ARCHITECTURAL INSTRUCTION FOR DRAFTSMEN IN THE JUNIOR COLLEGE

By

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THESIS

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PART ONE

INTRODUCTION

In 1749 Benjamin Franklin made the following statement in connection with the establishment of the Academy of Philadelphia, which afterward developed into the University of Pennsylvania:

"As to their (the student's) studies, it would be well if they could be taught everything that is useful and everything that is ornamental. But Art is long and their time is short. It is therefore proposed that they learn those things that are likely to be most useful and most ornamental, regard being had to their several professions for which they are intended." *

This statement applies with equal force to the public school system of the present time. The cultural side of education has been for generations the dominant form and it is only today that educators realize the foresight Franklin showed in advocating vocational training. At present there is a decided movement toward vocational education in addition to cultural education in our schools. The introduction of vocational training is justified by three considerations, namely: certain common aspirations of all students, the decrease in the use of the apprenticeship system of training,

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"*Making of our Middle Schools," by E. E. Brown Page 180

PART ONE

INTRODUCTION

In 1749 Benjamin Franklin made the following statement in connection with the establishment of the Academy of Philadelphia, which afterward developed into the University of Pennsylvania:

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This statement applies with equal force to the public school system of the present time. The cultural side of education has been for generations the dominant form and it is only today that educators realize the importance Franklin showed in advocating vocational training. At present there is a decided movement toward vocational education in addition to cultural education in our schools. The introduction of vocational training is justified by three considerations, namely: certain outmoded conditions of all students, the increase in the use of the apprenticeship system of training,

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*"Making of our Public Schools," by E. E. Brown Page 180

and the problems presented by the increased attendance in schools due to compulsory attendance laws.

Vocational training is a means that enables people in all walks of life and of all normal mental levels to attain certain common aspirations. These aspirations are: the desire to be self-supporting, the desire to produce or create, and the desire to receive remuneration for their efforts.

Another reason for the introduction of vocational education into our public schools is the decrease in the use of the apprenticeship system as a means of vocational training. The apprenticeship system once was the only means of training a boy in the trades. It was even used in many cases in the training of doctors and lawyers. With the development of the modern industrial system, education and training by apprenticeship began to fall into disfavor. By 1860 this system of training had largely fallen out of use.* The owners of industries found it more profitable to exploit children that to train them. As a result of this condition, labor unions proposed that children be given a vocational training at the expense of the state. This proposal met with strong opposition on the part of the employers, who maintained that the parents should pay for their children's training. In spite of this opposition, certain land grants were made by Congress in 1862 for training in the Manual Arts, but that is as far as the movement extended at that time. It was not until after 1910 that the program of vocational training which had been

*Douglas, Paul H. "American Apprenticeship and Industrial Education."

and the problems presented by the interwoven relationship in Mexico can be respectively attributed here.

Theoretical training is a means that enables people in all walks of life and of all normal mental levels to attain certain common aspirations. These aspirations are: the desire to be self-supporting, the desire to produce or create, and the desire to receive remuneration for their efforts.

Another reason for the participation of specialized education into our public schools is the changes in the use of the apprenticeship system as a means of vocational training. The apprenticeship system once was the main means of training a boy in the trades. It has been used in most cases in the training of doctors and lawyers. With the development of the modern industrial system, education has tended to apprenticeship based in full true fashion. By 1900 this system of training has largely fallen out of use.* The demands of industries found it more profitable to develop children and to train them. In a result of this condition, labor unions proposed that children be given a vocational training at the expense of the state. This proposal met with strong opposition on the part of the employers, who maintained that the parents should pay for their children's training. In spite of this opposition, certain land grants were made by Congress in 1862 for training in the general arts, but that is so far in the movement established at that time. It was not until after 1917 that the program of vocational training which has been

*Douglas, Paul H. "American Apprenticeship and Industrial Education."

recommended by the unions was extensively adopted, and even at the present time it is not universally put into practice. During the period 1860 - 1910 a general scheme of vocational training was not to be found. In some of the more complex trades a form of the apprenticeship system still survived. In some cases, private vocational schools were established. In a few exceptional cases, public technical schools were founded. These forms of training were far from satisfactory and they were not well organized into a system of vocational education. Their deficiencies have gradually come to be realized and the full force of the movement for vocational education at state expense is just now sweeping over the country. It has found expression in the Smith-Lever Act of 1915, the Smith-Hughes Act of 1917, the Smith-Sears Act of 1918, and the Sears-Towner Act of 1921. These Acts show the interest that our national government is taking in vocational education.

In addition to these Federal Acts, many of the State legislatures have recently passed compulsory education laws which require children to attend part-time school up to the age of sixteen or eighteen. In California, the law requires that children must attend full-time school up to the age of sixteen, and continue in part-time school up to the age of eighteen. This leads to the third consideration which is forcing educators to give particular attention to vocational training.

As a result of these state laws, many children are now attending school who cannot profitably follow the former college preparatory type of study in the High School. The mental levels of these children vary widely. The school should give them training to fit their varying mental levels, for, in a public school system, education should be based upon the potential abilities of the individuals. Those who expect to take higher training in the university may receive a broader and more abstract form of training, while those with low mental levels must be trained in the more specific types of work, if not in actual training for process jobs. Without this technical training, the time spent by such students will be largely wasted and the student will find himself a misfit when he gets out into the commercial world. with such technical training, however, he will be greatly benefitted and will, in most cases, be a more useful member of the business community. For this reason, a mixed curriculum of vocational subjects and cultural subjects should be introduced into our High Schools. This is the problem which at present exists in the secondary schools in the United States and particularly in California.

In the Universities of California a similar situation prevails. They too are receiving many more students than formerly. With the increasing number of graduates from the High Schools, a correspondingly larger number decide to continue their studies in the Universities. Many of these

As a result of these state laws, many children are not attending school who cannot profitably follow the former college preparatory type of study in the high school. The mental levels of these children vary widely. The school should give them training to fit their varying mental levels, for, in a public school system, education should be based upon the potential abilities of the individuals. These are apparent in their higher training in the university may receive a thorough and more realistic form of training, will issue all the mental levels must be trained in the more practical types of work, if not in actual training for producing jobs. Without this informal training, the time spent by such students will be largely wasted and the student will view himself a misfit when he goes out into the commercial world. With such industrial training, however, he will be greatly benefitted not all, it does help. In a more useful member of the American community. For this reason, a strong advocate of technical training and industrial training should be introduced into our high schools. This is also, perhaps, which at present exists in the vocational schools in the United States and particularly in California.

In the University of California a similar situation prevails. That the are spending many more students than formerly. This the increasing number of graduates from the high schools, a correspondingly larger number desiring to continue their study in the universities. Many of these

college students, like those in High School, have not the mentality to profitably follow the established curricula as they now stand. They need training for the semi-skilled professions, with the addition of a liberal amount of cultural study. Such students would be very successful in many of the semi-skilled professions such as drafting or optometry, while in the more advanced professions such as engineering or law, they would prove unsuccessful and be crowded out in time. The existing curricula are satisfactory for students of high mentality, but for students of only moderate mentalities, new programs of study are very desireable.

It is to meet this situation that the Junior Colleges have been established as part of the secondary school system of California. It has not been the intention in establishing the Junior Colleges that they should parallel the first two years in the University, but that they should meet the needs of students who cannot profitably pursue the advanced University course. Educators are now engaged in an effort to develope curricula which will suit the Junior College to the needs of such students. Developments along this line have not advanced far as yet, for the rapidity with which the movement for vocational education has grown up has not allowed time in which to devise ways of meeting it. It is the purpose of this thesis to aid in solving this problem.

college students, like those in this school, have not the maturity to profitably relate the astronomical curricula to their needs. They need training for the semi-skilled professions, with the addition of a liberal amount of cultural study. Such students would be very successful in many of the semi-skilled professions such as draftsing or optometry, while in the more advanced professional work in engineering or law, they would prove unsuccessful and be crowded out in time. The existing curricula are satisfactory for students of high mentality, but for students of only moderate mentality, our programs of study are very deficient.

It is in such cases situations that the junior colleges have been established as part of the secondary school system of California. It has not been the intention to establish the junior colleges that they should take the first two years in the University, but that they should meet the needs of students who cannot profitably pursue a advanced University course. Educators are now engaged in an effort to develop curricula which will suit the junior colleges to the needs of such students. Developments along this line have not progressed far as yet, for the problem with which the movement for vocational education has grown up has not allowed time in which to develop keys of meeting it. It is the purpose of this thesis to aid in solving this problem.

SUBJECT OF THESIS

This thesis considers the organization of a two-year curiculum for architectural draftsmen which gives the minimum essentials of architecture. The study of architecture may be divided into the following fields: Construction, Planning and Design, History, and Technique of Representation. Due to the extensiveness of these fields, this study will be limited to the examination of Construction, and Planning and Design. An examination of the remaining subjects will be postponed for future study.

At this point it may be well to observe that the leaders in vocational education maintain that every man should be trained for the position which he is to fill no matter how simple in its duties that position may be. Repeatedly in even the most routine process jobs, a short training has remarkably increased the worker's efficiency. In the case of architectural draftsmen, their duties are varied and involve consideraole responsibility, a fact which would justify a course of training for the men who occupy these positions. In New Zealand the need for this training has been recognized by the New Zealand Institute of Architects.* They have established a series of examinations to determine various degrees of competency, ranging from junior draftsmen to head draftsman. These examinations imply a thorough training on the part of

*Proceedings of the New Zealand Institute of Architects, Vol. No. 2, 1918-19, and Vol. No. 111, 1920.

SUMMARY OF THESIS

This thesis concerns the organization of a two-year curriculum for aeronautical engineers which gives the minimum essentials of aeronautics. The study of aeronautics may be divided into the following fields: Construction, Planning and Design, Safety, and Technique of Experimentation. Due to the extensiveness of these fields, this study will be limited to the essentials of Construction, and Planning and Design. An evaluation of the remaining subjects will be postponed for future study.

