A R C H I T E C T U R A L E D U C A T I O N

WITH SPECIAL REFERENCE TO THE UNIVERSITY OF PRETORIA

d e u r

BRIAN ALLAN THEODOR SANDROCK

Voorgelê ter vervulling van 'n deel van die vereistes vir die graad M.Arg. in die Fakulteit Wis- en Natuurkunde.

UNIVERSITEIT VAN PRETORIA,
PRETORIA.

15 Julie 1960.

A R C H I T E C T U R A L E D U C A T I O N

WITH SPECIAL REFERENCE TO

THE UNIVERSITY OF PRETORIA

C O N T E N T S

----oOo----

P R E F A C E

This thesis concerns the education of architects, with one of its chosen objects to bring into focus a particular aspect of a broad contemporary problem - the reconciliation of technology and the spirit. Indeed it must be openly admitted that this work was prompted in the first instance by the sincere belief that such a reconciliation is not only possible, but a matter of profound necessity. It is written in the teeth of increasing specialization, fully mindfull of the manifold responsibilities that will befall the architect if he is to maintain his age-old role of bringing together in harmony all the technological, materialistic, and spiritual aspects of human endeavour -; but in the ready conviction that it is entirely for the good that such a high aim be accomplished.

It is not intended to labour the wider aspects, since they are well enough known - but it behoves any thinking person to be attuned to the overall state of things around him, being so enabled to relate the details of his own particular line of experience to the situation as a whole. In the face of a landslide of technological advance, aesthetic and spiritual values tend to become obscured, outdated and ignored - scientific knowledge becomes increasingly impersonal and overwhelming. The pattern of serious thought shifts uneasily in search of equilibrium in the field of relentless new forces; while popular philosophy floats inevitably according to the ebb and flow of circumstances. The educationalist is ever more in need of a wide and steady understanding.

Never-the-less, this work is concerned primarily with a limited field -; architectural education, with special reference to the University of Pretoria.

 As such /.....

As such it demands a quiet assessment of a fairly intimate situation, rather than a global compilation of references and cross-references. In the long run the findings must be a matter of opinion - and it seems that the basic ingredients of sound opinion will be found in quiet and time. The material itself is at hand.

Furthermore the compilation of notes will be attempted with due respect for the astrigent qualities of brevity and explicity, albeit at the expense of finer subtleties of meaning and interpretation. At its best the work will be a positive probe into the problem. That it could provide a final and unequivocal answer has never been expected.

----oOo----

P A R T I.

ARCHITECTURE AND A PEOPLE.

"Architecture is the most comprehensive of all visual arts and has a right to claim superiority over the others. Neither sculpture nor painting, although both rooted in elementary creative and imitative instincts, surround us to the same extent as architecture, act upon us so incessantly and so ubiquitously. An age without painting is conceivable, though no believer in the life-enhancing function of art would want it. An age without architecture is impossible as long as human beings populate this world." NIKOLAUS PEYSNER.

Architecture bears above all other things unerring and irrefutable testimony to the culture and civilization of a people. It records mercilessly the basest superficialities and the highest spiritual ideals - technological decline or achievement; - it will reveal us blatantly to posterity for what we are, sans excuse, sans explanation. This is inescapable.

Architecture is the function of a whole people - the most tangible evidence of its existence. It is not the product of individual mind and hand alone. It is all-embracing - uplifting if it is inspired and degrading if it is abased. The architect is the guide and the co-ordinator.

We are concerned with two things -; the architecture of South Africa, as a key to our cultural standard -; the position of the architect in relation to the community, as a key to his ability to guide and co-ordinate its architectural creativeness.

 At a glance, /...

At a glance, a raw and unaesthetic architectural scene around us is enough to cause some concern. There is often reflected a new, 20th century mining camp mentality - flambouyant commercialism along with almost complete public insensitivity. Much ado about artistic and scientific flippancies in the so-called intellectual circles - a popular saloon-bar enthusiasm for garishness and sensationalism. Over everything hangs the heavily scented atmosphere of international and national idealogical intrigue.

All this is different from the depth and comparative clam of the 19th century Cape - or for that matter the dilletante aesthetic of the much despised classical revival. Difference in itself is unavoidable when the lubritorium has replaced the stable and the mansion of the "sole agent" has replaced the estate of the country gentleman; but it is in the nature of the difference that there lies ground for perturbation. There has been a change of values. Often our deepest sincerities have merely become a matter of expediency, or investment and return of some kind or another. The carefully patterned customs of the past are overruled, whether they be the solemn tradition of family religion or the finely sculptured stonework of a front entrance.

There is a limit here to logical and objective argument. Logic is very much the mechanistic aspect of the intelligence - the machine tool of endeavour with which it is just as easy to destroy as to create. By itself it finds neither God nor peace nor beauty, but it runs amock with an insatiable hunger for self satisfaction. Logical arguments are built up to enshrine almost anything from the atmospheric aesthetic of much contemporary

 art to the /.....

art to the barren sterility of low cost housing projects - from Communism to Capitalism - from morality to immorality. Let it suffice to say that there has been a change of values. Whether this change of values is for the good - or whether we merely find ourselves in the churning stomach of a civilization that has over-indulged in the ever-ready logic of materialism, is a matter for soul searching rather than for logistics.

That there should be consistency of opinion in these matters is not to be expected, nor for that matter would consistency be desirable - but the underlying process of soul searching is good and should be reflected in contemporary work. Yet it is only in a few notable exceptions that we can perceive any real depth of sensitivity about the less superficial aspects of the contemporary scene. Without this stimulus, architecture becomes a mere succession of solutions, which have meaning only for those who set the problems. We faithfully embark on a spiral of over increasing functional virtuosity which should by all logical reasoning lead us to the stars - but which in fact leads only inwards to itself.

Neither function nor logic are to be despised, for they are the salt of good architecture, but their indispensibility is so obvious as to be in danger of overwhelming all else. They are readily understood and seized upon. Critique becomes widespread and easy when we come to the engineering and functional aspects of contemporary building. We are incessantly told, and we can see, that all is not well. It is necessary only to accept that weaknesses exist, albeit at the price of some exaggeration.

- 4 - What then /.....

What then of the architect in relation to his community. By his own word he finds himself in a position of increasing jeopardy. At almost every conference and meeting of architects the most vigorous discussions are sparked by this very question. Opinion varies from the intense and abysmal despair of younger architects to the heavy, after-dinner contentment of the over matured, - but between these extremes lies a broad band of uneasiness that is too distinct to be ignored. Architecture, whose roots are so deeply entwined in the soil of Western culture seems now to be growing beyond the reach of its own exponents. So each must seize a portion while the going is good -; one must concentrate on the business of profit and return, another on the piecemeal ingredients of a witches brew of aesthetics, - while in the meantime the specialist waits impatiently in the background.

We can afford to look quietly back to Ictinus and his Parthenon, William of Sens and his Canterbury Choir or Michaelangelo and his Dome. Even here, something of the difficulties which beset these men filters, however faintly, through the pages of history. Vitrúvius writes impatiently about the weaknesses and worries of his own profession and devotes himself vigorously to its preservation. William displays the patience of Job in convincing his clients that the existing choir is beyond patching-up and that it must indeed be demolished and rebuilt. Perhaps the problems of our own time are not entirely new.

But by the same process of looking back it is clear enough that that synthesis of mind and material which is the hallmark of good architecture can be achieved only through the complete triumph of the architect over

the difficulties of his own environment - and in this his greatest hope must surely be in the trust and esteem with which he is held in the ranks of his own community. Without such trust and esteem architecture must become the plaything of pundits, clerks and specialists - the architect the general factotum of the building industry.

There are two sides to this - and it can safely be said that the greatest responsibility rests on the side of the architect himself. One can turn with both pride and humiliation through the history pages, to learn with what pains and endeavour the trust and esteem of communities have been won in the past. One can consider the immense breadth of culture and knowledge that was expected of our predecessors before baulking at the prospect of ourselves maintaining a grasp on the expanding cosmos of modern building technology. Certainly trust is something to be won only through ability - and constant readjustment to maintain that ability under changing circumstances. On the other hand there must at least be the seeds of sensitivity and true culture within the people before architecture can lift itself up for the ever increasing exchange of satisfaction between architect and community - yet it would often appear that it is only in a limited field that these seeds are to be found.

We are acquainted with those interminable midnight discussions about the role of the architect in modern society - when each speaker will attempt to adjust architecture to suit his own particular talents. Suggestions vary from transforming it into a new brand of engineering to transforming it into an occult science of building decoration - from big business to highly starched professionalism - from ready arguments about teamwork to

 obstinate /.....

obstinate individualism. To the weary eyed the miasma of ideas is weighed mainly in terms of its duration - and the intriguing reasons that could have brought it into being in the first instance. It is just at these cross-roads of opinion that architecture is the most at home, in the ceaseless endeavour to arbitrate between technology, morality and the spirit. Should any one speaker have his own way, it is likely that architecture might become absorbed on either left or right and the time honoured uniqueness of the profession might be lost. Yet each one in his own light sees architecture being jostled on either side by an ever tightening ring of specialization and petty officialdom. It is feared that its very breadth and diversity might in fact be its greatest weakness in the despairing struggle to break the crust of public indifference.

Thoughts inevitably turn to the educationalist who is looking from the touch lines at the hurly-burly of everyday affairs. Recriminations come easily in the heat of uncertainty and disappointment. But the educationalist himself is perhaps glassy eyed as his thoughts range back and forth in search of better strategies and better training methods for the future.

AN APPROACH TO ARCHITECTURAL TRAINING.

Three basic needs emerge -

The need to develop sensitivity, aesthetic judgement and a broad understanding of the times and the community;

The need to build up knowledge of the technological and functional aspects of building in keeping with new developments;

The need to win the confidence and trust of the community and to enhance the position of the architect.

Architectural education must aim at providing the individual with the essential raw material for the fulfilment of these needs. When architects are properly equipped to fulfil them, the divergency of finer problems will almost certainly solve themselves.

Educational strategy must be carefully and ruthlessly planned in order to achieve the maximum long term results rather than to meet with immediate student and post-graduate acclaim. In this, a shrewd judgement must be made of the true intrinsic value of the training given and of the extent to which the student will fill-in and expand on what he has been taught by way of his own experience and initiative. This is no easy task and professional education can all too easily deteriorate into an encyclopaedic glossing-over which will provide the educationalist with some sort of alibi for almost every kind of post-graduate exigency, but which in the long run carries no real strength within itself. Seldom is the best strategy by any means the most obvious in the eyes of either students or graduates and the educationalist must often carry the weight of his convictions entirely on his own shoulders -; nor is it the duty of the University to provide the profession with ready-made practitioners who will not cause embarrassment in any direction; much as the profession should like to be absolved of its own responsibility for the assimilation of new members. The educationalist must be prepared to accept the benevolent eye of the post-graduate who has learnt a lot of essential things for himself, in the comfort that he for his own part has instilled the process of thinking which

 led to these /....

led to these discoveries in the first instance - and has provided the kind of knowledge which could not have been gained elsewhere but at the University.

Furthermore, one should be wary of the tendency to assess professional status in terms of the sheer duration of university training demanded before qualification. It is common knowledge that some courses of professional training are grossly inflated while other courses requiring far less by way of mere endurance enjoy a higher academic standing. It is only sensible that the training should be as brief and as intensified as is possible, commensurate with the attainment of its essential objectives. Indeed the matter of optimum time utilization is one of paramount importance.

To return to the three basic needs, it is clear that the need to develop sensitivity, aesthetic judgement and understanding is the most difficult one to satisfy. In the first instance we have to deal with young matriculants who are not only immature in the general sense, but who have usually had no previous training in the techniques of visual observation and graphic representation. We are faced with the truly formidable task of first teaching them the basic alphabet of architectural language - a task akin to that which would face the Department of Mathematics if its first-year students had not yet learnt arithmetic. Secondly, we deal here with an aspect of architecture which is least likely to be carried further after graduation. In fact it is likely to be neglected. We are engaged in a fairly exclusive province of learning which is the least open to informed scrutiny, or even understanding, from outside. Thus it is very often thrust into the background after graduation, in favour of other

 aspects which /...

aspects which are more likely to influence lay opinion -; but without this architecture is entirely meaningless and the educationalist must plan carefully with a view to the full life-time of his student.

The need to build up technological knowledge is less difficult to fulfill, albeit no less important, - but we deal here with straight-forward, objective matters that yield easily to the force of reason. We can count with safety on a fairly extensive post-graduate expansion of this knowledge, provided the student is equipped with sturdy tools. It would be wise to ascertain that the student is fully at home with the basic principles of modern technology and building techniques with a view to his future learning.

So far as winning the confidence and trust of the community and enhancing the position of the architect are concerned, we can be sure that the successful fulfilment of the first two needs will carry us a long way towards this goal -; but at the same time the matter is not quite so simple as it might appear at first sight. Some assessment must be made of the broad requirements of the modern age as well as the particular requirements of architecture. The architect must fit into the environment in which he finds himself and must be fully conversant with the language of his times -; thus it might be necessary for him to have certain knowledge, which although of little direct value in his work, is essential to his acceptance in the educated world. Furthermore, we have to deal here with the question of professional self respect which must be attained through the guidance and example of the lecturing staff as much as through the means of syllabus.

In the light of this general approach we must now consider the means that will be adopted in arriving at some positive conclusions on architectural training at the University of Pretoria. Firstly it will be necessary to make a fairly thorough statistical examination of the situation, in order to get solid ground under our feet - a statistical examination which takes in a fairly wide field of time, but which avoids the irregularities of the immediate post-war period. It would, however, be unwise to place too much trust in the purely statistical aspects of the situation and it is, therefore, necessary to follow this by an "on the spot" critique of the various educational processes as they are in fact carried out. Thus armed, we will be in a position to appraise the worth of present training and to explore the possibilities of improvement.

----oOo----

P A R T II.

A STATISTICAL ANALYSIS OF THE SITUATION.

The first part of the statistical analysis concerns the Architectural School as a whole and covers the ten year period from 1949 to 1958 - the main purpose being to establish the size and growth of the school, the annual intake and output, and the numerical relation between degree and diploma students. This is shown graphically in Figure 1.

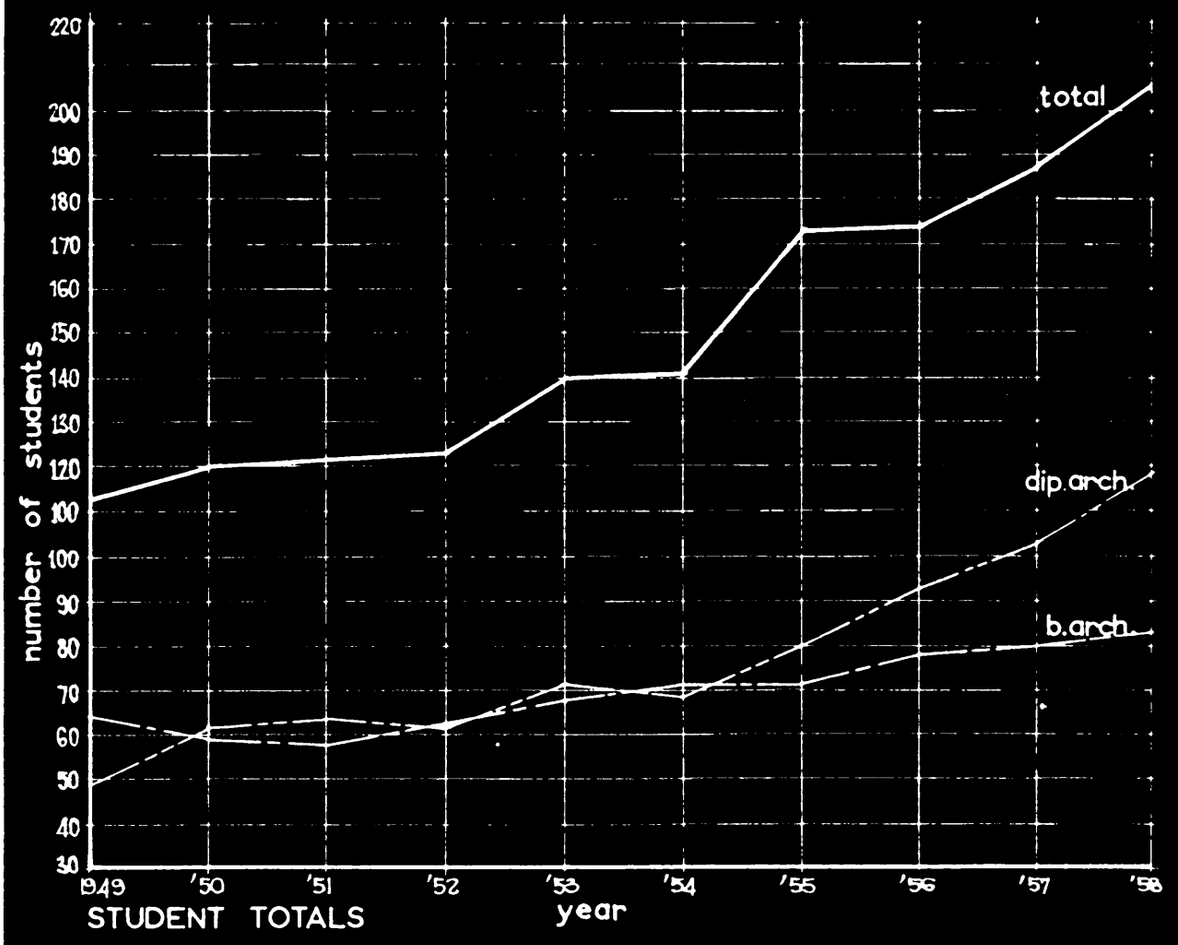
One is at once taken aback by the lack of relation between the growth in student totals and the annual intake. Whereas the student total has doubled itself in the ten year period under review, the annual intake has increased by only 31%. Furthermore, the annual output has actually shown a fairly even decline since 1953. At the same time it can be noted that while there has always been a larger percentage of degree registrations, there are in fact more diploma than degree students in the school and the percentage of diploma students has been steadily increasing in recent years. These unforseen anomalies immediately lead to a statistical group study of the trials and tribulations of 80 students who first registered in the three years 1949 to 1951, with an eye to getting a closer look at the strange swelling process which is apparently taking place in the school. This is shown in Figure 2.

