), as amended, agreed to adopt into its curriculum the instruction for the Advanced Course prescribed by the Secretary of the Army. This training, once entered upon by the student, is, under the terms of his contract, a required part of his course. No contract is executed between the government and students admitted to the Basic Course.

The Basic Course is the course of study normally pursued by the student during his Freshman and Sophomore academic years. The first year of the Basic Course consists of a minimum of three hours per week of formal instruction of a general type applicable to the Army as a whole and not specialized by arm or service.

The second-year course begins the specialization in Corps of Engineers subjects.

The Advanced Course consists of a minimum of five hours per week of formal military instruction, specializing in Corps of Engineers subjects. Completion of the Basic Course is a prerequisite to admission to the Advanced Course. Advanced Course students are required to attend one summer camp, which normally comes between the Junior and Senior years. This camp consists of practical and theoretical military instruction principally specializing in Corps of Engineers functions.

Students enrolled in the Basic Course are furnished military textbooks and uniforms. Students enrolled in the Advanced Course are furnished military textbooks and uniforms and receive an allowance for commutation of subsistence, currently at the rate of about one dollar per day.

The Advanced Course student, upon successful completion of the four-year R.O.T.C. program and graduation with a baccalaureate degree, is given a commission in the Organized Reserve Corps. Active duty is not required except in case of national emergency, but may be necessary to fill the requirements of any deferment agreement given to the student under the provisions of the Selective Service Act. Distinguished military graduates may be offered commissions in the Regular Army. Those accepting will enter the Regular Army in the grade of Second Lieutenant.

Pertinent Information

Uniforms are worn to each drill period and at such other times as may be prescribed. At all other times civilian clothing is worn.

Military control over A.R.O.T.C. students is limited to the time that the students are under Army instruction.

Any student dropped by the Rice Institute for academic failure or other cause shall be immediately disenrolled from the A.R.O.T.C. Any student performing unsatisfactory work in military science courses, or possessing unsatisfactory officer-like qualities, may be disenrolled from the A.R.O.T.C. regardless of the quality of his academic work.

Students taking five-year courses are considered eligible for enrollment at the beginning of their first, second, or third year.

Enrollment in the A.R.O.T.C. program at the Rice Institute is made at the beginning of the fall term only.

Eligibility Requirements

To be eligible for the A.R.O.T.C., a candidate must:

1. Basic Course
   (a) Be a male citizen of the United States.
   (b) Be not less than 14 or over 23 years of age.
   (c) Be physically qualified:
      (1) Be physically sound and well formed, and have a robust constitution.
      (2) Vision 20/100 each eye corrected to 20/20 in one eye and 20/30 in the other eye.
      (3) Heart, lungs, hearing normal.
      (4) Height 60 to 78 inches.
      (5) Weight in proportion to height.
   (d) Be acceptable to the Rice Institute as a regularly enrolled student.
   (e) Be qualified morally.
   (f) If entering the first-year Basic Course have at least three academic years remaining in his course of study.

2. Advanced Course
   (a) Be not over 27 years of age.
   (b) Be physically qualified.
   (c) Be morally qualified.
   (d) Be enrolled in any academic course leading to an engineering, technical, or other scientific degree. However, certain well-qualified students may be selected for the Advanced Course regardless of the course of study.
   (e) Complete such survey and general screening tests as may be prescribed.
   (f) Be selected by the Professor of Military Science and Tactics and the head of the Rice Institute.
   (g) Have completed the Basic Course or have received credit in lieu thereof.
   (h) Must execute a contract agreeing to complete the Advanced Course at the Rice Institute or at any other institution he may transfer to if such a course is offered, to devote five hours a week during the Advanced Course to the military training prescribed, and to pursue the courses of camp training prescribed by the Secretary of the Army.
   (i) If a deferment agreement is signed, the student agrees to serve for a period of two years on active duty if called by the Secretary of the Army.

Course of Training

The A.R.O.T.C. course of training consists of those courses, practice periods, and exercises prescribed by the Army Program of Instruction for Military and Civilian Colleges currently in effect, together with such training camps as may be prescribed.

Military science course as described below will be taken in succession, as listed:

Military Science 101–102 (first year). Presents an introduction to military science with description of military organization, military policy, and evolution of warfare; and covers basic military subjects as map reading, first aid, rifle markmanship, and leadership and drill.

Military Science 201–202 (second year). An introduction to Corps of Engineers technique. History of the Corps of Engineers. Camouflage. Chemical warfare. Explosives and demolitions. Hand tools and rigging. Mines and booby traps. Engineer tactics. Leadership and drill.

Military Science 301–302 (third year). Bridge design and classification. Signal communications. Engineer combat intelligence. Engineer supply. Military roads and runways. Organization of engineer units and combat divisions. Engineer tactics. Vehicle operation and maintenance. Water supply. Leadership and drill.

Military Science 401–402 (fourth year). Engineer support for the Air Force, communication zone, and the type field army. Command and staff. Construction, utilities, and job management. Motor movements. River crossing operations. Leadership and drill.

INDEX