At this point it may be well to observe that the lecture in vocational education maintains that every man should be trained for the position which he is to fill in making one single or life position that position may be. Especially in even the most routine process jobs, a more thorough and carefully thought-out job results efficiently. In the case of aeronautical engineers, their duties are varied and involve considerable responsibility, a fact which could justify a course of training for one and no other lower positions. In the England the need for this training has been indicated by the few highest qualified of aeronautics.* They have selected a series of questionnaires to determine various degrees of competency, ranging from junior draftsmen to top draftsmen. These examinations imply a thorough training on the part of

*Proceedings of the Ser Engineer Institute of Aeronautics, Vol. 31, 2, 1929-32, and Vol. 34, 121, 1930.

those taking them.

In the United States, on the other hand, no system of training draftsmen has been thus far developed. At present, training for draftsmen is carried on largely by draftsmen's clubs organized for that purpose, by extension courses, and by courses in a few of our Eastern colleges. The University of Pennsylvania offers a two-year course in architecture for architectural draftsmen, Cornell University offers a similar course. Both of these courses expect that the draftsmen who take them have had experience. They are not for beginners. Pratt Institute offers a course in architecture suitable for draftsmen, in which the structural side of the work is greatly emphasized. This course may be taken by beginners. Columbia University gives an extension course for draftsmen which leads to a certificate of proficiency after the equivalent of a four-year course has been taken. This course may be taken by beginners. In California, no direct architectural study is to be had in which a draftsman may get a systematic training. This thesis proposes, therefore, to organize a curriculum of architectural studies to meet this need. This curriculum should be of direct value to architectural draftsmen who expect to take only a two-year course of training.

The development of a course in architecture requires the study of two questions. These are: What subject matter shall be taught in each field of study, and, How the subject

these meeting rooms.

In the United States, on the other hand, no system of training architects has been made for developing. At present, training for architects is merely in imitation's study organized for that purpose, or extension courses, and by courses in a few of our Eastern colleges. The University of Pennsylvania offers a two-year course in architecture for architectural draftsmen, formal training offers a similar course. Both of these courses equip men the graduates who take them one acquaintance. This is not for beginners. Frank Lloyd Wright offers a course in architecture suitable for amateurs, in which the theoretical side of the work is partly emphasized. This course may be taken by beginners. Columbia University gives an extension course for architects which leads to a certificate of qualifications after the completion of a four-year course has been taken. This course may be taken by beginners. In California, the direct architectural study is to be had in which a certificate can not get a bachelorship degree. This lack of training, therefore, is responsible a certificate of architectural students to want this need. This curriculum should be of great value in architectural students who expect to take only a two-year course of training.

The development of a course in architecture requires the study of the questions. These are: What subject matter shall be taught in each year of study, and for the subject

matter of each field may be organized into a workable curriculum. It is with the study of these two questions that this thesis deals.

PART TWO

CONSTRUCTION

The first of the fields of architecture to be studied will be the field of Construction. The first consideration to demand attention is the method of determining what subject matter should be taught in a course in architectural construction.

METHOD OF DETERMINING SUBJECT MATTER

The subject matter of the course in construction has been determined by an analysis or survey of the types of construction that must be known by a draftsman in order to pursue architectural drafting. From this analysis, those items will be selected which are essential to the making of working drawings of the types of buildings which may occur in practically all offices where the architect does not specialize.

ANALYSIS OF THE FIELD OF CONSTRUCTION

The field of Construction may be divided into:

Wooden frame buildings,
Semi-fireproof masonry buildings,
Slow burning wooden mill construction,
Fireproof masonry construction,
Steel frame buildings, and
Concrete frame buildings.

Each of these types of construction has been subdivided

PART TWO

INTRODUCTION

The first of the tasks of architecture to be studied will be the field of Construction. The first consideration to demand attention is the method of determining what sub-just matter should be taught in a course in architectural construction.

Effect on curriculum taught before

The subject matter of the course in construction has been determined by an analysis or survey of the types of construction that must be known by a freshman in order to pursue architectural training. From this analysis, there then exist the minimum rules and essentials to the making of working drawings of the types of buildings which may occur in practicing all offices where the architect does not specialize.

Extent of the field of construction

The field of Construction was to include inter:

Lesson frame buildings.
Semi-fireproof masonry buildings.
Time saving working drawings.
Reinforced concrete construction.
Steel frame buildings. and
Concrete frame buildings.

Each of these types of construction has been analyzed

into their more important parts. These will be found in Table I on page 19.

SELECTION OF ESSENTIAL MATERIAL

The basis of determining what is essential to the architectural draftsman may be derived by finding out what work must be done by the draftsman in the average architect's office and what fundamentals must be known by him in order that the drawings may be made efficiently and at the least expense. The types of construction which an architectural draftsman will have to do are enumerated below. In each type of building, it is imperative that the draftsman should know how the building is constructed. It is not possible nor desireable to study all the facts which are encountered in each type of construction, because these vary in different offices and for different jobs. The underlying principles, however, are necessary for the efficient draftsman to know. The structural principles should also be understood, but it is not necessary that the draftsman should have gained mastery of the method of calculating loads in various types of construction.

In addition to a knowledge of how the building is constructed, it is also necessary to know the conventional symbols and methods of dimensioning a drawing.

Of the divisions of the field of Construction, the wooden frame building occurs most frequently, usually in

take later more important parts. These will be found in Table I on page 19.

SELECTION OF CONSTRUCTIVE MATERIAL

The basis of determining what is essential to the architectural draftsman may be derived by finding out what work must be done by the draftsman in the average architect's office and what fundamentals must be known by him in order that the drafting may be made efficiently and at the least expense. The type of construction taught an architectural draftsman will have to do are numerous and varied. In each type of building, it is impossible that the draftsman should know how the building is constructed. It is not possible nor desirable to teach all the trade skills are associated in each type of construction, because these vary in different cities and for different jobs. The underlying principles, however, are necessary for the efficient draftsman to know. The above-mentioned principles should also be understood, but it is not necessary that the draftsman should have gained mastery of the method of calculating loads in various types of construction.

In addition to a knowledge of how the building is constructed, it is also necessary to know the common symbols and methods of dimensioning i.e. details.

Of the divisions of the field of Construction, the modern frame building occurs most frequently, usually in

the form of a private residence. All the subdivisions of this type of construction are important and must be known in all architectural offices. Semi-fireproof masonry construction is also very important, and jobs involving this type of construction come up in nearly all offices. Slow burning mill construction does not occur very frequently except in offices that specialize in it. However, certain structural principles of slow burning mill construction are involved frequently in wooden frame construction and semi-fireproof masonry construction. For this reason, a limited amount of time needs to be devoted to the subject. Fireproof masonry construction also occurs frequently. This type of construction involves considerable technical knowledge of architectural engineering and is frequently done by specialists. For this reason, only a few of the underlying principles of this type of construction need be studied. These few principles, however, are essential to be known in order that the draftsman may work more intelligently in handling the remaining part of the drawings, even though he should not try to design the structural work himself. The steel frame building and the concrete building, on the other hand, usually occur in offices that specialize in that type of construction or have a specialist in the office to do this part of the work. For this reason, these two types of construction will be omitted from the study, since they represent advanced fields of construction.

the type of a private residence. All the qualifications of this type of construction are important and must be known in all architectural offices. Semi-fireproof masonry construction is also very important, and just involving this type of construction done up in nearly all offices. Also burning mill construction does not occur very frequently except in offices that specialize in it. However, certain principal principles of slow burning mill construction are involved frequently in wooden floor construction and semi-fireproof masonry construction. For this reason, a limited amount of time needs to be devoted to the subject. Fireproof masonry construction also occurs frequently. This type of construction involves considerable technical knowledge of structural engineering and is frequently done by specialists. For this reason, only a few of the principal principles of this type of construction need be studied. These principles, however, are essential to be known in order that the specialists may work more intelligently in handling the problems part of the problem, even though we should not try to design the structures ourselves. The steel frame building and the concrete building, on the other hand, usually occur in offices the specialist in that type of construction or have a specialist in the office is in charge of the work. For this reason, these two types of construction will be omitted from the study, since they involve advanced theory of construction.

BASIS OF ORGANIZING SUBJECT MATTER

Once the subject matter of any course has been determined upon, the governing principles that determine the organization of the subject matter in the course must be discovered. These principles are:

1. New matter should be presented as an outgrowth of the old.

2. New matter should be presented in small enough amounts at a time to be readily learned and retained in the memory.

3. Work already given should recur, if possible, at frequent intervals until the student has had time to master it.

4. Imitation of good models should be used as a means of gaining appreciation.

5. Work should be motivated by practical applications and by competitions.

6. Each larger step of the course should be of practical value, if possible, without further and continued study.

7. The course must have unity.

8. The demands of other courses upon the student's time must be taken into consideration.

ALLOTMENT OF TIME FOR EACH COURSE

Before any of the fields which are being studied can be arranged, it is necessary to assume a minimum time allotment for each of them. The time allotment given below has been made after each of the fields has been examined in detail. Additional time may be given any one of these fields as circumstances permit. This would result in a

BASIS OF CONDUCTING STUDIES MATTER

Once the subject matter of any course has been determined upon, the governing principles must determine the organization of the subject matter in the course that is developed. These principles are:

1. The matter should be presented so as to interest if the old.

2. New matter should be presented in small separate units of a size to be readily learned and retained in the memory.

3. Work already given should recur, if possible, at frequent intervals until the student has had time to master it.

4. Instances of good teaching should be given in a great variety of practical applications.

5. Work should be enriched by practical applications and by comparisons.

6. Each larger step of the course should be of practical value, if possible, without textbook and classroom study.

7. The course must have unity.

8. The demands of other courses upon the student's time must be taken into consideration.

DIRECTORY OF TIME FOR SHORT COURSES

Before any of the classes which are being studied can be arranged, it is necessary to develop a standard time allotment for each of the. The time allotment given below has been made after some of the fields has been examined in detail. Additional time may be given any one of these fields by circumstances permit. This would result in a

much more comprehensive training in that particular field. But in order to allow for a flexible curriculum, it will be assumed that the student is required to spend the equivalent time necessary to make twelve units of work as defined by the University of California, i.e. three hours of laboratory or drawings are required for one unit of credit. For administrative purposes, the credit value used at the Architectural School at Columbia University might be used to better advantage. According to the credit system used there, two hours of drawing or drafting are required for one point of credit. If this system were used, the minimum value required would be equivalent to sixteen points. In dividing the time between the various courses, it has been found after preliminary investigation that the courses in Construction, Design, and Planning are about equal in importance. The course called "Architectural Forms" which supplements the course in Design does not require as much time.