When one considers the group as a whole one finds that 53.75% abandoned the course, while 25% were still studying in 1958. Only 21.25% had qualified in 1958 or earlier. A detail break-down of the 46.25% who

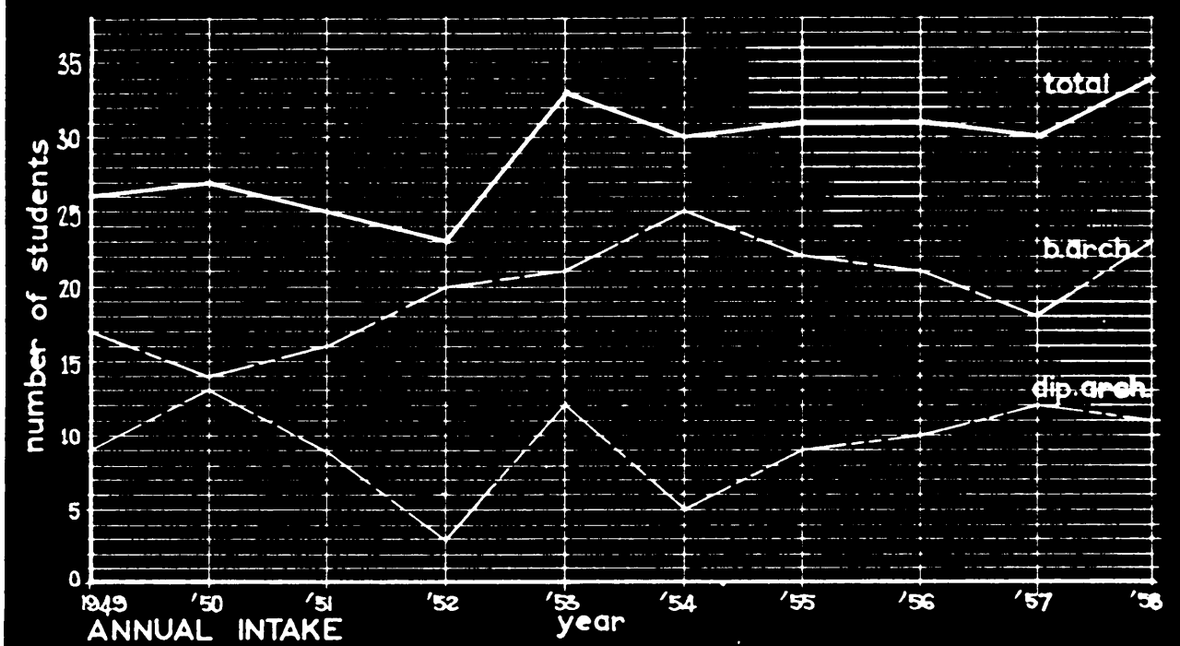
 did not /.....

SIZE AND GROWTH OF THE SCHOOL

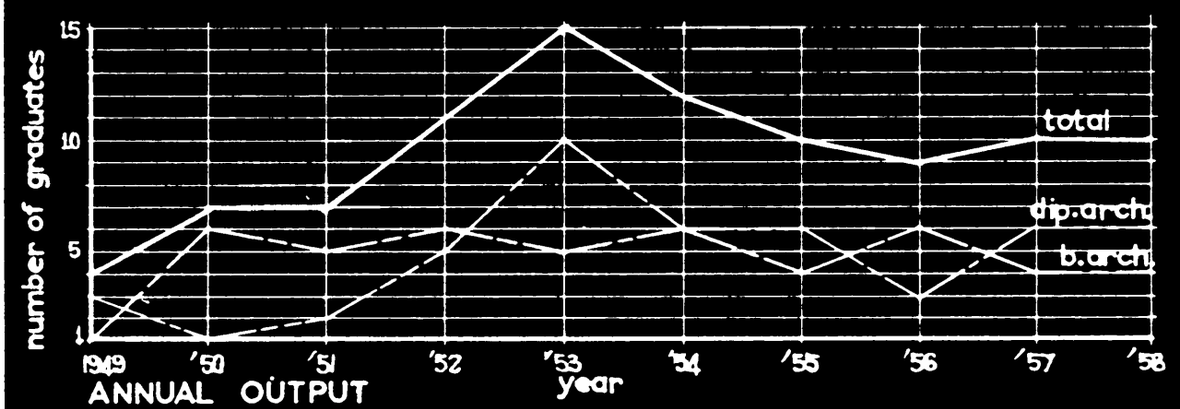
fig.1



STUDENT TOTALS



ANNUAL INTAKE

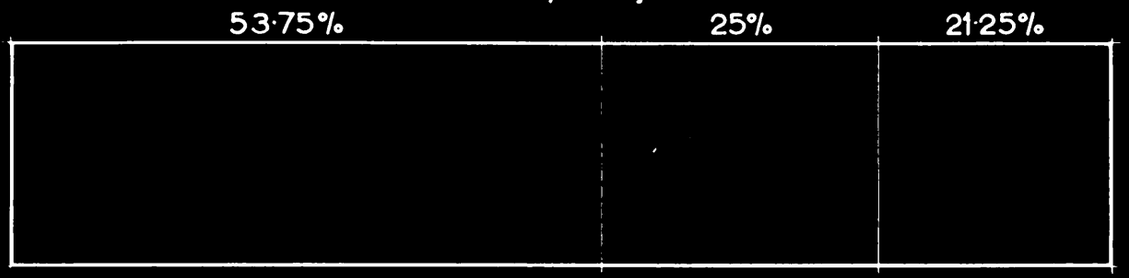


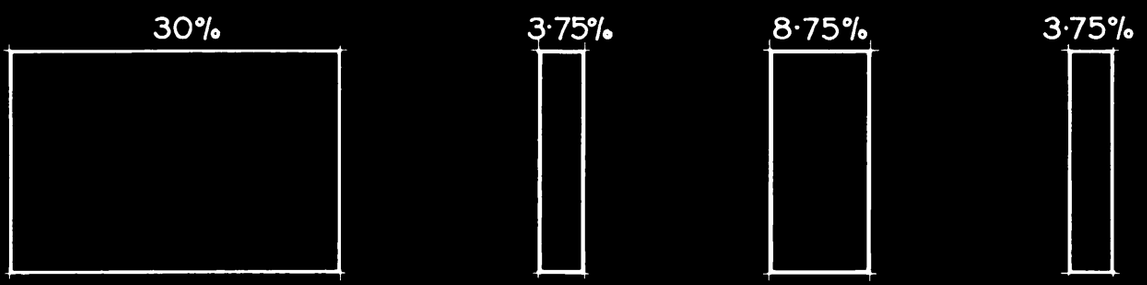
ANNUAL OUTPUT

GROUP STUDY

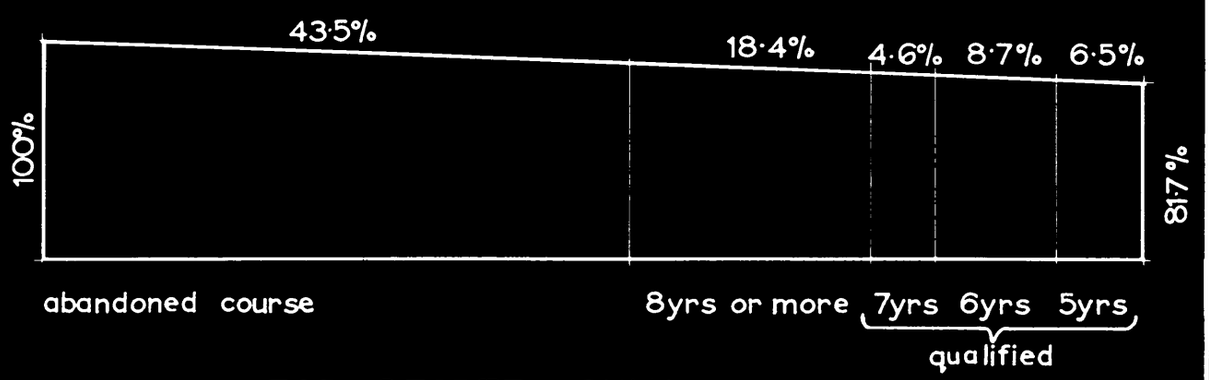
80 students first registered in 1949, 1950 & 1951.

fig.2

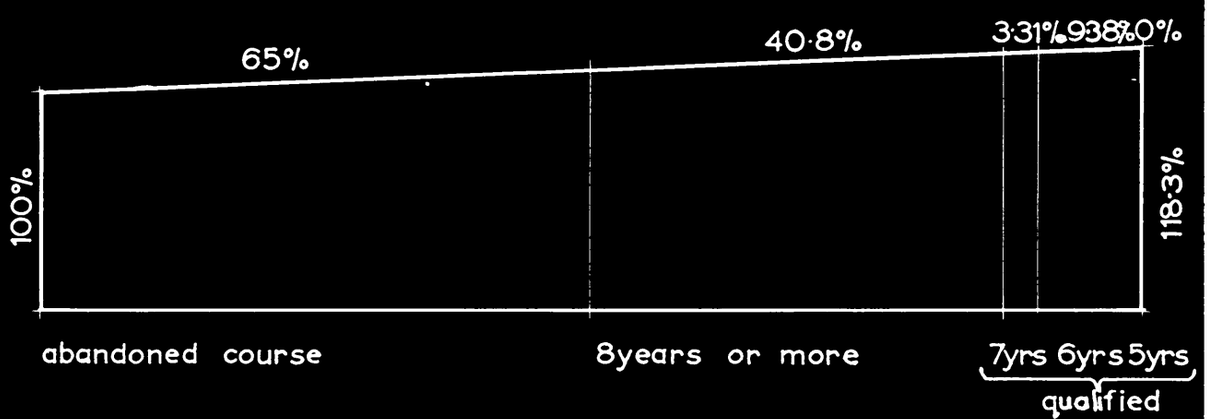




ANALYSIS FOR DEGREE & DIPLOMA COMBINED



ANALYSIS FOR DEGREES ONLY



ANALYSIS FOR DIPLOMA & SERTIFICATE ONLY

did not abandon the course reveals the astonishing fact that only some 4% of the students actually succeeded in completing the five year course in five years! Furthermore 30% of the original group (which is in fact some 65% of those who did not abandon the course) studied for eight years or longer. This then is how the swelling was caused; the greater bulk of students require eight years or more in which to qualify, whereas the course is nominally of only five years duration.

It appears likely that this state of affairs must be mainly due to the opportunities provided for part-time study by way of the diploma course. It is clear that a large number of students who register for the degree course eventually change over to the diploma. They are then free to earn a living and to proceed at a leisurely pace towards qualification. But a separate analysis for full-time and part-time students reveals that although this argument is valid, it can by no means provide the whole answer to the situation. In the group under study the swing-over from degree to diploma is approximately 18%, while it is clear from the graphs in Figure 1 that had a more recent group been studied, the swing-over would have been considerably more pronounced. None-the-less it is obvious that although the academic progress of the full-time students is much better than that of the part-time students, one finds even here that only 6,5% qualify in five years and approximately half of those who do not abandon the course require eight years or more.

In view of the drawn-out nature of the students' progress, it becomes a near impossibility to establish exactly what percentage of those who register eventually receive their qualification. At best it can be said that

 some 54% /.....

some 54% definitely do not qualify -; for the rest it seems to be a matter of perserverance. The interesting thing here is to try to establish at what stage and in which way the hold-ups occur, but this can not easily be done by straight-forward statistical analysis. By a process of induction it is, however, possible to arrive at some conclusions through a study of the statistics for the various Design classes. These are given in Tables 1 - 5 and Figure 3.

Taking the numerical size of classes first, it can be seen that the annual growth in the first and second years more or less parallels the increase in annual intake. From the third year onwards the annual increase in the class size becomes increasingly greater, fourth year having increased about 1.6 times and fifth year having increased about 2.7 times during the ten year period. Although these figures refer only to Design, they do appear to suggest that the swelling process, and therefore the hold-ups, occur mainly in the later years of the course. The reason for this is partly clear from a study of the percentage passes in each year, which reveals that there is a slightly smaller percentage of passes in the senior years than in the junior years. At the same time the overall percentage of passes in Design is considerably better than the percentage of academic success achieved by students in the course as a whole - from which the obvious inference must be drawn that the other subjects and not only Design, are responsible for failures. Whether the other subjects are the main cause of failures is not worth establishing statistically, for there are so many pschycological factors at play as to render the statistics virtually worthless. We come up against the divided attention of the student and the tendency to first throw in

TABLES FOR 1ST, 2ND & 3RD YEARS

year	total	%dip.arch	% b.arch.	%passed	%dip.arch. passed	%b.arch. passed
1949	29	27·5	72·5	65·5	75	62
1950	24	33·3	66·7	66·7	75	62·5
1951	27	33·3	66·7	63	55·5	66·6
1952	28	32	68	78·5	89	74
1953	30	40	60	70	66·7	72
1954	34	23·5	76·5	95	100	92
1955	29	24	76	100	100	100
1956	31	38·75	61·25	93·5	100	89·5
1957	29	48·27	51·73	76	78·5	73·25
1958	32	40·5	59·5	78	69·25	84·25

DESIGN I

year	total	%dip.arch.	% b.arch.	%passed	%dip.arch. passed	%b.arch. passed
1949	27	40·75	59·25	85	91	81
1950	23	43·5	56·5	61	60	61·5
1951	22	50	50	63·5	54·5	72·75
1952	19	37	63	79	86	75
1953	27	63	37	70	65	80
1954	25	44	56	84	91	78·5
1955	29	45	55	90	84·5	94
1956	28	53·5	46·5	71	73	69
1957	30	50	50	60	46·75	73·5
1958	20	65	35	60	61·5	57

DESIGN II

year	total	%dip.arch.	%b.arch.	%passed	%dip.arch. passed	%b.arch. passed
1949	18	44·5	55·5	99	87·5	90
1950	15	46·5	53·5	66·5	57	75
1951	29	62	38	79·25	77·75	82
1952	17	58·75	41·25	70·5	70	71·5
1953	20	55	45	85	72·5	100
1954	19	79	21	74	66·75	100
1955	25	64	36	76	75	77·75
1956	33	57·5	42·5	69·75	58	86
1957	26	57·75	42·25	80·75	80	82
1958	22	54·5	45·5	73	58·25	90

DESIGN III

TABLES FOR 4TH & 5TH YEARS

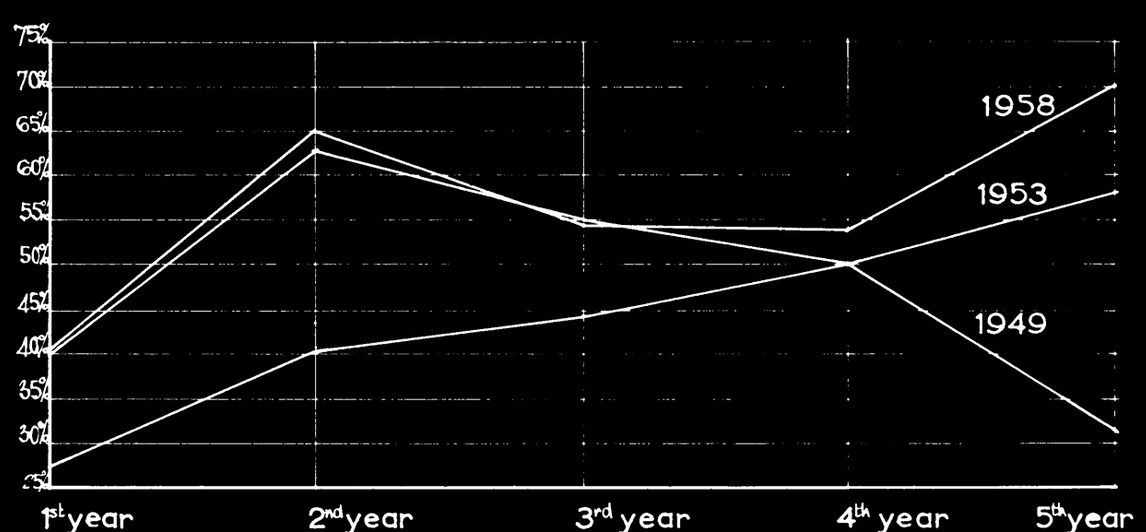
fig 3

year	total	%dip.arch.	%b.arch.	%passed	%dip.arch. passed	%b.arch. passed
1949	12	50	50	83·25	66·5	100
1950	18	50	50	78	89	66·5
1951	14	35·75	64·25	78·75	100	66·75
1952	23	47·75	52·25	87	100	75
1953	21	62	38	86	84·75	87·5
1954	19	58	42	63	63·5	62·5
1955	22	63·75	36·25	59	64·5	50
1956	27	66·75	33·25	92·75	89	100
1957	23	56·5	43·5	52	NOT AVAILABLE	
1958	26	54	46	88·5	78·5	100

DESIGN IV

year	total	%dip.arch.	%b.arch.	%passed	%dip.arch. passed	%b.arch. passed
1949	12	33·3	66·7	100	100	100
1950	10	40	60	60	75	50
1951	19	42	58	63·25	62·5	63·5
1952	19	52·75	47·25	79	90	66·7
1953	24	58·25	41·75	83·5	93	70
1954	19	52·75	47·25	79	80	78
1955	11	45·5	54·5	63·75	100	33·3
1956	19	63·25	36·75	79	83·5	71·25
1957	30	70	30	56·5	47·75	77·75
1958	30	70	30	93·25	95	89

DESIGN V



PERCENTAGE DIPLOMA REGESTRATIONS FOR 1949, '53 & '58

weight on the Design side of the course and then on the other - a matter which is best dealt with by "on the spot" enquiry. Broadly speaking, we can say that the majority of 'eight year students' are concentrated in the senior years.

This division of attention made difficult another study which was considered to be of considerable importance - namely, to examine the ability of students in Design in relation to their ability in the mathematical and scientific field. Popular thinking would sometimes have it that the gifted designer with a deep aesthetic sensitivity is often unable or deeply unwilling to master the processes of mathematical and scientific thought. This line of thinking has induced a tendency to soften the scientific side of architectural training in recent years in order to make possible the progress of the more "gifted". If it were entirely valid, it becomes clear in the light of modern requirements that the true architect would be a rarity - indeed the whole object of this work itself might have been baulked by the limitations of human ability. The need to get reliable information on this matter will be abundantly clear.

It is reasonable to assume that the tendency to neglect other subjects in favour of Design will be the greatest amongst those students who are weakest in Design and therefore have to devote most energy to keeping up in this subject -, even if the assumption is not entirely fool proof. If we concentrate only on students who have excelled in Design, the incalculable effects of divided attention are likely to be very much reduced. A careful study was therefore made of the progress cards of students who had made the best progress in Design during the ten year period under review, in order to establish the relation

between their examination results in Design and in the scientific and technical subjects. Students who had passed in Design with a symbol of B+ (70%) or better in three or more of the 5 academic years were taken as being the best Design students. It was found that 33 students who had completed the course satisfied these requirements. The results of this study were interesting and fairly conclusive. The most brilliant students had done equally well in Design and the mathematical subjects. Of the whole group only six had experienced any difficulty in Mathematics, Applied Mathematics, Physics or Theory of Structures, while two had actually experienced difficulty in Design itself having failed in this subject at some stage or another. Of the six who experienced some difficulty with technical or scientific subjects only two appeared to have been retarded by an inability to cope with these subjects; these students were delayed one and two years respectively, but they never-the-less qualified.

When it is borne in mind that any tendency towards divided attention, however much reduced in the group under study, would tend to weigh against these findings, it can be said with a degree of conviction that the popular opinion regarding the relation of Design to Mathematical and Technical ability is unfounded. Of course the converse is by no means proven - that mathematical and scientific ability are a key to design ability. Nor would this limited study exclude the possibility that there are indeed individuals who possess considerable talent for design but yet have no aptitude for mathematical subjects. The important finding here is that there do not appear to be enough individuals in this category to merit softening of the course - and if architecture requires individuals with

ability in both directions and these individuals can be found in numbers, it would be most unwise to cater for others. Only one matter must be borne in mind here, namely that the present extent of mathematical and scientific training is minimal and we have therefore matched a fairly low mathematical aptitude against Design -; one can go no further than to presume that our findings will remain reasonably unchanged should mathematical training be intensified.

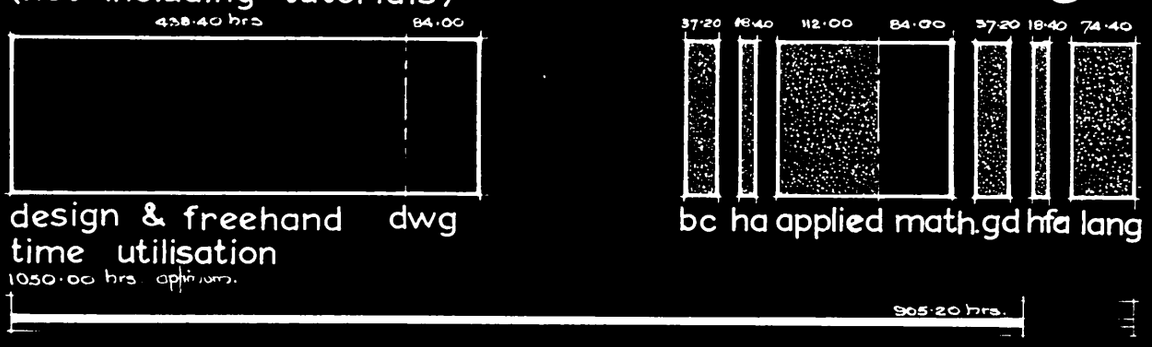
The final part of the statistical analysis is concerned with the matter of time utilization for full-time students - which must to an extent be theoretical, for it is based on time table and printed syllabus rather than on actual practice. For our present purposes this is to be preferred however, since we are not yet concerned with the extent to which the prescribed course is actually carried out in practice - that must come from "on the spot" observation. We are interested in the structure of the syllabus from a purely academic point of view, bearing in mind that some subjects may be considerably thinner in practice than one would deduce from seeing them described in the year book.

The main thing to be noticed from Figure 4 is that the amount of time devoted to other subjects in relation to Design becomes less with each successive year of the course. The more academic subjects such as Applied Mathematics, Languages, Physics and History are mainly concentrated in the earlier years, while there are no purely academic subjects in the final year - a policy which is more or less in line with other professional courses.

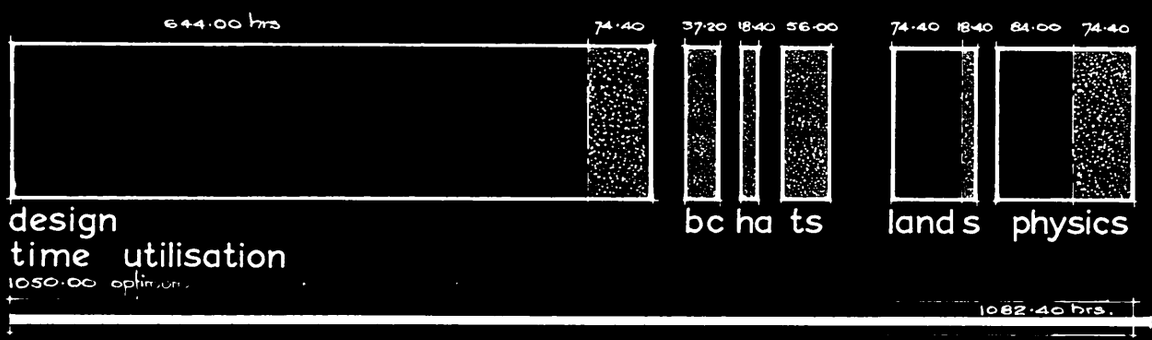
 A layman /.....

GRAPHIC ANALYSIS OF TIME ALLOCATION
(not including tutorials)

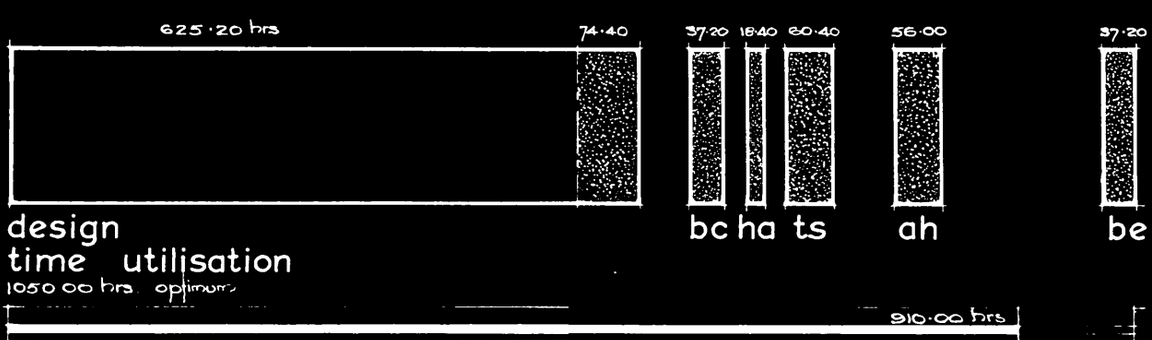
fig 4.



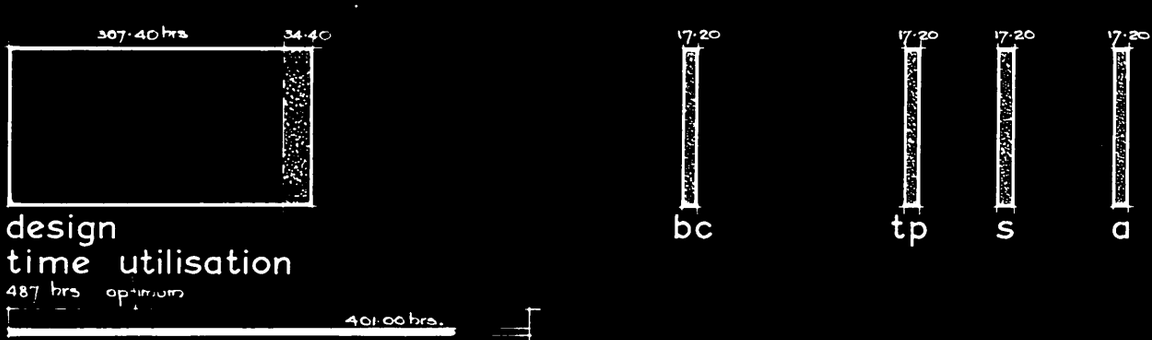
FIRST YEAR



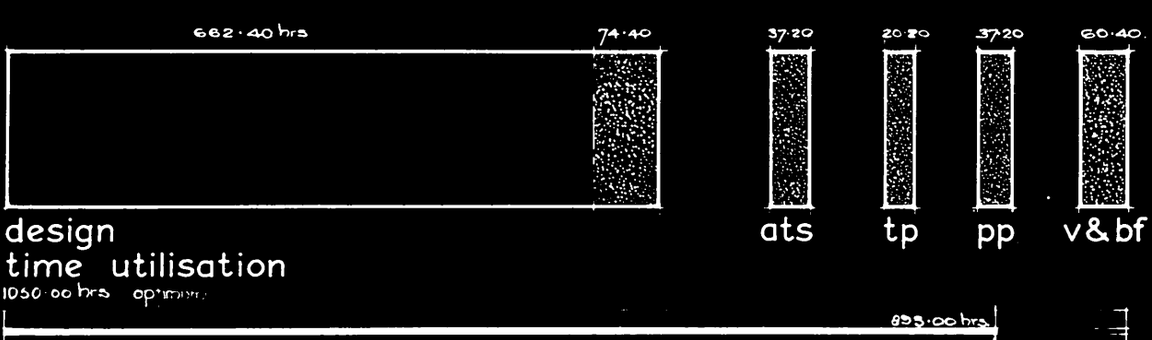
SECOND YEAR



THIRD YEAR



FOURTH YEAR



FIFTH YEAR

building construction	bc.	history of fine arts	b.f.a.	building equipment	be.	applied theory of structure	ats.
history of architecture	h.a.	theory of structure	t.s.	townplanning	tp.	professional practice	p.p.
applied maths	a.m	landsurveying	land s.	specification	s.	valuation & building finance	v&bf
geometrical drawing	gd.	applied hygiene	a.h.	acoustics	a.	language	lang.

A layman would be struck by the massive preponderance of time allocated to practical work in Design. In the light of ignorance, if there is such a thing, studio work is often seen as a kind of handicraft and it is suggested that Architecture should be relegated to the Technical College. To one unacquainted with the study of design it is difficult to appreciate that the design process is quite as academic as any other; but there is little object in wasting time on evangelism in this direction when the critic can be adequately answered in another. If we completely eliminate design lectures and studio work from the course, the architectural student spends some 1,200 hours on other subjects which are presumably acceptable - an amount well equal to that required for a normal B.Sc. degree. This matter settled, it would never-the-less be worth while for the architect himself to consider whether the present allocation of studio time is in proper balance. Once again we must leave the matter for detail study of a non-statistical nature.

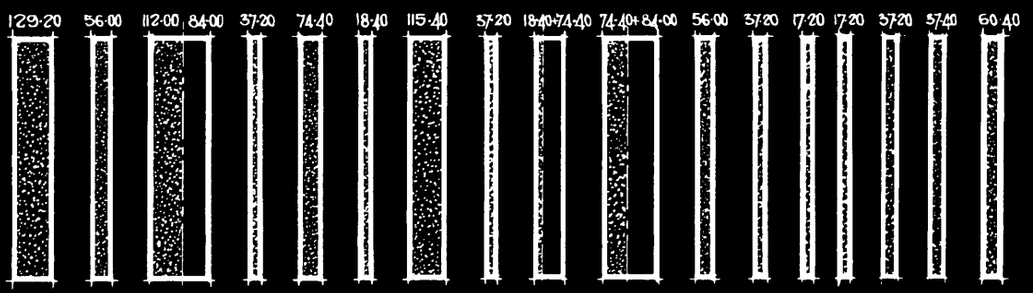
Figure 5 gives graphical information on the course as a whole from which the large number of different subjects can be seen - 18 in all. The analysis seems to show some justification for the often heard argument that apart from Design, architects study a little bit about almost everything and nothing much about anything in particular. It is, however, interesting to compare this wide variety of subjects with the orbital syllabus of civil engineers, who in a typical four year course tackle no less than 29 different subjects - a phenomenon which is by no means held up in justification. Another interesting point is the time spent on lectures concerning structural subjects such as theory of structures, building construction

 and services /....