For the fields of architecture that have not been studied in this thesis, an approximate time has been allowed in order to obtain a working basis. The history of architecture and freehand drawing have been allowed the time that is devoted to these subjects in the School of Architecture at the Columbia University. The study of graphic representation has not been allowed as much time as is allowed it at Columbia University or the University of California.

such more commendable yielding in that particular field. But in order to allow for a flexible curriculum, it will be required that the student is required to spend the equivalent time necessary to make twelve units of work in France or the Universities of Guildford, i.e. three hours of laboratory or practice and required for one unit of credit. For administrative purposes, the credit value used in architectural school at Columbia University might be used to better advantage. According to the credit system used there, the hours of drawing or drafting are required for one point of credit. If this little note work, the minimum value required would be equivalent to fifteen points. In dividing the time between the various courses, it has been found after preliminary investigation that the hours in Construction, Design, and Elective are about equal in importance. The course dealing "Architectural Issues" which supplements the course in design take up about half time.

For the fields of construction that have not been adapted to this theme, an experimental time has been utilized in order to obtain a working result. The history of architecture and French drawing have been allowed the time that is devoted to these subjects in the school of architecture at the Columbia University. The study of French has nevertheless has not been adjusted as much time as is allowed in a Columbia University or the University of California.

This has been done because the student is expected to have had orthographic projection in his course of high school drawing, and the problems covered in this subject should be sufficient to solve most of the problems that arise in ordinary practice. The more difficult problems which occasionally arise in graphical representation are for the architect or head draftsman to solve. Until these remaining fields of architectural study have been carefully examined, this time allotment will be made to them, therebeing sufficient flexibility in the curriculum to allow more time if needed in actually carrying out this curriculum.

The estimated time allotted to each course is given below, both in accordance with the credit value system used at the University of California and the one used at the School of Architecture of Columbia University. The credit value for each arrangement of hours is also included.

This has been done because the student is expected to have had orientation problems in his course of high school drawing, and the problems covered in this manual should be sufficient to solve most of the problems that arise in ordinary practice. The more difficult problems which occasionally arise in specialized representation are for the student or head draftsman to solve. Until some engineering field of architectural study has been carefully examined, this line diagram will be used to show, therefore, minimal flexibility in the curriculum to allow more time if desired to actually carrying out this curriculum.

The estimated time allotted to each course is given below, with an introduction also the result which results and of the desirability of familiarizing the student with the School of Architecture of Columbia University. The result value for each accomplishment or course is also indicated.

TIME ALLOTMENT AND CREDIT VALUE

	Univ. of Calif.		Columbia Univ.	
	Hours	Units	Hours	Points
Construction.	6	2	6	3
Design.	6	2	6	3
Planning.	6	2	6	3
Architectural Forms . .	3	1	4	2
Freehand Drawing. . . .	6	2	4	2
Hist. of Architecture .	2	2	2	2
Graphical Representation	1	1	1	1
Total	30	12	29	16

The credit value at both of these institutions is based upon a term of sixteen weeks. Most of the Junior Colleges in California, however, have a term of twenty weeks. In order to make this curriculum sufficiently flexible, and in order to meet the varying need of different Junior Colleges, each course will be organized upon a basis of sixteen weeks. Where the additional four weeks remain, the extra time may be used by the instructor to cover problems of special difficulty that often arise, or problems which he feels are necessary to add to the program indicated in this thesis.

Each of the courses covered by this thesis will be organized on a basis of the time allotment indicated above. This will allow ample time to include some cultural subjects each semester.

THE ALLOTMENT BY COUNTY TEAMS

	Date. of Coll. Score Units		Geographic Div. Score Units	
Centralized.	2	7	2	3
Tenure.	4	6	4	2
Planning.	8	2	0	8
Auditatorial Forms . .	3	1	4	2
Freehand Drawing. . . .	6	1	6	2
Visit. of Specialists .	2	7	2	2
Overtical Supervisation	1	1	1	1
Total	26	24	20	18

The overall value of both of these indications is based upon a lack of without needs. Most of the Tenure Policies in California, however, have a lack of family needs. In order to make this correlation sufficiently flexible, and in order to cover the varying need of different County Agriculture, each course will be expanded upon a basis of sixteen needs. Since the additional four needs remain, the extra time may be used by the Instructor to cover previous or special difficulty that often arises, or problems which he feels are necessary to add to the program indicated in this bulletin.

Each of the counties matched in this summary will be organized on a basis of the five difficulty indicated needs. This will allow maybe time to involve some helpful suggestions and models.

CONCLUSION

COURSE IN CONSTRUCTION

Organizing the material on a basis of the above factors, the large divisions of the course of architectural construction are as follows:

First term----------wooden frame construction.

Second term----------semi-fireproof construction.

Third term----------semi-fireproof construction and slow burning mill construction.

Fourth term----------introduction to fireproof masonry construction.

Many sections of each of these divisions can better be studied in some other connection. The disposition of the subtopics of each type of construction will be found in Table I, page 19. This is explained by the note which precedes it.

CONCLUSION

Summary in conclusion

Comparing the material on a basis of the same factors, the large divisions of the course of evolutionary culture-also are as follows:

First term----------modes from conservation.

Second term----------semi-transport transmission.

Third term----------semi-transport consumption and also marking will conservation.

Fourth term----------introduction to transport con-sumption.

Many sections of each of these divisions can further be studied in some other connection. The discussion of the subjects of each type of communication will be found in Table 1, page 19. This is explained by the side notes under Table 1.

TABLE I
CONSTRUCTION

Explanation of Table

The subdivisions of each field of construction are found listed below, on the lefthand side of the paper. The items which shall be studied in each of the four semesters of the Junior College course will be checked with an (x) in the four narrow columns on the right, the first column representing the first semester, the second column the second, etc. In the wide margin on the extreme right may be found remarks and references concerning the various topics.

Subject Matter	Term 1	2	3	4	Remarks
WOODEN FRAME CONSTRUCTION					
Excavation and Footings	x				
Basement and Cellars			x		
Underpinning	x				
Posts			x		Slow Burning Mill Construction
Construction of Walls and Partitions	x				
Floor Construction	x				
Ceiling Construction	x				
Roof Construction	x				
Trussed Openings	x			x	No theory first term
Door Details	x				
Window Details	x				
Flue and Chimney Construction	x				
Fireplace Construction	x				
Construction of Steps and Stairs	x				

[illegible]

[illegible]

The qualifications of each [illegible] of each [illegible] [illegible] Food Illegible Below, on the [illegible] side of the page. The items which shall be studied in each of the [illegible] [illegible] of the Joint Office course will be marked [illegible] in the four marks columns on the right, the first [illegible] [illegible] the first marks, the second [illegible] the second [illegible]. In the wide margin on the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

Subject Matter	Marks				Remarks
	1	2	3	4	
Course Plan Construction					
Preparation and Teaching	x				
Assessment and Failure		x			
Underpinning	x				
Tools			x		Flow marking [illegible] construction
Construction of Walls and Partitions	x				
Floor Construction	x				
Ceiling Construction	x				
Roof Construction	x				
Timber Courses	x			x	To theory first [illegible]
Tool Kinds	x				
Finish Details	x				
Plan and Delivery Constructions	x				
Template Construction	x				
Construction of Steps and Stairs	x				

Subject Matter	Term 1	2	3	4	Remarks
Porch Construction	x				
Cornice and Gutter Details	x				
Construction of Bay Windows and Projecting Masses	x				
Areas and Floor Drains			x		
Plumbing	x		x		Little first term
Heating				x	Elementary only
Lighting			x		
Built-in Equipment	x				
Miscellaneous	x				Or elsewhere
MASONRY CONSTRUCTION					
WALLS					
Kinds of Walls					
Brick		x			
Hollow Tile		x			
Concrete Block		x			
Concrete		x			No theory
Openings					
Window Details		x			
Door Details		x			
Relieving Arches		x			
Lintels					
Bending Moments				x	Simple loads
Strength of Beams				x	
Arches					
Construction				x	

Subject Matter				Remarks
Room Preparation	x			
Tables and Water Tables	x			
Construction of the Indoor and Preparing Rooms	x			
Area and Floor Space		x		
Cleaning	x		x	Little Tots Home
Heating			x	Elementary Cols
Lighting		x		
Sun-in Sunbeams	x			
Ventilation	x			11 windows
Equipment and Supplies				
Walls				
Kinds of Walls				
Paint	x			
Yellow Pine	x			
Concrete Floor	x			
Linoleum	x			No Money
Sand Box				
Piano Stools	x			
Tool Chest	x			
Cultivating Garden	x			
Tables				
Serving Counter		x		Lack
Storage of Games		x		
Drawers				
Cabinets		x		

Subject Matter	Term 1	Term 2	Term 3	Term 4	Remarks
Strength				x	
Furring		x			
Exterior Finish					
Veneering		x			
Common Bonds in Brick		x			
PARTITIONS					
Kinds					
Semi-fireproof		x			
Fireproof		x			
Details of Openings		x			
Bearings for Partitions		x			
FLOORS					
Wood					
Framing Methods		x			
Beams and Girders			x		
Fireproof					
Kinds of construction		x			
Methods of Framing				x	
Surface Treatments		x			
Beams and Girders				x	Elem. Formulas only
Size of Beams				x	Steel only
Live and Dead Loads			x		See Building Code
Bending Moment				x	Simple loads
CEILINGS					

Design Action	[illegible]	[illegible]	Remarks
Strength		x	
Bending	x		
Relation Tilter			
Tonnering	x		
Dense Beds in Kick	x		
Deflection			
Alone			
Dead-Firepout	x		
Firepout	x		
Details of openings	x		
Bearings for Partitions	x		
Floors			
Wood			
Framing Joists	x		
Beam for Joists			
Firepout			
Alone of construction	x		
Relient of Tenity		x	
Surface Flammability	x		
Beams and Joists		x	Also. Partitions
Size of Beams		x	Steel only
Live and Dead Loads		x	See Building
Bending moment		x	Steel/Beams
Ceiling			