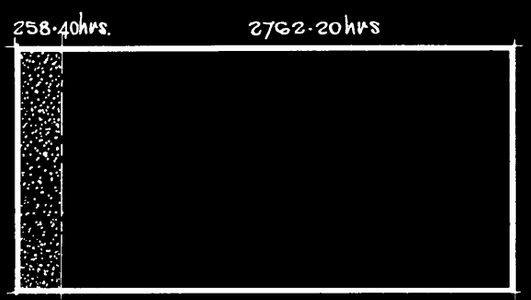
GRAPHIC ANALYSIS OF TIME ALLOCATION
(not including tutorials)

fig.5

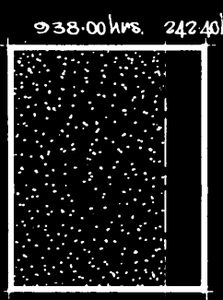
design & freehand drawing



TIME ALLOCATION 1-5



design & freehand drawing

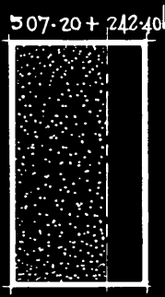


other subjects combined

TIME ALLOCATION 1-5

design subjects

structural subjects



related subjects

TIME ALLOCATION 1-5

practica

theory

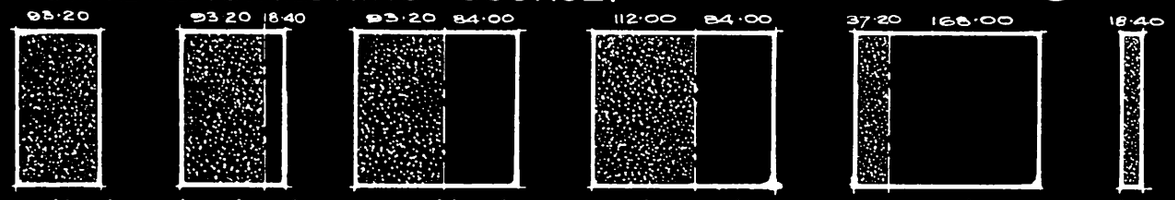
and services of buildings, etc., which is 393 hours compared with 350 hours of lectures and 348 hours of practical work devoted to this aspect in a typical civil engineering course. Naturally the architect devotes more time to building construction and less to theory of structures, but it is never-the-less important to note that the architect in fact spends more time in actual lectures in this sphere than does the civil engineer. The architect devotes some 153 hours to lectures on Theory of Structures as compared with 230 hours of lectures and 174 hours of practical work in the case of the engineer - but the engineer has only 48 hours of lectures and 87 hours of practical work in Building Construction as compared with 130 hours of lectures for the architect - and of course no cultural subjects. The time allocation of a typical Civil Engineering course is set out graphically in Figure 6.

Bearing in mind the different requirements of the two professions, all this would seem to indicate that from a time-allocation point of view the architect is adequately equipped to meet the demands that will be made upon him in the field of structure and building construction - and that he will be more than able to resist any encroachment into his own field by an over zealous engineering profession. But it is common knowledge that this is not entirely true in practice, which makes it advisable to carry the comparison between the two courses a little further.

Some light is shed on this anomaly when we consider what might be called the foundation subjects. The civil engineer studies at least two years of Mathematics, two years of Applied Mathematics and one year of Physics, with the possible inclusion of Chemistry. The architect studies only one year of Physics and a simplified Capita

GRAPHIC ANALYSIS OF TIME ALLOCATION. CIVIL ENGINEERING COURSE.

fig 6.

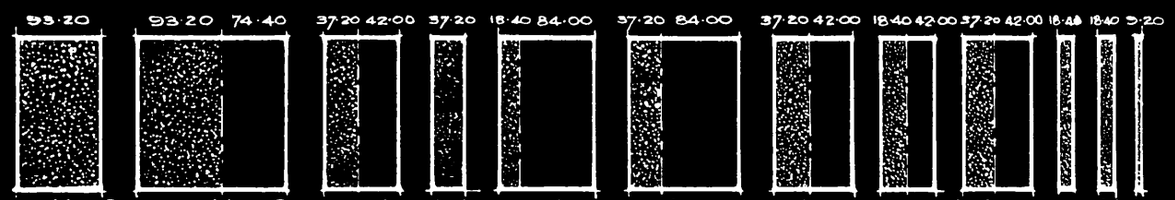


time utilisation

990·00 hrs optimum. (not including late lectures as in architecture)

802·40 hrs.

FIRST YEAR

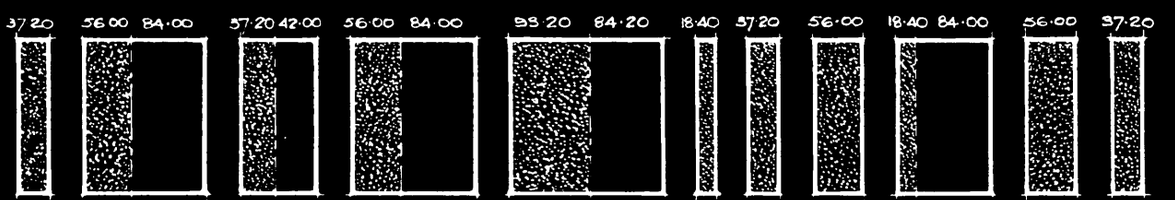


time utilisation

990·00 hrs. optimum. (not including late lectures as in architecture)

887·40 hrs.

SECOND YEAR

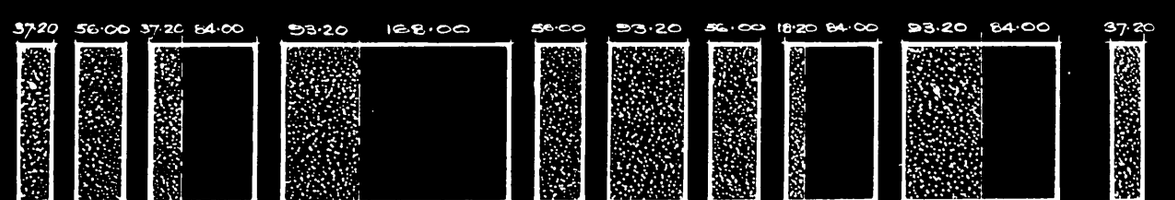


time utilisation

990·00 hrs optimum (not including late lectures as in architecture)

882·00 hrs.

THIRD YEAR



time utilisation

990·00 hrs optimum (not including late lectures as in architecture)

998·20 hrs.

FOURTH YEAR

mathematics	maths	graphics	g.r.	strength of materials	s.t.
physics	phy.	introduction to electrotechnics	i. elect	theory of structures	t.s.
applied mathematics	a. maths	economy & commerce	e.c.	design	de.
chemistry	chem	technical language	t.l.	business economics	b.e.
engineering drawing	e.d.	hydraulics	h	industrial psychology	i.ps.
introduction to engineering	i. e.	geology	geo	industrial statistics	i.st.
metallurgy	met	electrotechnics	e.t.	commercial law.	c.l.
thermodynamics	t.d.	land surveying	land.s.	soil mechanics	s.m.
building construction	b.c.	waterworks	w.w	civil engineering practice	c.e.p.
civil building construction	c.b.c	heat transmission	h.t.	planning & design	p&d
		thesis & laboratory	t&lab		
		seminar	sem.		

Selecta from Applied Mathematics I which is in the process of being abandoned. Quite apart from the fact that his mathematical and scientific grounding must lend to the engineer a greater aura of respectability in this age of the scientific gospel, one wonders how the architect could indulge in some 153 hours of instruction in the Theory of Structures without having endured a university course in Mathematics. The suspicion is aroused that the duration of his training in this direction might not be matched by its academic excellence.

Furthermore, it is interesting to note that Architecture for all its width of field offers no choice of syllabus, as is the case with civil engineering. Much has already been said against excessive architectural specialization, but this does not necessarily exclude a certain choice of syllabus. The architect must view with some trepidation certain subjects offered in the later years of civil engineering training such as Business Economics, Industrial Pschycology, Industrial Statistics, Water Supply, Drainage, Specifications and Quantities, Preparatory Accountancy, Business and Industrial Law, Public Administration and Professional Practice, which are obviously designed to equip the engineer for high executive positions. That these executive positions could infringe on the field of the architect is by no means beyond the bounds of possibility, in spite of the fact that the engineer has no knowledge of architectural design and very little knowledge of building construction - the charm of his greater "syllabus-appeal" would probably prevent the layman from being any wiser.

All in all the architects' training embraces some 4,200 hours of instruction, of which almost 50% is concentrated in the first two years.

With the extension of the course planned for 1960, the total time could be increased comfortably to over 4,500 hours. On this basis at any rate architects should be very competent indeed.

A CRITICAL ANALYSIS OF THE SITUATION.

The existing syllabus for Architecture is set out in Appendix 1, and by comparison the syllabus for Civil Engineering is set out in Appendix 2.

A fundamental problem of the whole architectural training becomes apparent as from the second year - it is the problem of having full-time and part-time students, who are required to do virtually the same syllabus - and who must be assessed according to exactly the same standard. The student who must put in a full day's work in an office has less than half the actual working time at his disposal that a full-time student has. According to theory at any rate the amount of tutorial work given in subjects other than Design is sufficient to fully occupy, without over-straining, the average student in his hours away from the University. Therefore, the part-time student's after-office hours are already as occupied as can reasonably be expected - where then does he find the 650 odd hours of working time which are equivalent to the full-time students' studio periods. It stands to reason that either the diploma student must be worked to breaking point, or else the full-time student must be idle.

In actual experience it has been found that both things happen simultaneously - particularly from the third year onwards. In the second year the full-time student at least has Physics which the part-time student does not,

 but from /.....

but from here on there is no difference. Even when the diploma students are worked to the limit of endurance, it is found that degree students are proceeding at a more than comfortable pace. Primarily, the problem relates mainly to Design, but it is inescapable that the strain of this incongruity should spread through the whole fabric of the course.

The uninitiated will be astonished that such an irrational system could have arisen in the first instance, but to those directly involved it is tempered by the usual complexity of arguments and customs that together go to create the status quo. Nor is the system peculiar to the University of Pretoria. Indeed it has often been defended. It is claimed that provision must be made for part-time study to enable the less financially fortunate student to qualify - or that the heavy demands made on the part-time student quickly result in a greatly increased draughting and design speed, which enable him to keep up with his full-time counterpart. Clearly these arguments are inapt -; the point at issue at the moment is not the advisability or otherwise of part-time study, but whether it is reasonable to expect both diploma and degree students to complete the same work in the same length of time. So far as increased working speed is concerned, it must be admitted that some part-time students have in fact developed ability through adversity, which when coupled with their increased practical experience has placed them in a position of leadership -; but for every one of these there are several others who have merely developed slip-shod ways and who have dragged out the course interminably. In all events one feels that the first mentioned are unfortunate in not receiving a degree for their efforts.

 When this /.....

When this fundamental weakness is seen along with the shortage of full-time studio staff, which will later become apparent, the basic cause of many mass meetings and badly worded petitions becomes abundantly clear. In both underwork and overwork lie seeds of discontent - a matter which it would be pointless to expound any further.

Design:

A layman's first impression on entering the architectural school would be that of students draped in various attitudes across the draughting furniture amid an untidy mess of paper and bric-a-brac - the incidence of students becoming considerably denser towards the junior ateliers. In spite of seeming inactivity, noise is at a fairly high level. Here and there a student might be seen applying water colours with apparent intensity - more intensity than would seem necessary for a painting job - rather more mess too. On the walls hang rows of meticulously rendered illustrations of buildings. The lecturer, if present, is usually not lecturing. All this is rather reminiscent of a primary school grades room and the layman retires in some confusion to the relative sanity of the integral calculus, vague thoughts stirring in his mind about the true purpose of university education.

The architect's impression is probably that of empty draughting stools - renewed irritation at the untidiness - a hardened acceptance of the apparent intellectual innocence on the young faces of those who must somehow be taught the most difficult thing that he can think of - the skill of architectural design. Under these unlikely circumstances a long process of trial and error, of gradually awakening maturity and judgement, of carefully balancing utility against beauty, light, air, structure, form and

 function is /....

function is slowly taking place. This is Design, which is the backbone of the architectural course and the subject first worthy of detail study.

The first year of study is concerned primarily with teaching the art of architectural draughtmanship and presentation along with the carefully planned but rather insiduous introduction of various elementary aspects of design, such as composition in two dimensions, colour, texture, shadow effects, scale and so forth. It must be borne in mind that the average student does not even know how to fill a drawing pan with ink at the commencement of this course, whereas he is required to be a fully proficient draughtsman at the end of it, - proficient that is not only in line drawing with instruments but in all the aspects of architectural presentation. It follows that draughtsmanship must be the predominating factor and that whatever design training there is must dovetail neatly into a syllabus planned primarily around the teaching of this new means of expression. The design side of the course builds slowly and unobtrusively up towards the threshold of understanding of the relation between draughtsmanship and three-dimensional reality. At the same time an attempt is made to equip the student with the essential data he will require before he can undertake real architectural problems. The course as it stands at the moment is purely preparatory. Much of what the student learns is either learnt unawares or so slowly that the work is inclined to be tedious, - particularly so since the normal student is anxious to launch out immediately into the design of multi-million pound buildings. It is probably a mistake to call the course Design I, - if it were called Architectural Draughtsmanship it would be undertaken with a good deal more fortitude.

There is not much quarrel with the present first year syllabus or with the allocation of time, but the school has always suffered from an urgent shortage of demonstrators in this course. It will be clear that continuous personal tuition is essential at this stage, requiring the services of at least two full-time demonstrators - a need which has unhappily never been fulfilled. The result is that students are left to fend for themselves to an extent greater than can reasonably be expected, even in the light of the university approach.

Design begins in earnest in the second year. The students receive lectures in various aspects of Design; the elementary principles of planning, the Gerstalt Theories concerning the psychology of visual experience, landscape gardening, lighting, colour and so on - all according to a fairly well defined syllabus, which does not appear in the year book. Some ten different design problems are set and while the actual context of the problems is revised from year to year the underlying pattern remains unchanged. Thus we always start with a simple, decorative scheme requiring little constructional and planning knowledge while lectures are given on domestic planning and general design principles, then a house, - at a particular stage a purely sculptural problem and at another particular stage a problem dealing almost entirely with interior decór. The pattern of design problems and lectures is carefully worked out in order to lead up to a scheme comprising more than one complex and more than one level. Here the student is introduced to almost all the basic, underlying processes and problems of architectural design. In order to preserve the clarity of the educational process, problems such as difficult site conditions,

 unusual /.....

unusual building restrictions, programme research, adjacent buildings and even cost, etc., are kept to an absolute minimum. The approach is rather empirical and the accent is on building up experience through tackling a fairly large number of small problems, rather than getting bogged down under the detail implications of more specialised design studies. Much is knowingly overlooked in favour of establishing a broad foundation.

Clearly the second year in Design (which is for all practical purposes the first) is one of fundamental importance. So far as the present syllabus and allocation of time are concerned the system is reasonably satisfactory. It has been the custom for some years to have one lecturer in charge of both first and second years - and since this lecturer starts from scratch, it is only to be expected that a fairly well defined, progressive syllabus has evolved. There is not quite the same need for personal tuition as in the first year and one demonstrator in addition to the lecturer could cope with the situation. In the past, the policy has been to have one demonstrator only for first and second years which has meant that both he and the lecturer have been hopelessly overloaded with work.

From the second year onwards, syllabus in Design becomes increasingly vague, if not entirely non-existent. A process of dreary repetition sets in which is by no means helped by the terse but gaseous guidance provided by the year book. We have already seen that although the student has been introduced to all the basic aspects of design in his second year, he remains unable to cope with large or specialised problems - nor is he fully matured or experienced in the art of Design. The fact must be faced that a long period of continuous practice lies ahead before he

can be considered fit to qualify - and that the matter of repeated exercise is in itself one of essential importance. But this does not mean that repeated exercise must now become the main objective of the course, least of all in the eyes of the students themselves.

We can be permitted some wordiness here in order to unfold this situation. The core of learning in all subjects reveals an ever diminishing field of new knowledge in return for an ever increasing vertical effort. No less in Design, the process of refinement is considerably more exacting than the process of assimilation of basic knowledge. The climber, if one may regard the student as such, might be unaware of his own progress, since his judgement is confused by the fresh memory of early progress in contrast to the seemingly prodigious effort required for present advance. Later he will no doubt be heartened to look back on the whole situation with some understanding, - but it is plain that the educationalist is at a certain stage confronted by problems which are as much pschycological as they are educational. His strategy must obviously be planned in the light of both these aspects. In a case such as Design where continued practice is essential to progress, everything possible should be done to make the sphere of practice as varied and stimulating as possible. If problems are merely selected ad lib and without reference to a defined syllabus the element of toil is likely to over-ride the element of learning. Furthermore the student's progress in the field of objective design knowledge, of which there is a great deal yet to be learnt after second year, is likely to be neglected in favour of a too obvious drive towards the achievement of design refinement.

The following design subjects were tackled by a typical group of students in their progress through the school :-

Second Year	Third Year	Fourth Year	Fifth Year
Exhibition Stall	Rag Float	Architects Offi-	Office Building
House	Furniture	ces and Flat	Shopping Centre
Fire Station	Travel Bureau	Hotel	Farm House
Shop Interior	House	Flats	Redesign of
Monument	Office Building	Shops and	Hotel
Cafe	Church and	Offices	Swimming Bath
Filling Station	Church Hall	City Hall	Architectural
Museum	Hotel	Hotel	School
Anglers Club	Architects		Guest Farm
	Offices		

The results of an at random choice of subjects are apparent. This particular group of students studied the problem of an hotel no less than five times during the last three years of their course. Offices of one kind or another were also tackled five times. Meanwhile they gained no experience whatsoever in industrial architecture and the comprehensive regulations and principles pertaining thereto - or design schemes involving the seating of large numbers of persons, with all the attendant problems of acoustics, visibility, comfort, fire regulations, ventilation and so forth. Not only did the group fail to gain any objective knowledge of a wide variety of different building types, but one can imagine with what lack of enthusiasm the fifth hotel was undertaken. Nor were the various problems such as difficult site conditions, programme research, adjacent buildings, etc., which were left unsolved in second year, tackled according to any planned sequence - if at all. Clearly this is not good enough. At the same time it must be pointed out that the University of Pretoria is merely conforming to normal South African practice in this respect -; the blame for this shortcoming cannot in all fairness be laid only at the door of this particular school of architecture. As a matter of fact,

it should perhaps have been said earlier that in examining architectural education at Pretoria, we are in fact examining one representative molecule of architectural education as a whole. Criticisms which arise solely out of the peculiarities of this specific school are not of the most importance to us.

But to return to our list of design subjects, the experienced eye will see even more written between the lines than has so far been mentioned. For instance it will be seen that the subjects are for the most part gleaned from the froth of everyday architectural practice, inasmuch as they demand very little programme research or special planning study. One is tempted to conclude that there is a tendency to suck programmes out of the thumb, rather than to face the detail study that is incipient in the preparation of programmes for more specialised problems. It might be argued that the student should receive the greatest experience in the type of work he is most likely to encounter in practice - but of course this is a superficial argument. Most everyday problems are of a relatively simple nature and if the student has developed the mental processes necessary for the solution of specialised design studies he will experience no difficulty in coping with the simple ones. One might as well argue that three-quarters of a doctor's training should be devoted to the treatment of head colds and stomach upsets.

The matter of programme compilation has in fact been much overlooked - for which one can not entirely blame the individual lecturer. The amount of work involved in the working out of even one comprehensive programme is considerable - and each lecturer is faced with the compilation of a complete set of programmes for each year of design.

 In the absence /....

In the absence of a library of past programmes from which to draw, and of easily available typing and duplicating facilities, his difficulties are manifold. At the same time it must be realised that it is not possible for students to derive the maximum benefit from their work until their efforts are properly guided through the medium of carefully composed programmes.

Another feature of the list of design subjects which is likely to provoke comment is the number of schemes undertaken in each year of the course. It will be seen that only one less problem was tackled in the third and final years than in the second year. Now when it is borne in mind that the second year is based on a fairly quick turn-over of relatively simple problems, one wonders how it is possible to do almost the same number of advanced studies in the same amount of time - even if one makes a liberal allowance for increased efficiency. Either the studies are not really advanced after all, or they are not being done thoroughly, or both. The integration of related subjects such as building construction, theory of structures, building finance, services of buildings, etc., into the design process should become ever more marked as the course proceeds, leading to schemes being done in more detail and at greater length.

In recent years there have been complaints from external examiners that Design is tending to become increasingly abstract and divorced from these practical considerations without which architecture can have no real meaning. But it is clear that until sufficient time is allocated to each problem to enable the student to go beyond the mere superficialities of the situation, it will be pointless to hope for much improvement. It is not

expected that the allocation of more time will in itself solve the problem, but it will certainly bring the solution within the bounds of possibility.

The question of co-ordination between design training and related subjects is one deserving of considerable thought. In some ways it might be compared with the relation of speech development to written language. For instance, if a young child were not permitted to express in speech things which he could neither spell nor write, it is clear that his whole development would be stultified, because his immagination and speech ability are well in advance of his capacity for written language during the early, formative years. However, when he comes to maturity we have a right to demand that his capacity for written language should in every way be equal to his speech ability. Much the same holds true for Design, for if we are to limit the second year students' design immagination entirely to his current knowledge of building construction, we are in danger of imposing an unrealistic restriction on his development - whereas it is essential that his constructional and practical knowledge should be so integrated into design in the final year that his work is architectural in the only true sense of the word.

At the moment we are not so much concerned with the detail solution to this problem as with the broad fact that some continuous curve of action is required throughout the student's progress -; a curve demanding continuity of thought between one year of design and the next. In the achievement of this continuity and in an indirect guidance of the student's approach to his work lies the key, rather than in any specific steps concerning the syllabus. In the past attempts have been made to incorporate subjects

such as building construction into Design, but these steps by themselves have tended to lead to the slow evaporation of the incorporated subject without bringing about a lasting overall improvement.

Continuity in Design is to a certain extent bedevilled by the complete break of over seven months between the end of the fourth year and the beginning of the fifth. This period of time is allocated to the gaining of additional practical experience, so that the student will on qualification comply with the requirements of the Institute of Architects. Quite apart from the merits or otherwise of this break in university training it is clearly wrong in principle that the university course should be adjusted to satisfy any needs other than those of a purely academic nature. It has been argued, with some justification, that the additional practical experience gained during this period is an invaluable foundation for the final year of study. In practice much depends on the type of office in which the student works and on the programme of work in that office during the period under consideration. Only when some form of control is exercised over so-called practical experience, will it be possible to make any truly reliable estimate of its worth. At present there is no control. But to return to the question of principle just mentioned, the inherent dangers are easily seen in the light of a new decree by the Institute of Architects that university training should be extended by six months. Whether or not this extension of the course will eventually transpire to have been an academic advantage, there are strong grounds for the suspicion that it was brought into being in the first instance for purely non-academic reasons. As far as the present break between fourth and fifth year

is concerned, it must remain a moot point whether the advantages outweigh the disruption in continuity and the shortening of fourth year to a point where the students have no sooner settled down, than they must commence preparation for the examinations.

Building Construction:

We now find ourselves on shifting sands. Much difficulty has been experienced in this subject in recent years which has led to an almost annual change of lecturers - and since each lecturer is inclined to improvise his own syllabus for his own particular year, it becomes a difficult task to establish exactly what is in fact being taught. This task if however made easier, through personal experience gained as external examiner in Building Construction I, II and IV over the past four years. The current Building Construction III syllabus is known and Building Construction V being incorporated in the working drawings required of final year students does not appear as a separate subject.

It is advisable to launch our study from two separate angles : from the angle of the syllabus as laid down in the year book and from the angle of Building Construction as actually taught at the moment. So far as the year book is concerned, we find a clearly defined, progressive syllabus, but one which has not been revised for very many years. That it is out of step with modern usage is clear from the attention devoted to various types of brick bonding, brick arches, timber constructions no longer in normal use, purpose made wooden windows and doors, stonework, stone mouldings and cornices, pediments, etc. - while there is no mention of modular construction, curtain walling and other recent developments. The extent to which this

prescribed syllabus is outdated is however more obvious from actual acquaintance than from the year book itself. When one compares the techniques given in the various hand books with contemporary methods, it is clear that the whole matter must come up for revision. Furthermore, there is a degree of duplication between Building Construction and other subjects which must also be eliminated. Bearing this in mind, there is no object in delving deeper into the possible shortcomings of the prescribed syllabus, but we must turn to the subject as actually taught.

Since the lecturers in Building Construction are in everyday contact with modern methods, there has been a natural tendency to break away from the prescribed syllabus and to improvise a revised approach. But since it has been decided, and perhaps quite rightly so, that the design lecturer for each year should also be the building construction lecturer, as a means of promoting co-ordination between these two subjects, we now find that there are three separate lecturers in construction. With each lecturer tending to improvise his own syllabus in isolation from the others, the incidence of duplication and of omission of work has been excessively increased. Thus we find that steel roof trusses, waterproofing, and certain materials are studied twice - in second and third years. Basement construction is studied three times! Soil mechanics, formwork and fire resisting construction are normally not studied at all. Various aspects of reinforced and prestressed concrete are tackled over and over again in the various years of Building Construction as well as in Theory of Structures. Once again we have come to a point where there is no object in pursuing the particular line of study any further.

At best certain overall observations can be made. Firstly that there is a tendency in Building Construction to treat certain aspects in an empirical, rule of thumb, manner when the underlying theoretical background is in fact covered in other subjects. For instance the principles of non-reflecting shop windows are taught without reference to the laws of reflection as studied in Physics - with the result that students draw light rays as though they were projected out of the eyes of the observer. Many aspects of reinforced concrete and pre-stressed concrete design are studied in isolation from the theory of structures, resulting in the impression that all ribbed floors have ribs of a certain dimension and spacing, capable of covering a certain arbitary span - or that pre-stressed concrete beams can span five times as far as normal beams. This kind of teaching is always dangerous in the hands of the less discriminating student and a serious attempt should be made to couple the theoretical and practical aspects.

Another observation concerns the study of building materials and the question of keeping abreast of new developments in this direction. The last few pieces of an erstwhile collection of samples have finally been lost in the dust of moving from one building to another. As things stand at the moment there is virtually no materials library in which students can see samples of the different materials in use. Nor is there any liaison with the building industry, by which means the school can be kept posted regarding the latest developments in this field.

So far as the supervision of building contracts and actual site experience are concerned, the Building Construction course maintains complete silence. Yet

supervision, according to the scale of fees at any rate, accounts for one third of an architects' work in actual practice. The preparation of progress schedules and the arrangement of site meetings are amongst those things which could be tackled at once - while actual site experience is something which must be seriously considered, either as a part of building construction or as a part of the students period of practical experience.

The field of modern building technology is becoming increasingly complex, which may in the long run demand the services of more specialist lecturers in aspects such as soil mechanics, paints, treatment of timber, plastics, site organisation and so forth. The principle of employing specialist lecturers has already been recognised in respect of electrical services, air-conditioning, plumbing and water supply, etc., but in these cases separate subjects have been created - which may not really be necessary. The creation of too many separate subjects is always inclined to lead to duplication and lack of co-ordination.

In considering the relation of Building Construction to Design, the fear must arise that much of what has been ascribed to a lack of co-ordination between these two subjects, might in fact be due to a straightforward weakness in Building Construction itself and no more. Certainly there is considerable room for improvement in the subject. Co-ordination should in theory be helped along a great deal by the working drawings which are done in the second, third and final years of Design. There might however have been a tendency in senior years to make these working drawings so comprehensive that they evade careful marking, in which event much constructional accuracy must have gone astray.

As with Design, it is difficult to establish accurately whether the time allocation is reasonable or not. Much more work could be done in the time now available, - but when one considers the wide scope of the subject and its great importance, one tends to think in terms of expanding the subject to fill as much time as can reasonably be made available rather than in terms of curtailment.

We must now turn our attention to those subjects, conducted by specialist lecturers, which are directly allied to Building Construction.

Electrotechnics and Applied Hygiene:

In Electrotechnics, which for some unknown reason is officially called Equipment of Buildings, we come across that puzzling phenomenon known as the attendance course. Apparently the underlying philosophy is that the student should have a nodding acquaintance with the subject without becoming too intimately involved. Apart from the old-world quaintness of this philosophy, there is little to recommend it in the field of university education. Either a subject is necessary or it is not - and if it is necessary, it should be accorded full honours. The origin of the attendance course probably evolves around the well meaning argument that although the subject is desirable, it is not essential to burden the student with a formal examination. However, those with some experience of the student approach to these matters will realise that a course without an examination is regarded with affectionate indifference.

The philosophy of the attendance course is to an extent reflected in the prescribed syllabus, which although fairly comprehensive, seems to demand a bedside manner on the part of the lecturer rather than a straight-forward

 attack on /.....

attack on the subject. It is interesting to note that the syllabus was apparently devised before the days of the electric lift - and that air-conditioning instead of being included in this course is included in Applied Hygiene. In actual practice both lifts and air-conditioning are very briefly discussed in the class. Once again we come up against the disturbing matter of duplication and we find that as the work is now being taught, air-conditioning, water supply, pumps, boilers, hot water and fire services are being studied simultaneously in both Electrotechnics and Applied Hygiene in varying degrees of detail. Both lecturers complain that they have only enough time to gloss over their subjects, which in practice seems to result in a kind of double glossing over. If the fourth year Building Construction syllabus were faithfully adhered to as regards water supply, drainage, heating, air-conditioning and fire services, the glossing over would be threefold - but the students have fortunately been spared this in recent years.

To return to Electrotechnics alone, it is plain that the course is one of considerable importance to the architect, embracing as it does electric lighting and all the other electrical services of buildings. It can safely be considered as being completely respectable and worthy of full status as a qualifying subject. When it is borne in mind that the electrical engineer is required to work under the direction of the architect in actual practice, its value becomes doubly clear. Furthermore, it appears from discussions with electrical engineers that even when duplication has been eliminated, more time will have to be allocated in order to cover a reasonable minimum of work,- even if we accept the tendency for specialist lecturers to overestimate the intricasies of their own particular subjects.

 In Applied /.....

In Applied Hygiene we have a clearly stated syllabus which relates mainly to water supply, drainage and so forth and is affectionately known as "Sludge". This important subject is well handled in actual practice, albeit under the pressure of limited time. If there can be any criticism it is that the subject occurs only in the third year, whereas the students require this knowledge for design at an early stage. As regards the matter of time, it seems reasonable to expect that the amount of relief that would be afforded through the transference of air-conditioning to Electrotechnics would make the present allocation acceptable.

Theory of Structures:

We come to the handing out of bouquets - to the dour efficiency of the practicing engineers and others, who have helped with this course. In syllabus, as in effect, Theory has been competently and progressively carried out, with a high degree of time utilisation. Never-the-less, it has not escaped the insiduous effects of the softening process which has taken place in architectural training in recent years. The lecturers have been compelled to accept a steady decline in student interest and ability. Such items as flitch beams, welded joints, shear reinforcement in beams, etc., have fallen by the wayside in the struggle to keep failures within reasonable limits.

Now this matter, the apparent lack of student interest and ability, is one which deserves special attention. All lecturers dealing with scientific and mathematical subjects are in one voice about the lowbrow character of architectural students. It seems that these students are quite incapable of the normal processes of objective reasoning - when called upon to make a drawing they

 excel, but /.....

excel, but when called on to assimilate a formula they suddenly display a mule-like mental resistance. A feeling of stifled frustration is created in the mind of the lecturer, along with an uneasy temptation to simplify the whole business and let the students through. Any suggestion of amplifying the scientific and mathematical training of architects is greeted with benign incredulity by these long suffering tutors.

One is tempted to question our earlier finding, - that there is no ground for believing that design ability and the ability for objective reasoning cannot go hand in hand. Yet a study of results in Theory of Structures for the 1958 examinations reveals with clarity that as a general rule those who are good in Design are good in Theory of Structures - those who are weak in Design are weak in Theory of Structures. The answer to this whole state of affairs does not lie in the matter of mere ability so much as in a wide number of related facets of the situation - the incongruity of the full-time part-time business; the matter of divided attention; lack of logical co-ordination in other subjects; the outlook towards mathematical subjects engendered in the mind of the student by the design staff; the lack of efficient "filter subjects" in the first year; and so forth. Furthermore, it must be borne in mind that as soon as a course is suspected to be a haven for the woolly-headed, it is inclined to collect the flotsam and jetsam of aspirant graduates from other more astrigent courses. If this element is allowed to penetrate into the course, it is likely to cause problems. In the architectural school there are students who have been permitted to struggle on for up to ten years, hanging like lead weights in the different parts of the course. It would be most unwise to

 accept the /.....

accept the present situation in the mathematical subjects as something which just is so - something which must simply be accepted in the training of architects.

To return to Theory of Structures, one can find nothing but praise for what has been achieved. In spite of manifold difficulties it has been possible to reach a standard of training, which, in its own sphere, is not far short of the working knowledge of the average practicing civil engineer. Earlier the feasibility of doing a fairly extensive course in Theory of Structures without any university mathematics was questioned. It must openly be admitted that the withdrawal of mathematics from the architectural course has placed Theory under strain, - a strain which has perhaps manifested itself only in recent years. At the same time, a syllabus has been evolved around the practical, every-day empiricism of current engineering practice which has enabled architectural students to progress fairly far with a very modest mathematical ability. They are in fact learning the type of "boereteorie" which the average engineer depends on when he has forgotten the basic training he received at university - and most engineers do forget. The newly graduated architectural student could probably work out a simple concrete structure in far less time than the newly graduated engineer. But the architect's horizon is very clearly defined - he can go so far and no further, because of his lack of mathematics and first principles. Advanced structural systems such as shell vaulting, geodesic domes, etc., are beyond the reach of "boereteorie", while they are becoming of ever increasing importance to architecture.