Subject Matter	Term 1	Term 2	Term 3	Term 4	Remarks
Relation of Construction to Floor Above		x			
Hanging Ceilings		x			
Furring		x			
ROOF CONSTRUCTION					
Flat Roof					
Surface Loads		x			
Finishes		x			
Spacing of Conductors		x			
Construction		x		x	See Floor Cont.
Pitch Roofs					
Surface Loads		x			
Wind Pressure		x			
Finishes		x			
Spacing of Conductors		x			
Construction					
Wood Construction		x		x	
Fireproof					Omitted
TRUSSES					
Stresses				x	Simple Cases Only
Construction					
Wood				x	Simple Cases Only
Steel				x	" " "
FOOTINGS AND FOUNDATIONS					
Under Walls		x	x		
Under Columns				x	Simple Cases Only

Subject matter	Use	Remarks
Relation of construction to floor joist	x	
Laying ceilings	x	
Jointing	x	
Roof construction		
Tile roof		
Surface lines	x	
Finishes	x	
Heating of foundations	x	
Construction	x	x See text book.
Site work		
Surface lines	x	
Site layout	x	
Trusses	x	
Heating of foundations	x	
Demolition		
Tool construction		x
Transport		Matrix
Tunnel		
Stresses	x	Study- Tool Cart
Construction		
Tool	x	Study Cart
Study	x	
Footings and foundations		
Under table	x	
Tool cabinet	x	Study cart

Subject Matter	Term 1	2	3	4	Remarks
BASEMENTS					
Thickness of Walls			x		
Water Proofing			x		
AREAS AND FLOOR DRAINS			x		
INTERIOR COLUMNS					
Wood			x		
Steel				x	Simple Cases
Concrete Piers					Omitted
Brick Piers			x		
Formulas				x	Simple Cases Only
FIRE PROOF STEPS			x		No Formulas
PLUMBING				x	
HEATING				x	Simple Theory
LIGHTING				x	
EXTERIOR CORNICES					
Construction		x			
INTERIOR WOODWORK					
Detailing		x			
SYMBOLS					
Method of Dimensioning	x	x	x		
Symbols of Materials	x	x	x		
Symbols of Fixtures	x	x	x		

From Table I the subject matter for each term may be found. It is impossible to organize a course from this data which will be entirely satisfactory the first time that it is tried, for many weak spots are sure to arise where the sequence of the material is too difficult for the students or where the time allotted to some subject was incorrectly estimated. In view of this fact, the following list of plates covering the first term's work in the field of architectural construction is given only as a suggestion to indicate a method of instruction that might be carried out in each semester.

TWENTY-ONE PLATES ON
WOODEN FRAME CONSTRUCTION

Plate 1 Details of Wall Construction (See Fig. 158, p. 28)

Plate 2 Methods of Dimensioning

Plate 3 Dimensioning Problem (A white Print of a simple plan on which the student is to supply the dimensions) and Dimension Lines

Plate 4 Fireplace Construction

Plate 5 Symbols (Plumbing, Electric, etc.)

Plate 6 Copy of a Typical Plan (See Fig. 156, p. 28)

Plate 7 Foundation Plan for Fig. 156 (To be worked out by student.)

Plate 8 Details of Roof Construction

Plate 9 Cornice and Gutter Details

Plate 10 Roof Plan for Fig. 156

Plate 11 Door Details

Plate 12 Window Details

Plate 13 Copy Typical Elevation (See Fig. 157, Page 28)

Plate 14 Step and Stair Construction

Plate 15 Framing around Wall and Floor Openings

Plate 16 Floor Plan (to be developed from a sketch of a small bungalow)

Plate 17 Section of the Same

Plate 18 Elevation of Same

Plate 19 Roof Plan for Same

Plate 20 Foundation Plan for Same

Plate 21 Typical Details for Same

PLATES-DRS PLATES ON
MODERN FRAME CONSTRUCTION

DESCRIPTION OF FOUR TYPICAL PLATES

The following descriptions are given to show in detail how the work may be arranged following the outline given on the preceeding page.

LESSON I

Construction Details.

1. Explanation of construction may be given by means of a lecture by the instructor, by reports of students, by the use of a syllabus, or by the use of a text.

2. Description of Plate I:

   a. Section through

      1. Footings
      2. Underpinning
      3. Flooring
      4. Ceiling
      5. Roof

   b. Plan of studs at corner of house

   c. Elevation of framing at corner of house

   d. Tabulation in brief of Specification Data.

3. Specifications to be written up more fully as the student progresses in the form of a card index.

   a. Estimated time--6 hours.

LESSON II

Symbols of Methods of Dimensioning.

1. Explanation of dimensioning and symbols

2. Description of Plate

   a. Window symbols
   b. Door symbols
   c. Symbols for materials and sections
   d. Method of dimensioning
   e. Application of above

3. Estimated time--3 hours.

[illegible]

[illegible] questionnaires can serve to show in detail how the work may be carried out following the outline given in the preceding pages.

Section I

Observation Activity.

1. Observation of school class may be given by teacher of science to the participants, by members of the group, or the use of a [illegible], or if one has it a film.

2. Description of Class 1.

a. Activity [illegible]

1. Problems
2. Experiments
3. Field trips
4. Writing
5. Work

b. Time of class in minutes [illegible]

c. Number of [illegible] in number of minutes [illegible]

d. Objective [illegible] of experiments [illegible]

3. Description [illegible] in the science [illegible] [illegible] in the film or [illegible] class [illegible].

a. Activity [illegible] [illegible].

Section II

Description of [illegible] Experiments.

1. Description of [illegible] [illegible] [illegible]

2. Description of class

a. Science [illegible]
b. [illegible] [illegible]
c. Reasons for [illegible] [illegible]
d. Results of [illegible]
e. Appearance of [illegible]

3. Describing film--[illegible] [illegible].

LESSON VI

Typical Plan.

1. Copy Figure 156

2. Scale $\frac{1}{4}$" = 1' 0"

3. Time -- 9 hours

Note: This plate has been used in class at University of California and can be done in ink in 9 hours.

LESSON XIII

Type Elevation.

1. Copy Figure 157.

2. Scale $\frac{1}{4}$" = 1'0"

3. Estimated time -- 3 hours

Note: This plate also has been used at the University of California and can be done in 3 hours.

Group VI

Sorting Plan.

1. Copy Figure 1a7
2. Write $y'' = 1/x$
3. Time -- 4 minutes

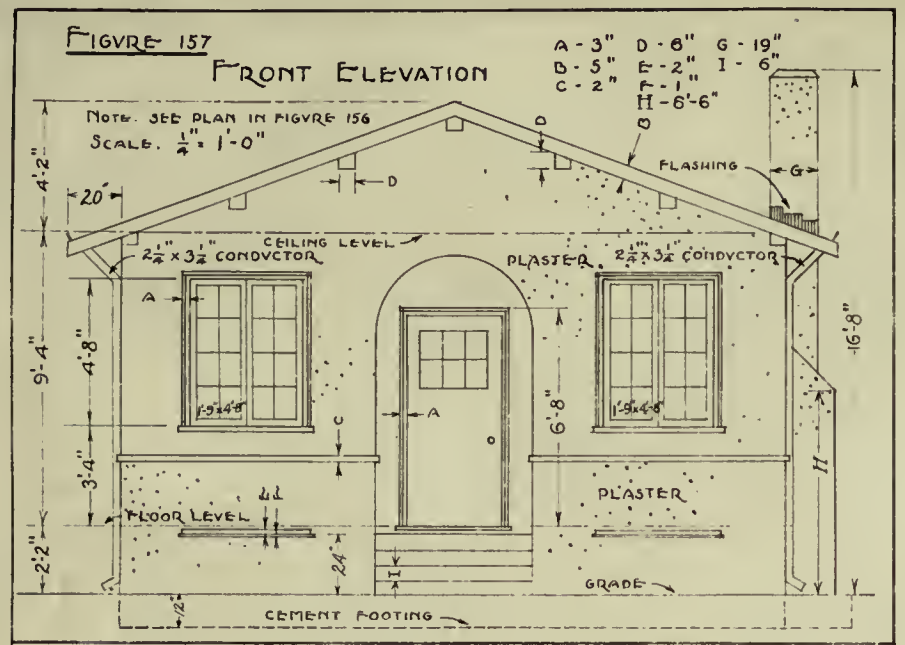
Note: This plate was found to be easier if diversity of definitions was not to come in for 1/2 minute.

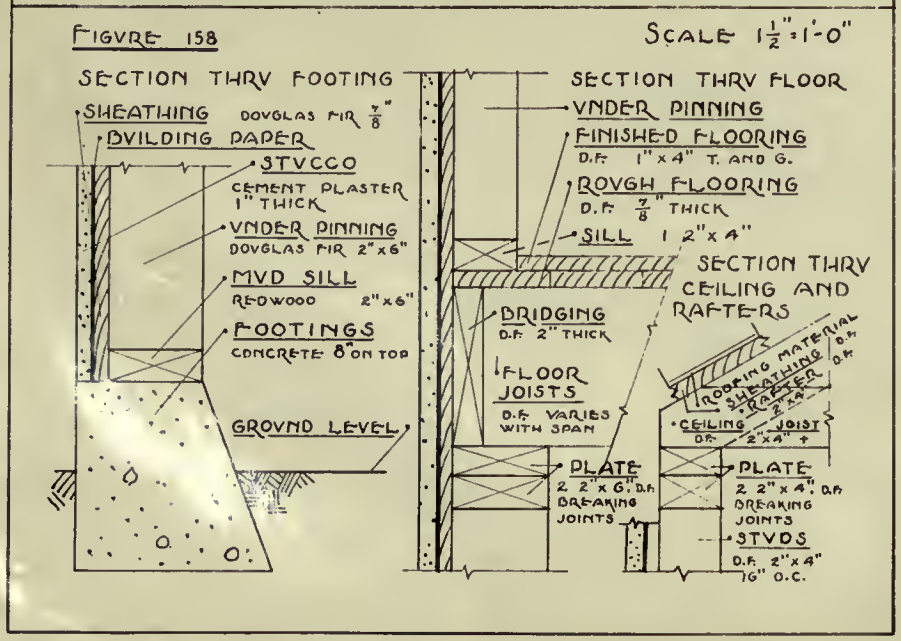
Group VIII

Sorting Operation.