Prior to these new structural developments, the course in Theory was more than adequate for the architect.

Perhaps even now it would be very nearly adequate if the architect had in addition sufficient mathematical language at his command to enable him to read technical papers and explore new developments for himself.. But when one bears in mind that a decline is in effect taking place in Theory at the present moment, it becomes obvious that all is not well. The decline is not in any way the fault of the lecturing staff - it is due to several different reasons. Firstly, there is the apparent mental inertia of architectural students, which has already been mentioned, - secondly, the delayed result of the withdrawal of mathematics from the curriculum, bringing with it the necessity for devoting a large amount of time to the revision of matric mathematics - time which was formerly devoted to Theory only. Finally there is the complete break of fifteen months between the November examinations in Theory II and the recommencement of Theory in the final year, resulting in such an evaporation of knowledge that valuable time must be devoted to the resaturation of the class.

The establishment of good balance between Theory of Structures and other subjects in an Architect's training is a particularly difficult problem. Obviously one does not want to make architects into engineers, but at the same time the architect is incapable of designing without a thorough knowledge of structure, - nor can he uphold his position if he is to be driven blindly into the arms of the engineer in the everyday practice of his profession. While the present empirical approach to Theory falls slightly short of his requirements, it is at the same time almost as comprehensive as empiricism will allow. The moment one wants to go further, the whole approach might have to be abandoned in favour of the "real thing" - and

 when it /.....

when it comes to the "real thing", there are, it seems, no half measures. The architect must virtually become an engineer. A whole field of study in this direction has been untouched and it remains an open question whether a suitable formula can be found or not.

Until detail research has been done, one must accept that the present system is as satisfactory as can be expected, but every effort must be made to maintain the standard and to check any decline.

Applied Mathematics and Physics:

One can but admire the tenacity and energy displayed by the Department of Applied Mathematics in their dedicated struggle with the special course for architects. The syllabus has been meticulously worked out around the particular requirements of architecture with a friendly bias towards simple, graphical solutions wherever these are applicable. Unfortunately, there is some duplication of work between Applied Mathematics and Physics in the fields of statics and dynamics - but this duplication is at present unavoidable. It is necessary to include elementary statics and dynamics in the Applied Mathematics course, since it would be impossible to proceed further without them and the course must equip the student for Theory I in his second year. On the other hand, they are also included in the standard Physics I course which architects must take along with students from many other walks of university study. But architects take this course in their second year, so that Applied Mathematics cannot make any use of the statics and dynamics learnt in Physics - nor is it reasonable to expect the Department of Physics to make special arrangements on behalf of a handful of architectural students, for we are concerned only with degree students

when it comes to Physics. Special credit must go to the Department of Applied Mathematics for their willingness to inaugurate a special course - and for the work done in compiling separate lecture notes for architects.

Physics I is the standard work-horse syllabus that is dispensed with untiring efficiency to thousands of students throughout the country. It is a course of particular value to architects. Statics, dynamics, heat, light, sound, magnetism and electricity are all fields in which he should at least have an elementary knowledge. The practical work is excellent training in experimental technique.

The Language Courses:

Here the question of exactly what is done, and with exactly what efficiency, is of secondary importance to the arguments which led to the introduction of the course into the architects' curriculum in the first instance. The architect is required to complete a specially watered-down course in his home language - and one wonders why. At first sight the language course seems to bespeak a mistrust of the standard of training achieved in high schools, which might or might not be justified, but which certainly does not place on the University the onus of rectifying the position if indeed it needs rectification. However, the course was probably first introduced in order to pacify vague mental stirrings about that elusive quality commonly known as culture. At the same time it was no doubt argued that the course would assist the architect in the writing of properly spelt letters and the compilation of reports. Unfortunately business correspondence and the like are not touched on in the course as it now stands - at best it can ensure that the architect has read a book or two before launching out into the closed circuit

of professional life. Student reaction to the course varies from passive acceptance to clamlike indifference and it is interesting to note that there are probably more failures in this subject than in any other - amongst both good and poor students. The regulations with some manipulation, allow students to be dogged by the language course until their final year.

The course occupies twice as much time in the first year as Building Construction, which is completely unreasonable in view of the limited help it brings. There might be some justification for a course in the alternative official language, or in a foreign language that would enable students to peruse foreign technical publications, - but clearly the present language course should be omitted from the curriculum in order to make room for more pertinent matters.

Geometrical Drawing:

Training in this subject is essential for architects, but one wonders whether the present syllabus does not go further in the pursuit of a theoretical position in space between two theoretical planes, than is really necessary for the business of architectural draughtsmanship. As things stand at the moment, the more advanced aspects of the course might very well be justified in the light of the mental exercise they offer, - but should mental exercise be provided in some other form, the reintroduction of mathematics for instance, this argument might no longer be valid.

One is tempted to consider the feasibility of incorporating Geometrical Drawing into the first year course in Architectural Draughtsmanship. The principles

 of shadow /.....

of shadow projection and the inter-relation of plan, section, elevation and perspective are already dealt with in Draughtsmanship. Subject matter must be provided for draughting exercises and it is quite possible that problems in geometrical drawing could be set to be problems in drawing technique - simultaneously. If one is prepared to accept that some reduction in the scope of Geometrical Drawing would do no harm, the arrangement seems perfectly workable.

History of Architecture:

This course embraces a somewhat wider field than the history of architecture alone, since it deals with the parallel development of the visual arts and the more interesting aspects of social history. It could with more accuracy be called a study of the development of aesthetics than the history of Architecture. Being very closely tied to design and the general philosophy of architecture, it is of considerable value to the student. The syllabus, which was evolved many years ago, is generally sound and is reasonably faithfully followed in practice. One criticism is the omission of the study of Cape Dutch architecture, which should certainly be included. Time allocation is in good balance with the requirements of the course.

History of Fine Arts and Free-hand Drawing:

Two more attendance courses. One must first decide whether they are wanted or whether they are not. So far as the History of Fine Arts is concerned, it is clear from our description of the syllabus for History of Architecture, that there is no real necessity for a separate course in this field. In practice the course consists mainly of crocodile visits by the students to various art exhibitions - an occupation which need hardly

be reflected in the curriculum. Clearly the subject could be dropped without loss, which along with the omission of Geometrical Drawing and Language would account for a total time saving in the first year of 130 hours of formal instruction.

Freehand Drawing, particularly figure drawing, is of considerable importance. The subject is well handled at the moment but suffers from the common disabilities of the attendance course. It is already attached to the design syllabus and all that is needed is to bring about a legitimate incorporation into Draughtsmanship. The time allocation appears to be reasonable in view of the amount of work which has to be done -; one does not like to mention syllabus in connection with figure drawing and so forth.

Survey and Acoustics:

These two subjects deal with essential aspects of the architect's training. The courses are competently handled and in both cases time allocation and syllabus are in good balance. No grounds for criticism or for revision can be seen.

Town Planning:

The first year is an attendance course - the second, which presumably builds on the first, is a qualifying course. The syllabus for the first year of study consists mainly of an historical survey and once again one is inclined to the opinion that this aspect belongs very naturally to the History of Architecture. It would be an absurdity to study the history of individual buildings without bearing in mind the history of town planning - the medium which binds the whole together. If the subject

is properly treated in History of Architecture there seems to be little object in continuing with the attendance course. So far as the second year is concerned, we have a subject which is of considerable importance - although some people would believe that the subject is not of architectural importance at all and consists of a process of abstract aerial surgery. Opinion has even been misguided to the extent of regarding town planning as a direct branch of land surveying or civil engineering. Under the circumstances we can be devoutly thankful that there are considerably fewer towns to be planned than there are town planners.

To return to the point, a working knowledge of the underlying principles of town planning is essential to the architect - but the subject is a comprehensive one and it is neither feasible nor desirable to turn the architect into a fully fledged town planner. In practice the average architect will be concerned mainly with the detail aspects of town planning and landscape gardening - the relation of a particular building to its site, the buildings around it and the street in which it is located. Over and above that he needs an appreciation, but no more, of how his particular building fits into the city as a whole. Architects are in practice flagrantly disobedient of the basic laws of detail town planning and it is not surprising that the profession has lost much initiative in this field. Never-the-less, a comprehensive study of town planning must be made by way of a separate post-graduate course such as that offered by the University of the Witwatersrand, or the course recently introduced at Pretoria.

The present syllabus in Town Planning II seems to meet the architect's requirements very nicely. At the

 same time /.....

same time it is unfortunate that it is not backed up in Design by actual exercises involving buildings that must be made to harmonise with other buildings directly adjacent to them. More accent should be placed on the matter of good architectural manners than on the overall aspects of town planning.

Specification:

In recent years the custom of writing specifications has fallen into disuse in the practicing field - a happening which must be viewed with some misgiving bv the more serious minded. It is true that the specification has become a much neglected document in competition with Bills of Quantities, but the reason for this might be in the fact that architects have not revised their approach to Specification writing in order to meet changed circumstances. Whatever point of view one might have regarding this situation, the fact remains that the course in Specification, if it is properly taught, is of considerable benefit to architects. At the moment the subject is very well handled and has succeeded in bringing many of the detail refinements of building construction to the attention of the students. The time allocated appears to be too short but Specification now has to cover up for many weaknesses in Building Construction itself, which should not be necessary. If Building Construction were brought in hand the time might be sufficient.

Professional Practice and Estimates and Building Finance:

Two excellent courses, well handled and much enjoyed by all - there is no need for comment here except the suggestion that Estimates and Building Finance could occur earlier in the curriculum, in order to make architects aware of the financial implications of building at an earlier stage of Design.

The Curriculum as a whole:

A word of warning must be sounded against the tendency of regarding a cirriculum in itself as the whole solution to university education. It is not so much what is taught, but how it is taught and in what academic atmosphere, that in the end is going to determine the true value of education. Even the most objective and non-philosophical will agree that the methods of approach and processes of thought engendered in the mind of the student are of more importance than the actual weight of knowledge absorbed. Thus a syllabus which in itself is nearly perfect might in the long run produce sterile results - another which is open to easy criticism might by nature of its very imperfection stimulate in the better student a capacity for independent thought. Furthermore there is probably no curriculum at the university which would not be vulnerable to a detail criticism, by anyone other than those who had brought it into being in the first instance. At the same time, much justifiable criticism can be brought to bear on the present system of architectural education - much dissatisfaction is being expressed in the profession as a whole. But it would be unreasonable to merely pin this down on the universities or their staff. The existing system, it must be remembered, was evolved to satisfy the profession - and the profession was in turn influenced by overseas tradition in the matter of architectural education. Inasmuch as we owe a debt of gratitude to the guidance of the Royal Institute of British Architects, we can also ascribe many of our current difficulties to the influence of the same body. Nor should it be forgotten that neither architecture nor architectural education in England and America are any less open to criticism than they are in our own country.

 Clearly the /....

Clearly the time has come for us to reconsider our dependence on the inherited approach to architectural education and to develop an independent line of thought. This is not said in a spirit of churlishness or petty pomp-ousness, but in the humble conviction that the younger countries must now consider the possibility of striving towards leadership in certain fields -; in the field of architecture this would be in accordance with the age-old pattern of history. If it has been seen that the existing system is unsatisfactory and in need of revision, we must be wary of becoming too involved in the petty implications of the situation, lest we fail to recognise its logical necessity in the never ending, overall pattern of change. It is merely in the nature of things that some must in time find themselves at the end of a phase - others must find themselves at the beginning of a new phase, which in its own turn might yet grow old on them.

The improvements that can be made will be less spectacular when they have become encrusted with the bar-nacles of time, than they first appeared when seen from the visionary point of view. Changes will come up for criti-cism in the hard field of actual practice. Yet they should be made for the sake of striving.

Implications of the Extended Course:

The extension of the period of training for architects which will come into effect from 1961 onwards, will mean from the university point of view that an addi-tional six months will become available for academic training. We have already seen that there is little rela-tion between the nominal duration of the course and the time actually taken by the average student to qualify.

The time actually taken is unreasonably long and the so-called extension might yet be used as a means of shortening an architects studies - provided its implementation is accompanied by a thorough pruning and revision process. The simple addition of six months to the existing course would make no real difference.

Most universities envisage detail changes in order to adjust themselves to the extended course - but it is clear that with things as they have been determined, the beginning of 1961 would be the opportune time to launch out with a completely new approach.

Staff and Staff Organization:

When it comes to staff for professional education, the university must face the difficult facts of the situation. It has the open choice between the weathered and experienced practitioner with considerable status in his own profession, the young and inexperienced, the so-called academic, and the downright incompetent. The man of standing and established ability cannot be expected to give the university more than a relatively small proportion of his time in return for the financial temptation offered - nor would he wish to devote himself exclusively to academic matters by very nature of his first love for the actual practice of his profession. At the same time, he alone can lend direction, tone and breadth of vision to the training. The young and relatively inexperienced will be attracted by the salaries and will work with enthusiasm and efficiency - but they are likely to utilise the university as a stepping stone towards their own private practices, which might in time result in them slowly entering the first mentioned category.

The so-called academic professional man is a rarity and a doubtful asset. One must bear in mind the old saying that those who can, do - those who can't, teach. Thoughts have often turned wistfully around the dedicated person who would forsake all for the sake of education, but in the hard school of life most dedicated persons are in the first instance, dedicated through necessity rather than through conviction.

This state of affairs has been a source of irritation and miscalculation. Attempts have been made to formulate rules, but it is clear that no rule can lie with equal validity across the wide span of different categories. We must turn to strategy rather than to legislation. Take the case of the established and successful professional man - we must not attempt to strangle his career when we so sorely need the wisdom he gains through standing deep in the heart of his own profession. If we must choose between hours of leadership from a Neutra, or the day-long attentions of a devoted but uninspired alternative at the same price, we must choose the Neutra. On the other hand it must be clearly understood that only a Neutra could force us into such a choice. Nor should we be misled by the actual size of an individual's outside interests, for in a field such as architecture the person with a very large practice might be free to devote more time to the university than one with a medium practice - because the very large practice is built around senior members and clerical staff who can take the load off the leader's shoulders. When we come to wisdom and direction, each case must be weighed on its own merits. Above all, a university needs wisdom.

But wisdom and direction by themselves are worthless unless the means can be found of putting them into effect. We come to the executive side, and the other end of the scale. While it might take a minute to suggest that students should be guided along certain lines, the actual guidance might require prodigious labour. In many instances the labour need is greater than the need for inspiration. We can reasonably expect a full days labour from a newly qualified architect in return for a relatively modest salary - and he is perfectly well equipped to do the kind of work that is required of him. Some work, such as teaching first year students how to use their instruments, can be competently done by senior student demonstrators. In the case of the more junior executive personnel the question of private practice does not even enter - or if it does, they can be despatched with impunity.

What is needed is a carefully balanced staff structure, covering the whole range of categories except the incompetents in direct relation to the need for each one. At the same time the structure should be sufficiently flexible to permit the logical progession of each member within it, - or out of it if needs be. In actual practice it would be difficult to achieve perfection, but it would be quite possible to reach a standard of staff proficiency equal to that of any other university department, if not a little better when one bears in mind that we can draw on outside capital. But before this can even be considered, sufficient posts must be created in order to stabilise the framework. It is interesting to compare the staff position at other universities with that at Pretoria. The following figures relate to the staff concerned with purely architectural subjects such as Design, History and Building

Construction - not the specialist staff concerned with Physics, Theory and so forth :

Witwatersrand	Cape Town - 1958	Pretoria - 1960
160 Architectural Students	About 250 Architectural Students	226 Architectural Students
Dean of Faculty 7 Full-time Lecturers 2 Student Demonstrators Typist cum Secretary shared with Faculty of Fine Arts	Dean of Faculty Associate Professor 9 Full-time Lecturers 4 Demonstrators 1 Librarian 1 Laboratory Attendant 1 Secretary 1 Clerical Assistant (1-12 Visiting Specialists)	Head of Department 3 Full-time Lecturers 1 Part-time Lecturer 2 Student Demonstrators

Before we hang our heads too low in shame, it must be admitted that personal experience raises the suspicion that Cape Town might be over-staffed. All the same, the position at Pretoria is far from satisfactory with 4 full-time staff to cope with 226 students as against 8 staff for 160 students at Wits. Nor does architecture enjoy faculty status at Pretoria as it does at Wits., Cape Town and Natal - yet we are expected to be the spearhead of architectural education for the young Afrikaans-speaking majority of this country. A balanced staff structure consisting of four members would be a rather comic arrangement the only reasonable choice is to take a majority of experienced practitioners and to suffer the consequences according to their own particular ability.

In recent years there has been much play on the personal limitations of individuals, without realising that these limitations are being seen in the searchlight of a very difficult situation. The herd instinct is inclined to lead to criticism in search of a scapegoat. Personal limitation is a normal and not unpleasant thing - one should look for the underlying reasons that have prevented the system from working well within this limitation.

Accommodation and Equipment:

Like a band of gypsies, the architectural school has moved from camp to camp in recent years. The actual ill effects on education have not been as great as the inconvenience. Environment is a matter of particular importance to the architectural student, but walls cannot teach by themselves. In the unhappiness of a troubled situation there has been a tendency - very natural for an architect - to look towards a new building as a solution to many problems. Now the building has come, and the homeless must feel a deep sense of gratitude to the authorities for having provided it. But it is more likely to intensify the need for change than to bring about an improvement on its own.

When it comes to equipment, the architects look with watering mouths at the shiny new apparatus that is being carried into the engineering building. They long for apparatus of their own - but exactly what they are going to do with this apparatus no one really knows. The absence of research and experimental work in the architect's curriculum is often seen as a result of the lack of equipment and laboratories; whereas if the truth be told, the authorities would probably provide both equipment and space if a sound case could be made out for their necessity.

----oOo----

P A R T III.

A PROPOSED NEW SYSTEM.

1. THE UNDERLYING OBJECTIVES AND PRINCIPLES OF A NEW SYSTEM.

We have already discussed the overall, essential needs of architectural education and it is clear that the main objective of any new system should be to meet these needs as adequately as possible. From the point of view of æsthetic training, it has been seen that the Design Course as it now stands is in urgent need of revision in order to make proper use of the time available. It should be possible to achieve a higher standard of training without any increase in time or labour. Training in the constructional side can be greatly improved through elimination of duplication, some syllabus revision and the reintroduction of Mathematics. Professional standing and public confidence in the architect will be greatly enhanced through the incorporation of more purely scientific work in the curriculum. All this is obvious enough, - but there might be different attitudes of mind to the situation and it is best that our own should be plainly stated before proceeding with the details of a solution.

The overriding wish is not to lengthen architectural training or to make it more difficult for the average student, but to shorten the time actually taken to qualify - to cut out all the dead wood and to promote a healthy and vigorous growth. The basic causes of seediness and dissatisfaction must be ruthlessly eliminated, without too much respect for the status quo. If we are too respectful of the complexity of counter-arguments and vested

 ideas, /.....

ideas, we will fare no better than to end with compromise - a positive form of indecision.

The new curriculum is based on the extended period of training prescribed by the Institute of Architects, but it does not accept the principle of interposing long periods of practical experience between the various years of the course. Much thought has been given to the matter, and the advantages of continuous university education in whole academic years are considered to outweigh the advantages of prolonged practical experience. The course consists of five complete academic years along with such practical experience as can be gained under a controlled system during the vacations. At the end of this five year period, successful students will be awarded the B.Arch. degree, whether the Institute of Architects is prepared to accept them for membership or not. It is anticipated that the Institute will in fact refuse membership on the grounds that the students have not had sufficient practical experience - meaning that Pretoria graduates will have to wait 12 months after graduation before being eligible for the title of architect and the right to practice as architects. In all events the course should not be broken up into half academic years. If a deadlock should arise in negotiations with the Institute, a complete year of practical experience could be added at the end of the course, which would not affect the detail planning of the new curriculum -; but the University of Pretoria has the whiphand in dealings with the Institute to a greater extent than is perhaps realised. So far as acceptance of any revised course by the Royal Institute of British Architects is concerned, it must be borne in mind that such acceptance is more to the advantage of British

nationals immigrating to the Union than to Union nationals immigrating overseas. At the same time, recognition by the R.I.B.A. brings automatic recognition by other institutes throughout the world, which is a more serious consideration. Any break down in negotiations with the R.I.B.A. might lead to direct negotiations with other countries; negotiations which have every reason to succeed in view of the high standard of training in South Africa. The problems which might arise in connection with recognition by the various institutes, are by no means insurmountable - we would be putting the cart before the horse if we allowed them to weigh heavily in the planning of a new curriculum.

There will be no part-time study for architectural students and only the degree will be awarded. At the same time a course will be introduced for a diploma in Architectural Draughtsmanship, which will be of three years duration if the first year is taken full-time, or of four years duration if the whole course is studied part-time. This course, which is a very much simplified one embracing only the fundamental educational requirements of an architectural draughtsman, will replace the present diploma in architecture. It will go out of its way to assist the student who does not have sufficient funds to attend the university full-time, but it will not attempt to match up with an architect's training, - nor will it be possible to use this course as a direct step towards a degree.

The whole argument for this arrangement must be explained a little further. We have already seen the difficulties that are posed by the present diploma course and we are fully aware that a change must be made.

Two choices are open : - the complete elimination of diploma studies or a reduction in the standard of training required for a diploma. One is tempted to jump at the first choice as being the most obviously correct from the University point of view, but certain important factors must be borne in mind. The present diploma course provides architects in Pretoria with an essential labour force of some 100 draughtsmen whose withdrawal would cause a complete upset in the profession, since there is no alternative source of non-graduate staff. The architectural profession in South Africa, unlike the profession in other countries, is like an army which has only generals and apprentice generals. As can be expected, the strategy of such an army is a befuddled compromise of conflicting expert opinion, whereas its fighting ability is strictly limited. Withdraw the apprentice generals and there is no fighting ability left at all. What is wanted is fewer and better generals along with a much increased rank and file. The elimination of the diploma course without the substitution of something else in its place would be disasterous.

It has been argued that the university is a place for higher academic education. If there is need for a course in draughtmanship, this need must be fulfilled by the technical colleges and not by the university. However, it will be seen that in designing a course for architects, all the machinery required for training of architectural draughtsmen is already there. One can expect a big drop in numbers with the insistence on full-time training for architects, which will mean that the necessary space for the draughtmanship course will also be available. Since we have both the machinery and the

 space, /.....

space, it is unwise if not impossible to expect all this to be duplicated at the technical college. Furthermore, it is highly desirable that the architectural profession should have a direct control over the training of architectural draughtsmen - and that the relation between their training and the full academic training of architects should be carefully co-ordinated in one institution. The situation can be seen in much the same light as the diploma courses in radiography, physiotherapy and so forth, which are conducted under the wing of the medical school of the university.

Some of the more contented members of the architectural profession might be pricked into instant protest by all these suggestions. They will say that in instituting a simplified diploma course, we are in effect incubating a new generation of quacks who will undercut the architect in the practice of his profession. But of course nothing could be further from the truth - if the man who is trained purely and simply as a draughtsman and who is not allowed by law to use the title "architect" can effectively compete with the fully qualified man, there is surely little justification in having an architectural profession in the first instance. Even at the present time there exist channels for quasi-architectural education. Is it not better that such channels should be closed in favour of a controlled approach to the problem under the guidance of the profession itself. Surely the profession must stand on its own legs rather than rely on the principle of protection. None-the-less protests will be heard, particularly from those quarters where unskilled competition is likely to meet with most success. The only reasonable course of action is to ignore these protests, for they surely do not carry the weight of majority opinion.

The diploma will be a diploma in Architectural Draughtmanship only and recipients will not be eligible for membership of the Institute of Architects. The Institute would, however, be wise in working towards a special category of membership dor draughtsmen, even in the face of the numerous difficulties that lie in the way.

When it comes to organization within the architectural school itself, one can only assume that sufficient staff will become available. This is not an idle assumption, for the authorities will surely not be blind to a logical setting out of the whole position, provided they can be assured of an improvement of conditions in return. Furthermore one must assume that the regulations will be rigidly applied when it comes to the interminable failure of some students - the possibility of diverting such students without ceremony into the new diploma course, will be readily seen. But even in the relative sanctuary of the diploma course the position will need watching.

No form of entrance examination or selection of students other than the existing system, is envisaged. It is quite unreasonable to attempt to assess a student's ability before he has had an opportunity of proving himself - and the only real opportunity for this is through the course itself. The first year of the course as it is now planned is as comprehensive and fair an entrance examination as can reasonably be hoped for. At the end of the first year students will be advised to study for the degree in architecture, the diploma in draughtmanship, or to abandon their studies altogether - depending on their actual shown ability.

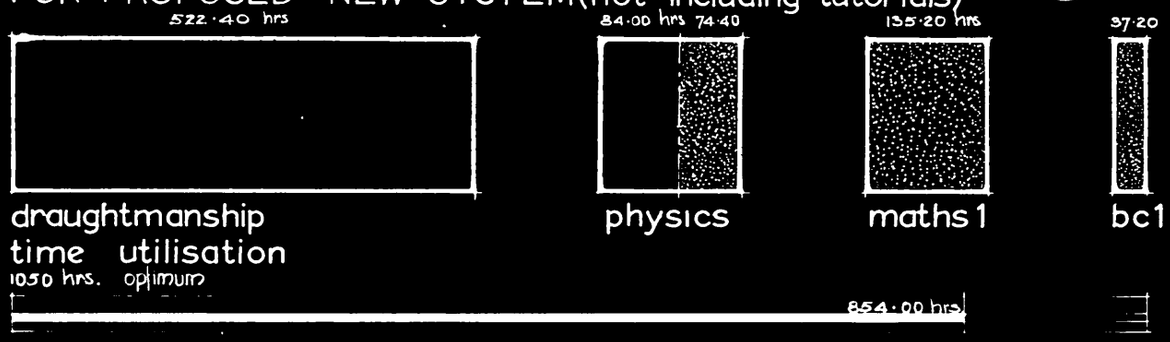
The design thesis required of architectural students will be completed within the five year period. Time will be allocated for this purpose, for even as things stand, five years is a long period of study for a single bachelors degree - to tag a thesis onto the end of this would be expecting too much. An attempt will be made to simplify the thesis, since students have in recent years tended to crucify themselves in attempting projects worthy of a doctorate.

The changes that are suggested are perhaps not as drastic in detail as might have been expected from the foregoing notes. Wherever possible the underlying structure of the old curriculum has been preserved, for we are not in pursuit of novelties in this study. Only three completely new courses, that is courses which are not yet given in any faculty at the University of Pretoria, are included. These courses - Economic and Sub-Economic Housing, State and Municipal Architecture, and Advanced Structural Studies, are one year courses which can easily be arranged. For the most part there are very few administrative difficulties involved.

Once a revised curriculum and a syllabus for each subject have been arrived at, it is necessary that they should be adhered to. If individual lecturers are allowed to improvise or to omit at will, the whole sense of the business becomes lost. One must expect suggestions for improvement and the machinery should be set up for coping with such suggestions in a properly planned way. No course of professional training can afford to remain static - but at the same time it must always function according to a properly organised system that is perfectly clear to all concerned.

GRAPHIC ANALYSIS OF TIME ALLOCATION FOR PROPOSED NEW SYSTEM(not including tutorials)

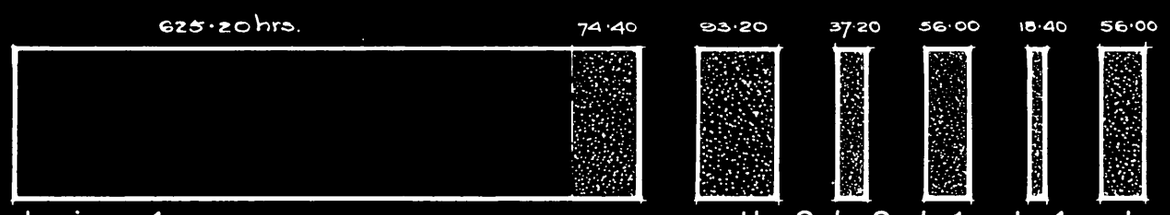
fig 7.



time utilisation
1050 hrs. optimum

854·00 hrs

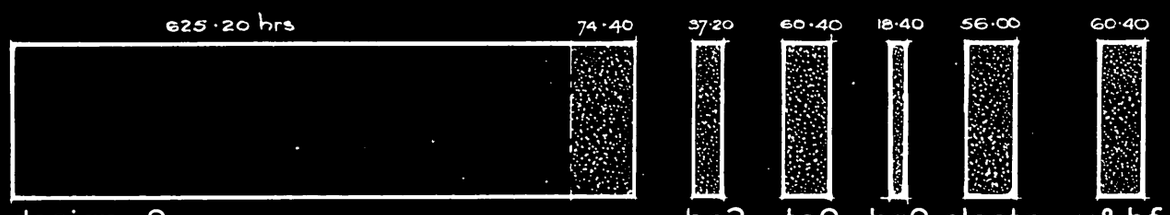
FIRST YEAR



time utilisation
1050 hrs optimum.

961·20 hrs

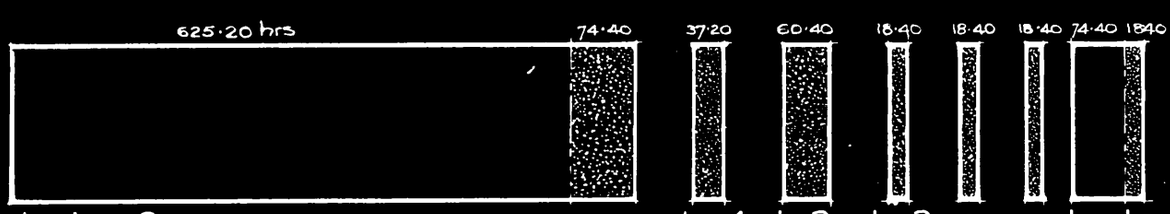
SECOND YEAR



time utilisation
1050 hrs optimum

933·20 hrs

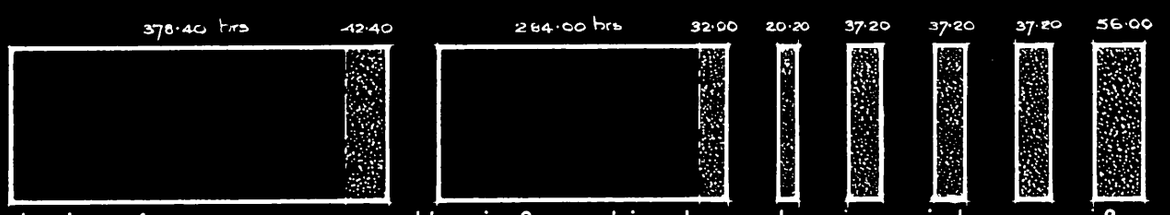
THIRD YEAR



time utilisation
1050 hrs optimum

947·20 hrs

FOURTH YEAR



time utilisation
1050 hrs optimum.

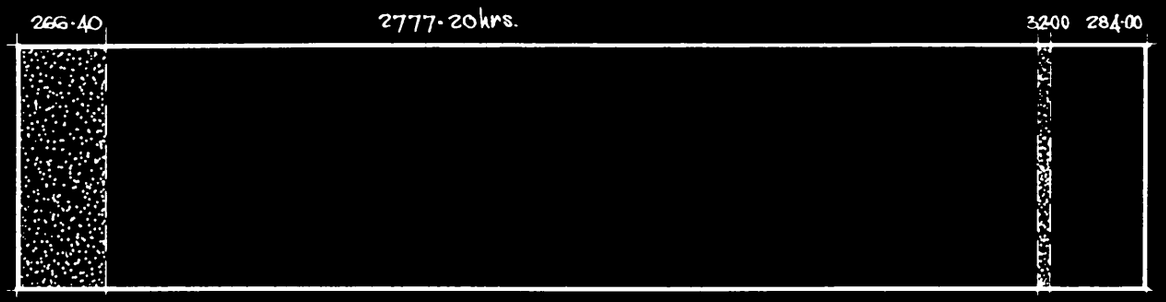
925·40 hrs

FIFTH YEAR

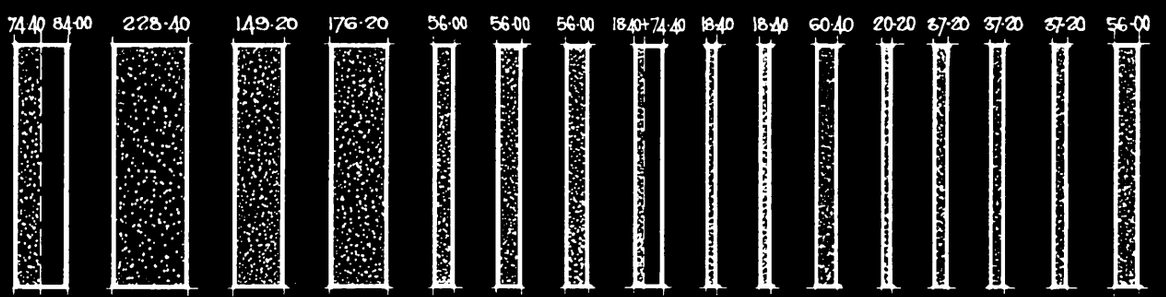
physics = phy. applied hygiene = ah acoustics = a industrial psychology i.ps.
building construction = bc electrotechnics = electr landsurveying = lands industrial statistics i.st.
theory of structure = ts. valuation & bldg finance = v&bf townplanning = tp industr. & commercial law i&c law.
hist. of architecture = ha specification = s professional practice = pp mathematics = maths.