1. Copy Figure 1b7.
2. Write $y'' = 1/x$
3. Estimated time -- 3 minutes

Note: This plate was found to be easier if diversity of definitions was not to come in for 1 minute.





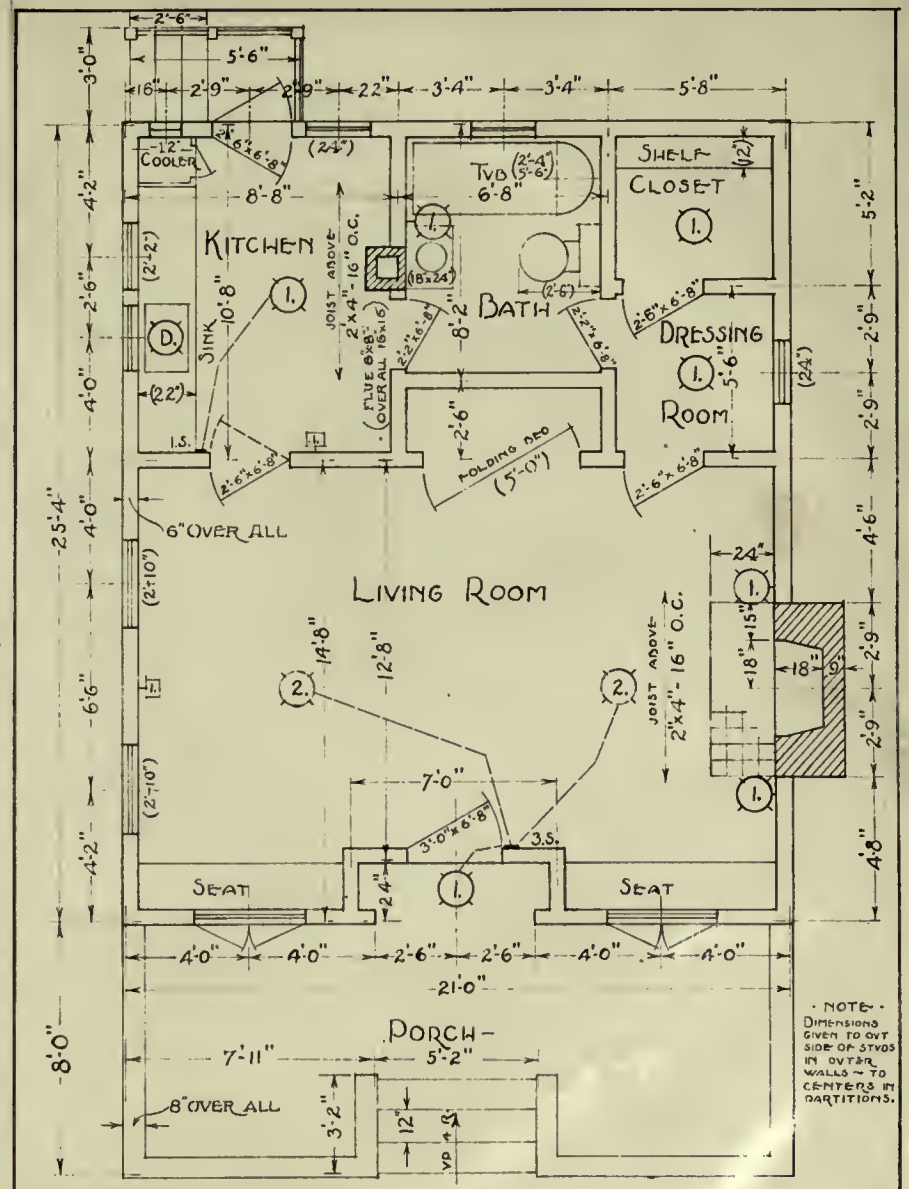


FIGURE 156 GROUND FLOOR PLAN

AN APARTMENT BUNGALOW.

PART THREE

DESIGN

THE RELATION OF DESIGN AND PLANNING

Design and planning are closely related and frequently need to be studied together, but the principles underlying design may not always be studied to best advantage in the same problems where planning is the important feature. For this reason, design and planning are considered separately in this thesis until the principles of each are sufficiently understood to admit of being combined into one course, which is, of course, the ultimate goal.

METHOD OF STUDYING THE FIELD OF DESIGN

The content of the course in design has been determined by examining the factors which make for the attainment of the desired goal, that is, facility, originality, and refinement in design. These factors are; first, the analysis of what makes a pleasing design; second, the acquisition by the student of an appreciation of refined proportions; third, the accumulation of a knowledge of the forms of architectural expression; fourth, the acquisition of facility in designing.

The principles underlying good design are difficult to formulate. A satisfactory and complete statement of what makes good or bad design has not yet been framed. Beauty of design depends upon the excellence of proportion of the various parts, and their relationship to one another. Every law that has yet been laid down as a scientific basis of

proportion has been so questionable as to be unsatisfactory as a working basis for design and is of use only as a check. While a general scientific basis of design has not yet been discovered, certain specific arrangements of masses have been found which, when followed, result in designs that usually look well and satisfy the eye, provided that the proportions of each part and the proportion between parts be good. These have been reached by an analysis of the field of design and the classification of designs into several groups. Certain groups of designs are found to be satisfying to the eye provided that the parts are well proportioned, while others are always unpleasing to the eye. From such a procedure J.B.Robinson has formulated certain principles of design in his book, "Architectural Composition."

In dealing with the design of the building as a whole, his first classification is on a basis of vertical divisions of the building which are pleasing to the eye. These are, in brief:

1. A single mass.
2. Two masses with a connecting link.
3. Three masses with two connecting links.
4. Any of the above three with appendages on:--
   (a) Both ends.
   (b) One end only.
5. One large mass balanced against a great number of details.
6. Subordinate masses, which may be classified similarly to the large masses.

proportion has been so inestimable as to be unsatisfactory as a working basis for design and is at best only as a check. While a general scientific basis of design has not yet been discovered, certain specific arrangements of masses have been found which, when followed, result in designs that usually look well and satisfy the eye, provided that the proportions of each part and the proportion between parts is good. These have been reasoned by an analysis of the field of design and the classification of designs into several groups. Certain groups of designs are found to be satisfying to the eye provided that the parts are well proportioned, while others are always unpleasing to the eye. For such a procedure J.E.Robinson has formulated certain principles of design in his book, "Architectural Composition."

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   (a) Both ends.
   (b) One end only.

5. One large mass balanced against a great number of details.

6. Subordinate masses, which may be classified similarly to the large masses.

His second division is on a basis of horizontal divisions. These are:

1. One horizontal member, especially if capped with a heavy cornice.
2. Two horizontal divisions with cornice as a crowning member.
3. Three horizontal divisions with widest dimension in the middle.
4. More than three divisions, treated as a modified form of three divisions.*

The second factor, the acquisition of an appreciation of refined proportion, becomes necessary in the absence of any definite rule as to what constitutes good proportion. This appreciation can be gained by the constant seeing of buildings that are in good proportion and the copying of these buildings in sketches. This demands that the student must be familiar with the history of architecture and the important buildings of different ages and different styles. The discussion of the history of architecture is not included in this thesis. In addition, however, to the course in the history of architecture, the student needs to be shown good examples of various styles that will illustrate the problem that he is working on . At the early stages of design, imitation is a valuable aid in gaining an appreciation of the styles of architecture.

*It will be noticed that the modern treatment of many skyscrapers is a development since this book was published. This need not affect the present discussion, for it is far beyond the limits of this problem.

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*It will be noticed that the modern treatment of many skyscrapers is a development since this book was published. This need not affect the present discussion, for it is far beyond the limits of this problem.

The third factor, the accumulation of a knowledge of the forms of architecture and ornament, is of such importance as to deserve being organized into a separate course. Moreover, this knowledge can be gained more readily if studied independently of the course in Design. Accordingly, the study of the forms of architecture and ornament has been incorporated in the course called "Architectural Forms." However, at the beginning of the course in Design, a few of the forms of architecture are so necessary that they will be incorporated into it. These forms may be found listed in Tables II (page 44) and III (Page 47)

The fourth factor deals with the acquiring of facility in design. This involves an understanding of the technique of getting architectural ideas on paper, and also practice in applying this knowledge. The technique of designing has two phases. The first is the skill in drawing and in rendering architectural ideas. This comes under the course dealing with graphic representation, which is not studied in this thesis. The second phase deals with the method of studying a design. The procedure of developing an idea from the first conception to the finished drawing is as follows. The first idea is placed on paper at a rather small scale. The sketch is then enlarged one or more times until the scale of 1/4" = 1' 0" is reached. This is the scale of the dimensioned working drawing. At this scale all of the larger proportions are set. The details are then enlarged to the scale, 3/4" = 1' 0", full size, or any other convenient scale.

In performing these operations, five principles must be kept in mind to reach a successful and efficient solution of a design or "projet." They are as follows:

1. The general proportions can be best determined in simple masses at a fairly small scale.

2. The details of the finished building must be subordinate to the whole and in the same proportion as they were in the preliminary drawing at small scale.

3. The design cannot be developed independently of the plan.

4. The elevation is dependent upon the section.

5. The structural consideration of the building must always be kept in mind as the design is being developed.

Summarizing; the four factors of design which form our basis of selecting the content of the course in design are: first, the analysis of what makes a pleasing design; second, the acquisition by the student of an appreciation of refined proportions; third, the accumulation of a knowledge of architectural forms; and fourth, the acquisition of facility in design.

BASIS OF ORGANIZING SUBJECT MATTER INTO A COURSE

The principles controlling the organization of the subject matter into a course in design have been stated previously in the discussion of the field of construction. The correlation of the courses in design, in architectural forms and in planning influence the organizing of the subject matter

In particular these generalizations, like principles and so are in sense is needed a successful and efficient solution of a design or "project." They are as follows:

1. Correct proportions can be best determined in a fit model or a fairly small scale.

2. The details of the finished building must be considered in the light and in the same proportion as they are in the ultimate drawing or small scale.

3. The design cannot be considered independently of the site.

4. The elevation is dependent upon the section.

5. The structural consideration of the building must always be kept in view in the design in detail as well as in large.

Generalizing, we have [illegible] of rules which can be basis of selecting the method of the course in design [illegible] then, an example of how such a [illegible] design [illegible] the application in the instance of an apartment in [illegible] structural [illegible], the economical [illegible] of structural [illegible], and [illegible], the necessities of [illegible] design.

Scope of [illegible] a [illegible] in a [illegible]

The principles controlling the [illegible] of the subject matter into a course [illegible] have been briefly presented in the discussion of the field of composition. The correlation of the courses in design, to a definite [illegible] and in [illegible] interests the [illegible] or the subject matter

in each of these.

In considering the first factor in the study of the field of design, that is, the analysis of what makes pleasing design, the most important principles in organizing the subject matter are: first, a progression in easy steps from the simpler groupings in design to the more complex; second, the presentation of new material as an outgrowth of the old; and third, the motivation of the work by practical applications when possible and occasional competitions between students. These considerations give one basis for organizing the content of a course in design as is indicated by the tabulation which occurs further on in this discussion. (See page 36)

In gaining an appreciation of refined proportion, which is the second factor in the study of the field of design, the element of imitation plays a very important part. Good examples chosen from the various styles of architecture which illustrate the principles that are being studied at any particular time should be copied by the student. These copies should frequently be freehand sketches in which the general proportions of the building are studied. At other times, more carefully drawn copies should be made, This work should supplement the original work in design throughout the course/

Due to the organization of the course in planning and design, the principles resulting from the consideration of the

in case of fusion.

In considering the first factor in the study of the field of design, that is, the theories of architectural planning, the most important principles in controlling the complex matter are first, a progression in each step from the simpler principles in design to the more complex, through the consideration of the material in an outgrowth of the site and form, the motivation of the mass as a rational application possible and reasonable compositions arrangement. These considerations give one skill to consider the problem of a course in design or it is followed by the consideration which ensure success in the final situation. (See page 40)

In period an appreciation of related problems, which latter cannot factor on the street or the civic design, the element of interaction plays a very important part. Such simple means that the outline begins of individuality. Such illustrate the principles that are under consideration or not practicable are should be begun in the student. These begins considerably in consequent relations in a big all general treatments of the building are studied. Although these are essentially these begins should be used, this more local equipment the original ness in design introduces the interest

Due to the adaptability of the design in school, but design, the principles resulting from the consideration of

last factor are somewhat arbitrarily determined. The first principle is that proportions can best be determined in simple masses. During the early part of the first semester, little else can be included, due to the fact that only a limited knowledge of architectural forms has been gained. The principle that the design must be developed in connection with the plan may also be emphasized toward the end of the first semester. The second term, the principle that design is dependent upon the section and the principle that the structural consideration of the building should always be considered may be added. The remaining semesters' work is largely a continuation of the study of these same principles applied to more complex designs. The remaining principle, i.e., that the details of the finished building must be subordinate to the whole and in the same proportion as they were in the preliminary drawing at small scale can best be studied in the latter part of the course dealing with architectural forms.

ILLUSTRATIVE PROBLEMS

The types of buildings selected as subjects for the study of these underlying principles matter little. They must, however, illustrate the principles that are being studied at any particular time. A review of current work of architects shows numerous private residences, mausoleums, stores, auditoriums, theatres, schools, hospitals, hotels, clubs, banks, and churches. Any of these might make good subjects for problems or "projets" illustrative of the under-

lying principles of design. Of these, the private residence occurs most frequently and in the greatest variety of shapes and sizes. For this reason, the private residence may be largely used as illustrative material for the first semester's work in design.

From the foregoing principles the following tabulation has been developed, which gives the content of a course in architectural design to cover four semesters.

CONCLUSION:

A PROGRAM FOR A "DESIGN" COURSE

The following program is offered as a suggestion of how this material might be organized into a course.

FIRST SEMESTER — Time--9 hours per week

PRINCIPLES TO BE MASTERED:

1. SINGLE MASSES

   a. Treatment of horizontal lines

      Division of wall
      - Into 2 parts
      - Into 3 parts

      Mouldings
      - Cornice
      - String courses
      - Attic courses

   b. Fenestration
      - 1 story
      - 2 story
      - 3 story

2. ONE MASS AND APPENDAGES

   Treatment of Horizontal lines

   Treatment of Fenestration of appendages

3. SINGLE MASSES WITH SUB-ORDINATE MASSES

   2 sub-ordinate masses

   3 sub-ordinate masses

   Several small masses

4. DORIC ORDER

   At small scale

   At large scale

   Window Architraves

CORNICES

Tuscan

Ionic

ILLUSTRATIVE PROBLEMS (First Semester)

	PROBLEMS.	Weeks Allowed	Prelim. Sketches	Final Sk.
1	1. One story cottage	1		2
	2. Two story house (rustic cornice)	1		2
	3. Tuscan order (with mouldings)	½		1
	4. Two story house (tuscan cornice)	2	2	1
	5. Doric order (small scale)	1		1
	6. Three story city house	2	2	1
	7. Original Design (based upon plans made in planning)	2	1	1
	8. Ionic cornice and window architraves	½		1
	9. Country house with service wings	2	2	1
	10. Old English cottage	2	2	1
	11. Competition (in connection with planning.)	2	2	1

~~The Second Semester the Remeining Classifications considered by Robinson, should be Learned.~~
~~The Illustrative Problems should follow those indicated in "Planning", in the remaining semesters.~~

SECOND SEMESTER

PRINCIPLES TO BE MASTERED

ONE MASS AND APPENDAGES (Cont'd.)

TWO MASSES (with Connecting Link)

Fenestration of Link

TWO MASSES AND APPENDAGES

THREE MASSES (with Connecting Link)

RELATION OF ELEVATION TO SECTION.

RELATION OF ELEVATION TO STRUCTURAL REQUIREMENTS

ILLUSTRATIVE PROBLEMS (Second Semester)

Five problems Such as

A Small Club
A School
A Church Etc.

Two Problems Such as

A Bank (Elevation and Section)
A Library " " " Etc.

Competition Involving Above Principles (with Planning)

THIRD AND FOURTH SEMESTERS

Use of the Classic Orders as Decorative Forms --- 3 Problems

Continuation of Above Program in connection with Planning.

Systematic Study of the Requirements of One Building.

SECOND SEMESTER

REVOLUTION IN THE ELECTRONS

ONE MORE LAW IDENTIFIED (cont'd.)

TWO MAGNETS (with connecting link)

Penetration of Link

TWO ELECTRIC AND ELECTROMAGNETS

THREE MAGNETS (with connecting link)

RADIATION OF ELECTRICITY TO MAGNETS.

RELATION OF ELECTRICITY TO THEORETICAL MECHANICS.

ILLUSTRATIVE STUDIES (two or three semesters)

Five problems such as

A Small Crane
A Pulley
A Square, etc.

Two problems such as

A Lamp (Elevation and Section)
A Factory " " " etc.

Competition involving Force Principles (with drawing)

LIFE AND POWER DEPARTMENT

Use of the Climate Centre as laboratory focus --- 3 Problems
Continuation of Power Problem in connection with Planning.
Systematic study of the Requirements of One Building.

PART FOUR

ARCHITECTURAL FORMS AND ORNAMENT

The study of architectural forms divides itself into two parts. First, the forms as a whole, and second, the ornament of the separate members of these forms. Architectural ornament has been considered separately, in this thesis, from the architectural forms in determining what subject matter should be taught in the course of architectural forms.

In considering the forms, it is found that the same principles of composition underlie good design in the building as a whole, and good design in architectural forms. In addition to these principles, two other considerations must be kept in mind. An understanding of this relationship between the design on paper and the form in reality must be kept constantly in mind. An understanding of this relationship results in pleasing proportion and refinement of architectural forms and ornament. The second consideration is that an appreciation must be gained of the changes in the form when it occurs in several different styles. This of of great value to draftsmen who are employing the freer styles of architecture. These principles must receive emphasis throughout the whole course of architectural forms.

The subject matter to be taught has been determined by an analysis of architectural forms and by the selection of those forms which are essential to draftsmen. This subject matter will be found listed in Table II, Page 44.

PART FOUR

ARCHITECTURAL FORMS AND DESIGNS

The study of architectural forms divides itself into two parts. First, the forms as a whole, and second, the arrangement of the separate members of these forms. Architectural ornament has been considered separately, in this thesis, from the architectural forms in determining what ornament should be taught in the course of architectural forms.

In considering the forms, it is found that the same principles of composition materially good design in the building as a whole, and good design in architectural ornament. In addition to these principles, two other considerations must be kept in view. In consideration of this relationship between the design as given and the ability to execute work on such considerations in mind. In understanding of this relationship principle in choosing composition and arrangement of architectural forms and ornament. The second consideration is that an appreciation must be gained of the changes in the form when it comes to working different sizes. This is of a great value to draftsmen who are supplied the lower grades of architecture. These principles must receive emphasis throughout the whole course of architectural forms.

The subject matter to be taught can best be classified by an analysis of architectural forms and by the selection of those forms which are material to draftsmen. This subject matter will be found listed in "Part II, Page 44.

The basis of selecting the forms to be taught will be discussed after an analysis has been made of architectural ornament.

In considering ornament, the subject matter may be arrived at, first, by an analysis and selection of the elements of ornament, and second, by an examination of the principles that underly the composition. The subject matter of architectural ornament will be found listed in Table III? on Page 47. The principles of composition may be divided into line composition, tone or mass composition, and color composition. Of these, color composition is not necessary in the earlier stages of architectural study. As to line composition, pleasing composition results when lines are used in accordance with the following rules which are stated in Arthur Wesley Dow's book, "Art Composition".

1. Two lines meeting at a sharp angle are pleasing.
2. Two lines which meet at an angle and have the corner bracketed are pleasing.
3. Lines which are subordinate to a central axis or motive are pleasing.
4. Lines which are symmetrically placed are pleasing.

In addition to these statements of Mr. Dow, the fact that:

1. Lines which radiate from a central point are pleasing.

Mass or tone composition is based upon pleasing proportions of light and dark, either in the form of high lights contrasted with shadows, or solids contrasted with voids. A pleasing result in mass composition is obtained

The basis of selecting the forms to be sought will be discussed after an analysis has been made of architectural order.

In considering ornament, our subject matter can be derived at, first, by an analysis and selection of the elements of ornament, and second, by an elucidation of the principles that underly the composition. The subject matter of architectural ornament will be found listed in Table III on page 47. The principles of composition may be divided into line composition, tone or mass composition, and color composition. Of these, color composition is not necessary in the earlier stages of architectural study. As to line composition, primary compositions results when lines are used in accordance with the following rules which are, in fact, Tselay Dow's book, "Art Composition".

1. Two lines meeting at a more acute angle are pleasing.
2. Two lines which meet at an angle and have the former prolonged are pleasing.
3. Lines which are coordinate to a central axis or active are pleasing.
4. Lines which are symmetrically placed are pleasing.

In addition to these statements of Dow, the real fact:

1. Lines which radiate from a central point are pleasing.

Even in tone composition is found some pleasing proportions of light and dark, which is the form of color lighted contrasted with shadows, or white contrasted with black. A pleasing result in tone composition is obtained

1. When the masses suggest pleasing line composition,

2. When there is a balance of a large mass against smaller masses,

3. When similar masses are balanced against each other in pairs, or

4. When similar masses are grouped in threes, the largest being in the middle.

These principles are the basis of architectural ornament.

BASIS OF SELECTING SUBJECT MATTER.

The frequency with which the forms occur has been used as the basis for selecting what subject matter ought to be taught in the course of "Architectural Forms and Ornament." The Classic orders of architecture and details taken from them occur most frequently. The modifications of the Classic orders which developed during the Renaissance and the Colonial period also occur with frequency, likewise, the Collegiate Gothic architecture also occurs somewhat frequently and is of sufficient importance to demand study in this course. The remaining forms of architecture do not occur frequently enough to justify being included in this course. They are used in offices which specialize in this style or where a highly experienced draftsman along this line is employed.

BASIS FOR ORGANIZING SUBJECT MATTER.

The subject matter of the course in "Architectural Forms and Ornament" will be organized on a basis of the same principles that have been used previously. Imitation again plays a very important part in this organization.

1. When the masses support placing line composition,

2. When there is a balance of a large mass against smaller masses,

3. When similar masses are balanced against each other in pairs, or

4. When similar masses are grouped in threes, the largest being in the middle.

These principles are the basis of architectural ornament.

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BASIS FOR ORGANIZING SUBJECT MATTER.

The subject matter of the course in "Architectural Forms and Ornament" will be organized on a basis of the same principles that have been used previously. Imitation again plays a very important part in this organization.

Due to the close relationship of design to architectural forms, a few of the most fundamental forms will be given in the course in "Design" during the first semester, and the time allowed for architectural forms will be added to the time allotted to the "Design" course.

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TABLE II

ARCHITECTURAL FORMS

Note: This table is arranged similarly to Table One, the columns on the right of the list indicating the term in which the particular item is to be taken.

SUBJECT MATTER	I	II	III	IV	Remarks.
ORDERS OF ARCHITECTURE					
COLUMNS					
Tuscan----------		X			
Doric----------	X	X			
Ionic----------		X			
Corinthian----------			X		
Composite----------			X		
Greek Doric----------			X	X	
Greek Ionic----------		X	X	X	
Greek Corinthian---------				X	
Renaissance Adaptations--		X	X	X	
Colonial Adaptations-----		X	X	X	
CLASSIC ORDERS					
CORNICES					
Relation to Height of Building.	X	X	X		
Roman Cornices					Slight Steady
Tuscan----------	X				
Doric----------	X				
Ionic----------	X	X			
Corinthian----------			X		
Composite----------			X		
Greek Cornices					
Doric----------			X		
Ionic----------			X		
Corinthian----------				X	
Renaissance Cornices		X	X	X	
Colonial Treatment		X	X	X	
DOOR AND WINDOW TREATMENTS					
Architraves etc					

TABLE II

[illegible]

Note: This table is arranged similarly to Table One, the columns to the right of the also indicating the years in which the [illegible] is to be taken.

[illegible]	I	II	III	IV	Results
[illegible]					
[illegible]					
Lumber					
Corn		X			
Iron					
[illegible]			X		
[illegible]			X		
Green Corn				X	
Green Iron			X	X	
Green [illegible]					
Homesteads [illegible]		X	X	X	
Social [illegible]		X	X	X	
[illegible]					
[illegible]					
Raising [illegible]	X	Y	X		Y
[illegible]					
Lumber	X				
Corn	X				
Iron	X	X			
[illegible]					
[illegible]					
[illegible]					
Corn			X		
Iron			X		
[illegible]				X	
Homestead [illegible]		X	X	X	
Social [illegible]		X	X	X	
[illegible]					

Subject Matter	I	II	III	IV	Remarks
Architrave Alone					
Roman----------	X	X	X		Doric
Greek----------				X	First
Renaissance----------		X	X		Semester
Colonial----------		X	X		
Architrave & Cornice (with and without pediment)					
Roman----------		X	X		
Greek----------				X	
Renaissance----------		X	X		
Colonial----------		X	X		
PEDIMENTS					
Unbroken Pediments---			X		
Broken Pediments-----			X		
ATTIC COURSES----------			X		
BASE COURSES----------			X		
BALUSTRADES----------			X		
ARCHES					
Roman----------			X		
Florentine----------		X			
STRING COURSES ----------	X	X			
COLLEGIATE GOTHIC					
WINDOWS AND MULLIONS ------	X			X	
BAY WINDOWS ----------				X	
BUTTRESSES ----------				X	
ARCHES ----------					
Two centered ----------	X			X	
Four centered ---------	X			X	
PARAPET WALLS ----------				X	

Subject Matter	I	II	III	IV	Remarks
Indicative Mood					
Aorist		X	X		Aorist
Future				X	First
Imperfect		X	X		Generation
Optative		X	X		
Subjunctive - Contract (with and without particle)					
Aorist			X		
Future				X	
Imperfect		X	X		
Optative		X	X		
PARTICIPLE					
Aorist (active, middle)			X		
Aorist Passive			X		
ATTIC DECLENSION			X		
BASIC GRAMMAR			X		
SYNTAX			X		
VERBS					
Review			X		
Literature		X			
Review Test	X	X			
DOCUMENTARY PROSE					
Review Lit. and Lang.	X			X	
Lit. Prose	X				
Notes on	X				
Attic					
Epic contracts	X			X	
Ionic contracts	X			X	
Homeric Text	X				

Subject Matter	I	II	III	IV	Remarks
COPING					
Parapet Walls				X	
Gables				X	

TABLE III

ORNAMENT

Note: Shapes of mouldings learned first Semester. Refinement of mouldings studied second Semester.

SUBJECT MATTER	I	II	III	IV	Remarks
1 MOULDINGS					
ROMAN			X		
Fillet----------		X			
Bead----------	X				
Cavetto----------	X	X			
Scotia----------	X	X			
Cyma Recta----------	X				
Cyma Reversa----------		X			
Ovalo----------	X	X			
Torus----------		X			
GREEK			X		
2 DECORATION OF MOULDINGS					
ROMAN					
Anthemion and honey suckle			X		
Leaf and dart		X			
Bead and fillet		X	X		
Acanthus			X		
Bayleaf Garland			X		
Egg&Dart		X			
GREEK DECORATION				X	
3 DECORATIVE BANDS					
ROMAN					
Dolphins and achanthus			X		
Acanthus scroll			X		
Flutted bands			X		
Festoon			X		
GREEK					
Greek Fret				X	
4 REPEATED ORNAMENT					
ROMAN					
Rosette			X		

TABLE III

ORNAMENT

Note: Scope of moulding during first Semester. Patterns made of moldings studied second Semester.

SUBJECT MATTER	I	II	III	IV	Remarks
1. MOULDING					
ROMAN			X		
Fillet		X			
Bead	X				
Cavetto	X	X			
Scotia	X	X			
Cyma Recta	X				
Cyma Reversa		X			
Ovolo	X	X			
Torus		X			
GREEK			X		
2. DECORATION OF MOULDING					
ROMAN					
Astragalus and Bead; egg and dart			X		
Leaf and dart		X			
Bead and fillet			X		
Acanthus			X		
Zevlaat Cabinet			X		
Bud and leaf		X			
OTHER DECORATION				X	
3. DECORATIVE BANDS					
ROMAN					
Dolphins and acanthus			X		
Acanthus scroll			X		
Fluted bands			X		
Vitruvian			X		
GREEK					
Greek Fret				X	
4. REPEATED ORNAMENT					
ROMAN					
Pompeia			X		

Subject Matter	I	II	III	IV	Remarks
Lion's Head			X		
Anthemion			X		
5 CONSOLES					
Roman			X		
Greek			X		
6 ROMAN KEYSTONES			X		

Subject Matter	I	II	III	IV	Remarks
Lion's Head			X		
Antheaion			X		
COMMODES					
Roman			X		
Greek			X		
ROMAN EMPERORS			X		

CONCLUSION:

OUTLINE OF COURSE IN "ARCHITECTURAL FORMS"

On a basis of the above considerations, the course in "Architectural Forms" has been organized. A brief outline of the work in the four semesters may be used as a guide, as follows:

FIRST SEMESTER

a. Small Scale Studies of

Tuscan Cornice
Doric Cornice
Ionic Cornice
Doric Column
Related Forms

b. Free hand sketches of Forms

SECOND SEMESTER

a. Detailed Study of

Tuscan Order
Doric Order
Ionic Order
Related Forms

b. Comparative Study with other Styles

c. Free hand sketches of Forms

THIRD SEMESTER

a. Detailed Study of

Corinthian Order
Composite Order
Related Forms
Other Roman Details

b. Comparative Study with other Styles

c. Introduction to Greek orders

d. Free hand sketches of Forms

e. Decorative use of Orders on the Facade of a building.

Conclusion:

Analysis of Journal Instructional Usage

In a study of the above concluding items, the course in Audiovisual Films has been discussed. Brief analysis of the work in the four semesters may be used as a guide, as follows:

First Semester

a. Small, basic studios of

Image Overlays
Basic Control
Audio Overlays
Basic Cutaway
Matched Frame

b. Film based exercises of forms

Second Semester

a. Detailed study of

Fixed Order
Basic Order
Limit Order
Matched Frame

b. Descriptive films with other subjects

c. Film based exercises of forms

Third Semester

a. Detailed study of

Continuity Scene
Descriptive Scene
Dramatic Scene
Order Effect Utility

b. Descriptive Scene also other subjects

c. Correlation to other courses

d. Film based exercises of forms

e. Descriptive use of objects in the [illegible]

FOURTH SEMESTER

a. Further Study of the Greek Orders.

b. Detail Study of a Few of Most Important Gothic Forms.

c. Freehand Sketches of These Forms.

FOURTH SEMESTER

a. Further study of the great orators.

b. Overall Study of a few of most famous or notable poems.

c. Practice in Scansion of Single Poems.

PART FIVE

PLANNING

BASIS OF SELECTING CONTENT FOR COURSE IN PLANNING.

The content of the course in planning has been determined by examining those qualities which are necessary to possess in order to develop and organize a plan successfully. Those qualities are; first, a knowledge of the basic principles which underlie planning, second, facility in developing a plan problem, and third, familiarity with the scientific method for finding a solution of a problem.

The basic principles underlying planning which should be learned by a student are:

1. The plan must be worked out in relation to the structural requirements of the building.
2. The plans must be considered in relation to the cross sections of the building.
3. The plans must be related to the elevations.
4. Any one floor plan must be developed in relation to the other plans of the building.
5. Plans may be adapted to fit different styles of architecture.
6. It is frequently desirable to place several adjoining rooms on the same axis.
7. It is necessary to have judgment as to the size of the rooms and ability to estimate the size of the rooms already constructed.

These are the principles which underlie good planning.

Facility in planning is to be gained by constant practice. Frequent planning problems should be given, starting with simple problems, and gradually advancing to more complex problems.

PART FIVE

PLANNING

BASIS OF SELECTING CONTENT FOR COURSE IN PLANNING.

The content of the course in planning has been determined by examining those qualities which are necessary to persons in order to develop and organize a plan successfully. These qualities are: first, a knowledge of the basic principles which underlie planning; second, facility in developing a plan process; and third, familiarity with the scientific method for finding a solution of a problem.

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These are the principles which underlie good planning.

Facility in planning is to be gained by constant practice. Frequent planning problems should be given, starting with simple problems, and gradually advancing to more complex problems.

To gain time for this practice, the method of presenting the finished plans must be simple. Pencil drawing on tracing paper will be satisfactory for most of the drawings required. This is the method used in most architectural offices.

The next important thing to be gained from a course in planning is the conception of the use of scientific method in reaching the solution of a problem. One of the things which makes a building valuable for a long period of time is that it shall meet the needs for which it was built in the most satisfactory manner possible. This method of examining the requirements of a building is excellently illustrated by the pamphlet by Strayer, Englehart and Hart called, "Standards of Schoolhouse Construction". Although this method of study is extremely valuable in actual practice, it is not possible in this course to give much time to it. A short time in the last semester of the student's work has been allowed to it in order that he may gain this conception of the method used in a scientific attack of a problem.

The purpose of a course in planning is to become familiar with the several points which have been just described.

BASIS OF SELECTING ILLUSTRATIVE PROBLEMS.

In selecting problems with which to illustrate the principles outlined above, the most essential consideration is that the problems must motivate the work by being practical. It is not possible to study every type of building that occurs in modern practice, nor is it necessary to do so for the most

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important purpose of a course in planning is to learn the principles that underlie planning, and not to learn a multitude of facts and details which are to be found in one specific type of building only. Providing the proper method of attacking a problem is known, a study of the peculiar needs of the different types of problems need not be considered until they occur in the offices. In examining the current work of architects, the type of buildings to be found are private residences, stores, banks, churches, clubs, hotels, theatres, memorials and mausoleums, etc. Of these, the private residence occurs most frequently and with the greatest variety of form. It varies from very small cottages to mansions of several stories, and country houses consisting of several complex parts such as service wings, amusement wings, residence portions, etc. Since this type of building is best known to the student and has such varying possibilities in planning, it will be used in the beginning of our course in planning. After studying the residence, simple problems may occur from the list of buildings just mentioned. These should gradually become more complex as the course advances.

BASIS OF ORGANIZING SUBJECT MATTER.

The same principles have been used in organizing the subject matter of the course in planning as was outlined in Part II under construction. The element of competition can be used at times to stimulate the student's work, but this element must be used with discretion, or the course will

important purpose of a course in planning is to learn the principles that underlie planning, and not to learn a multitude of facts and details which are to be found in one specific type of building only. Providing the proper method of attacking a problem is known, a study of the peculiar needs of the different types of problems need not be considered until they occur in the office. In examining the current work of architects, the type of buildings to be found are private residences, stores, banks, churches, clubs, hotels, theatres, memorials and mausoleums, etc. Of these, the private residence course most frequently and with the greatest variety of form. It varies from very small cottages to mansions of several stories, and country houses consisting of several complex parts such as service wings, servants wings, residence portions, etc. Since this type of building is best known to the student and has such varying possibilities in planning, it will be used in our explanations of our course in planning. After studying the residence, similar problems may occur from the list of buildings just mentioned. These should gradually become more complex as the course advances.

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The same principles have been used in organizing the subject matter of the course in planning as was outlined in Part II under construction. The element of competition can be used at times to stimulate the student's work, but this element must be used with discretion, or the course will

lack thoroughness and continuity. One or more of the problems each semester should be studied in relation to the course in design. All the principles underlying planning which have been enumerated above should be covered, briefly at least, the first semester. The second and third semesters should be devoted to a more extensive study of these same principles, using more complex problems, and part of the fourth term should be devoted to the scientific solution of a simple problem.

The time allotted to planning is six hours per week each of the four semesters. On the basis of the foregoing consideration, the following program is suggested as one possible organization of the work.

lack thoroughness and continuity. One or more of the problems each semester should be studied in relation to the course in detail. All the principles underlying planning which have been enumerated above should be covered, briefly at least, the first semester. The second and third semesters should be devoted to a more extensive study of these same principles, using more complex problems, and part of the fourth term should be devoted to the scientific solution of a simple problem.

The time allotted to planning is six hours per week each of the four semesters. On the basis of the foregoing considerations, the following program is suggested as one possible organization of the work.

CONCLUSION

TYPICAL PROGRAM FOR FIRST SEMESTER

Note: Preliminary solutions should be filed at the end of the first week when they occur.

PROBLEMS Scale 1/8" = 1'0"	Weeks allowed	Prelim. sketches	Final sketches	REMARKS
1. A _ Room Bungalow (small)	1		3	
2. A _ Room Cottage	1		2	
3. A _ Room House (first floor)	1		2	
4. Same (Seoond floor plan)	1		2	
5. A _ Room House (Two plans)	2	3	1	Two Sketches for each floor.
6. A _ Room, one story House, irregular plan.	2	3	2	
7. A _ Room House (two plans), irregular plan.	3	3	2	
8. A _ City House (three plans)	2	2	1	
9. A competition -- a large country house.	3	3	1	Combined with "Design."

PROGRAM FOR SECOND SEMESTER

Six problems such as A small club A Library A Church, etc.				
A Competition	3	2	1	Combined with "Design."

PROGRAM FOR THIRD SEMESTER

Five or Six problems combined with design--such as:				

DOMESTICS

TYPICAL PROGRAM FOR FIRST SEMESTER

Note: Preliminary solutions should be filed at the end of the first week when they occur.

PROBLEMS Scale 1/8" = 1'0"				REMARKS
1. A _ Room Bungalow (small)	1			3	
2. A _ Room Cottage	1			2	
3. A _ Room House (First Floor)	1			2	
4. Same (Second floor plan)	1			2	
5. A _ Room House (Two plans)	2	2		1	Two sketches for each floor.
6. A _ Room, one story House, irregular plan.	2	3		2	
7. A _ Room House (two plans), irregular plan.	2	3		2	
8. A _ Story House (three plans)	2	2		1	
9. A competition -- a large country house.	3	3		1	Combined with "Design."

PROGRAM FOR SECOND SEMESTER

Six problems such as A small club A Library A Church, etc.				
A Competition	3	2		1	Combined with "Design."

PROGRAM FOR THIRD SEMESTER

Five or six problems combined with design--such as:				

A small Hotel A School A Bank Building An Office Building, etc. Competition	4	2	1	At least three should involve the Classic orders as decoration.
FOURTH SEMESTER				
A thorough Investigation of some simple problem along methodical lines for about one half of the course. Remainder of Semester--short problems, same as before.	7		1	

A small Hotel A School A Bank Building An Office Building, etc. Construction	4	2	1	At least three should involve the Classic orders as decoration.
FOURTH SEMESTER				
A thorough Investigation of some single problem along architectural lines for about one half of the course. Remainder of Semester--short problems, same as before.	7		1	

PART VI
RELATION OF COURSE TO SECONDARY
SCHOOLS AND UNIVERSITY.

A few additional remarks must be made concerning the articulation of this course with the High Schools and The University of California.

As to the High School it is assumed that all students who enter this course have had the following subjects before they enter the Junior College:

Algebra
Geometry
Mechanical Drawing (One Year)
Freehand Drawing (At least one Year).

As to the Relation of this Course to the University, this course is not organized for students who expect to take the architectural course in the University, for there the work is viewed from a very different angle. Furthermore the Necessary prerequisites for the Upper Division courses could not be given in connection with this course and still leave time to accomplish the purposes for which this course was organized.

This course was organized for students who expect to take only a two year Course.

PART VI
RELATION OF COURSE TO SECONDARY
SCHOOL AND UNIVERSITY.

A few additional remarks must be made concerning the articulation of this course with the high schools and the University of California.

As to the high school it is assumed that all students who enter this course have had the following subjects before they enter the Junior College:

Algebra
Geometry
Mechanical Drawing (one year)
Freehand Drawing (at least one year).

As to the relation of this course to the University, this course is not designed for students who expect to take the engineering course in the University, for there the work is viewed from a very different angle. Therefore the necessary preparatory for the Upper Division courses could not be given in connection with this course and will have to be accomplished the preparatory work this course was arranged.

This course was arranged for students who expect to take only a two year course.

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