GRAPHIC ANALYSIS OF TIME ALLOCATION FOR PROPOSED NEW SYSTEM(not includig tutorials)

fig 8.

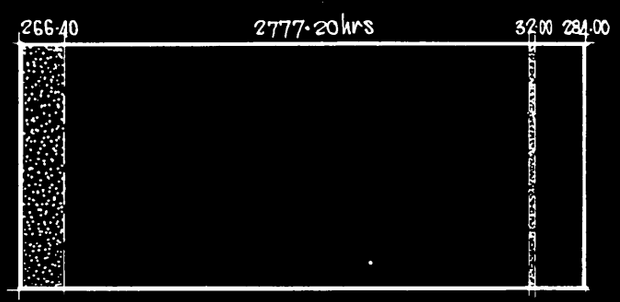


draughtmanship, design & thesis, workingdrawings.



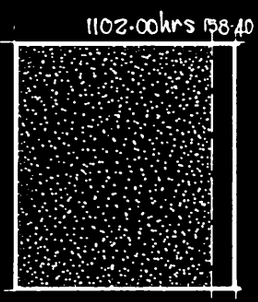
phy. maths. (maths chosen in 2nd year) bc. ts. ha. ah. electr. lands. s. a. v&bf. tp. pp. i.ps. i.st. i.&c. law

TIME ALLOCATION 1-5

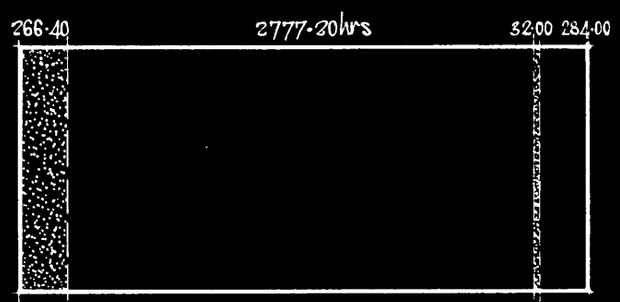


draughtmanship, design & thesis

TIME ALLOCATION 1-5

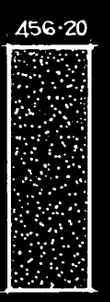


other subjects combined

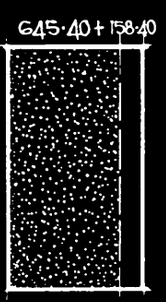


draughtmanship, design & thesis

TIME ALLOCATION 1-5



structural subjects



related subjects

practica

theory

We must now go on to a study of the proposed new curriculum.

2. (a)

OUTLINE OF PROPOSED NEW CURRICULUM FOR B.ARCH. & DIPLOMA.

B.ARCH.	DIPLOMA.
Five complete academic years - full time	First year - full time
First Year:	
Architectural Draughtmanship	Architectural Draughtmanship
Building Construction I	Building Construction I
Physics I	Physics I
Mathematics I	
Only Physics or Maths may be carried on to 2nd year - depending on 2nd year choice	
Second Year:	
Design I	Design I (Special)
Building Construction II	Building Construction II
Theory of Structures I	Drainage and Water Supply
Mathematics II or Physics II	
History of Architecture & Fine Arts I	
Drainage & Water Supply	
Only Maths, Physics or Drainage may be carried on to 3rd year	
Third Year:	
Design II	Design II (Special)
Building Construction III	Building Construction III
Theory of Structures II	Electrotechnics
History of Architecture & Fine Arts II	
Electrotechnics	
Valuations and Building Finance	
Only Electrotechnics or Valuations may be carried on to 4th year	Candidates for Diploma may do 1st year part time in two years. Course is then four years
Fourth Year:	
Design III	
Building Construction IV	
Theory of Structures III	
History of Architecture & Fine Arts III	
Specification	
Acoustics	
Land Surveying	
Only Theory, History, Specification or Acoustics may be carried on to 5th year	

Fifth Year:

Design IV (first semester only)
Design Thesis & Working Drawings
Town Planning
Professional Practice

Plus any three of the following :-

Business Economics
Economic & Sub-Economic Housing (new)
Industrial Psychology
Industrial & Commercial Law
Industrial Statistics
Public Administration
State & Municipal Architecture (new)
Advanced Structural Studies
(only after Maths II) (new)

2. (b)

DETAILS OF PROPOSED NEW SYLLABUS FOR B.ARCH. AND DIPLOMA IN ARCHITECTURAL DRAUGHTMANSHIP.

THE DEGREE IN ARCHITECTURE

F I R S T Y E A R

ARCHITECTURAL DRAUGHTMANSHIP.

Various techniques of free-hand drawing
Line drawing in pencil and ink with instruments
Lettering - Roman and Modern
Orthographic projection and scale
Water colour technique in monochrome and polychrome
Isometric and perspective projections

Architectural Draughting Technique

Working drawing conventions, scales, setting out of drawings, etc.
The compilation of Information Sheets in preparation for Design I

Two Dimensional Design Principles

Colour harmony, texture, Gestalt psychology, rythm and balance, proportion and the golden section

Geometrical Drawing

Conic sections, sections through various solid bodies, shadow projection, etc.

Three-Dimensional Design Principles

Mass; Volume

Advanced Geometrical Drawing

Hyperbolic parabloids and other curved surfaces
Elementary spherical geometry
Principles of model building - materials for model building

BUILDING CONSTRUCTION I.

The course aims at equipping the student with sufficient knowledge for the design of simple, single storey buildings.

Basic Materials and their Properties

Bricks and other clay products
Principles of brick bonding
Mortars and plasters
Timber and timber products
Building boards, etc.
Seasoning of timber

Foundations and Damp-Proof Courses

Floors: Solid floors
A brief survey of floor materials and their properties
Suspended floors
Skirtings, etc.

Doors: Various types of doors
Standard sizes
Timber and steel door frames
A very brief survey of door furniture,etc.
Sliding wooden doors
Folding doors
Double and single swing doors
Glass doors

Windows: Steel windows in cottage section
Principles of wooden window construction
Window sills
Drawn sheet glass and glazing compounds
Lintols and the reinforcement in lintols

Roofs: Simple timber trusses
Corrugated iron roof construction
Flashings, valleys, ridges, gutters, beam filling, lap, etc.
Ceiling construction
Ceiling materials
Brief mention of insulation materials,etc.
Slate and tile roof construction
Shingles, asbestos cement roofing materials, etc.
Flat roof construction with boarding, sheet iron, rolls, etc.

Building Bye-Laws - where applicable

PHYSICS AND MATHEMATICS.

As for normal B.Sc.

S E C O N D Y E A R

In order to gain admission to the second year of study a candidate must have passed all the first year subjects with the exception of Mathematics or Physics. Candidates may not enter the second year course in either Mathematics or Physics without having passed the first year course.

DESIGN I.

Elementary problems in design
Single storey buildings on straightforward sites
The proses of architectural design and planning
Principles of orientation, solar charts and sun control
Gardening and site layout
Plants and trees and their characteristics
Interior design studies
Furniture and furnishings
Colour in architecture
One design scheme, in face brickwork including interior cupboards and a small outdoor swimming pool, must be carried through to complete working drawings

The policy will not be to concentrate on particular building types but the following subjects will nevertheless be dealt with in the course of this year.

Principles of domestic planning - the house as a whole and an analysis of each part of the house
Domestic kitchen design and layout
Small restaurant kitchens, service circulation, counters, tables and seating
Manoeuvring characteristics and open air parking requirements of motor vehicles
Filling stations and motor servicing requirements

Formal lectures will be given in all aspects of the theory of Architectural Design. Students will be required to build a three dimensional model of the design scheme for which working drawings are prepared.

BUILDING CONSTRUCTION II.

Reinforced Concrete:	Cement, fine aggregates and coarse aggregates Lightweight aggregates Water, mixing methods, weigh batching, mixes by volume Placing of concrete, vibration, tamping, etc. Curing of reinforced concrete Surface finishes Guncrete Various simple forms of concrete construction, beam and slab, hollow tiles, ribbed floors, etc.
Flat Concrete Roofs:	Waterproofing and insulation Parapets, gutters, full-bore outlets,etc. Expansion joints
Brickwork:	Application of brickwork to framed structures Faggots, cut bricks, etc. Cavity wall construction Reinforced brickwork
Steel Windows and Doors:	Sliding and sliding-folding steel doors Doors and windows in industrial and universal section Projectovent and other special types of windows Adjustable window louvres
Joinery:	Cupboards, counters, shelving, special shelving, systems, etc.
Steel & Iron:	Metalwork, riveting, welding, etc. Standard steel sections Steel lattice trusses, etc.
Roofs:	Advanced steel and timber truss construction
Stairs:	Reinforced concrete and timber stair construction Stair finishings Handrails, etc.
Basement Construction:	Cavity and other methods of basement construction Sumps and sump pumps, sub-soil drainage, etc.
Fireplaces, Chimneys, etc:	
Building Bye-Laws:	Where applicable

THEORY OF STRUCTURES I.

Course remains unaltered.

 HISTORY OF /.....

HISTORY OF ARCHITECTURE AND FINE ARTS I.

An introductory course covering the whole period from Egyptian and West Asiatic to Modern. A brief survey of the principal periods and outstanding developments in the history of Architecture, Town Planning and Fine Arts, as seen in relation to their geographical, social, political and religious background.

SANITATION AND HYGIENE.

Ventilation and air-conditioning are omitted from this course. The study of filtration plant for swimming pools and of fire services is added. Otherwise the course remains unaltered. Closer liaison will be promoted with Design.

T H I R D Y E A R

In order to gain admission to the third year of study a candidate must have passed all the subjects for the first year of study. He must also have passed in Design I, Building Construction II, Theory of Structures I History of Architecture and Fine Arts, and one other subject from the second year.

DESIGN II.

More advanced problems in design
Multi-floor buildings
Sloping and restricted sites
Adjacent buildings
Orientation problems
Provision for future expansion
Landscaping and interior design studies
Introduction to programming
One exercise in alterations and additions which must be carried through to working drawing stage

Attention will be concentrated on the study of Commercial Architecture :-

 Hostels and /....

Hostels and Hotels:	General planning considerations The planning and equipment of large kitchens (in conjunction with Electrotechnics) Lounges and a la carte restaurants Bars and the special regulations pertaining thereto Kitchen and bar service Service entrances and staff facilities Fire and escape regulations Dance halls
Parking Facilities:	A special study of under-cover parking facilities Ramp and manoeuvring requirements Space efficiency and peak-hour efficiency A brief survey of semi-automatic and automatic systems
Flats:	Planning of the individual unit Services and service access Site coverage and restrictions Servants quarters and regulations
Shops:	Shop window and display design Lighting studies (in conjunction with Electrotechnics) Circulation, Security, differing requirements of different types of shop Interior layout, aisle widths, escalators Shop fittings Fire services and escape Air conditioning requirements
Offices:	Office layout and orientation Lighting, heating, air conditioning, lifts, telephones and other services (in conjunction with Electrotechnics and Sanitation and Hygiene) Flexibility, suites and toilet facilities Fire and escape regulations
Banks and Building Societies, etc.	Banking halls Tellers cubicles Clerking space Security and supervision Vaults and records rooms

Students will receive formal lectures in the abovementioned subjects as well as all relevant building bye-laws, etc. They will be required to make estimates and payability calculations for various schemes. (In conjunction with Estimates and Building Finance)

BUILDING CONSTRUCTION III.

Construction Applicable to Design II:	Curtain wall construction Sun control systems Lightweight walling Movable partitions Shop windows and shopfitting generally The integration of services and structure Terrazzo, tiles and other facing materials, along with fixing methods Panelling Construction of suspended ceilings Records room and strong room doors Vault construction and ventilation Building Bye-Laws where applicable
Building Materials:	A comprehensive study of contemporary building materials and their methods of application Manufacturers literature and codes of practice Lectures by specialist lecturers on - flooring materials, paints and paint work, plastics, the uses of non-ferrous metals in architecture, mastics and jointing compounds, special wall finishings, ceiling materials, glasses, glass mosaic, glazed and enamelled products, hardwoods and soft woods, treatment of timber against infestation, stone and marble, blinds, furnishings, etc

Students will be required to do research in various fields and to compile written and illustrated reports. A building materials library will be established and visits to factories will be arranged.

THEORY OF STRUCTURES II.

Course remains unaltered.

HISTORY OF ARCHITECTURE AND FINE ARTS II.

Architecture, Town Planning and Fine Arts as an expression of the development of Western Civilization. A detail study of structural and aesthetic evolution from the Greek period to the end of the Gothic period.

ELECTROTECHNICS.

Units of electricity used in practice. The determining of constants for electrical equipment. The conductivity of wires and cables.

Electrical Supply Generally

The power station (dynamo, altenator)
Transformers and automatic switch gear
High tension and low tension supply
Reticulation by overhead wires and cables
Bye-laws and regulations applicable to the supply of electricity

Electrical Supply to the Building

Cable or overhead supply
Meterboards, switchboards, high-tension and low-tension rooms
A study of the particular requirements of houses, commercial buildings, factories and workshops, places of public assembly, hotels, flats, hospitals, laboratories
Emergency plant

The Electrical Plan

Standard symbols, etc.
Co-ordination with other services

Lighting

Theoretical computation of lighting intensity
The light meter
Psychological and physiological principles of lighting
Effects on colour, absorbtion and reflection, chromatism, polarity, etc.

Light Fittings and Illumination Requirements

A study of the various types of light fittings
Illumination requirements of offices, factories, educational buildings, laboratories, hospitals, domestic buildings, theatres and auditoriums, shops (Neon signs, etc.), and the site and roads

Illumination Design

(In conjunction with Design II)
The design of an illumination layout for a shop
Illumination design in general

Kitchen and Cafeteria Equipment

(In conjunction with Design II)

Lifts and Escalators

Space requirements, plant rooms, various automatic systems, speed, carrying capacity, Factories Act, inspections, maintenance, cost, etc.

Legal Aspects of Electrotechnics

Laws, suppliers regulations and IEE-standard regulations

Electrical Heating

Various systems of electrical heating
Suitability for different building types
Running costs
Maintenance, etc.

Ventilation and Air Conditioning

Impurities in air and humidity
Natural ventilation, ventilators, different types of windows, etc.
Forced ventilation
Principles of air conditioning
Humidity control, purification, heating and cooling
Alternative systems of air conditioning and suitable applications of each type
Noise and draught
Plant room requirements
Air conditioning in theatres and auditoriums, offices, shops, factories and laboratories, etc.
Running costs and maintenance
The working out of a complete air conditioning system (In conjunction with Design II)

Telephones, Inter-Com. and Public Address

Provisions to be made for telephone and inter-com. cables, switchboards, etc. in buildings
Requirements of public address systems

Lightning Protection

Lightning conductors, earthing, etc.

Alarms, etc.

Fire and burglar alarms, etc.
Electric clocks

Electrical Bibliography

Supervision of Contracts, etc.

The architect's supervision over the electrical sub-contractor.
The architect and future progress in electro-technics

The allocation of lecture time for this course has been doubled. Close liaison will be promoted with Design II.

VALUATIONS AND BUILDING FINANCE.

This course remains basically unaltered, but students will carry out exercises in computing estimates of cost and payability for their own schemes in Design II.

F O U R T H Y E A R

In order to gain admission to the fourth year of study a candidate must have passed all the subjects for the second year of study. He must also have passed in Design II, Building Construction III, Theory of Structures II and two other subjects from the third year.

DESIGN III.

Advanced studies in design
Foundation problems
Adjacent buildings
Orientation problems
Landscaping and interior design studies
Programming and the general research methods applicable to specialised problems
Allowance for future expansion
Survey of actual sites (In conjunction with Land Surveying)
Working drawing studies of pre-fabrication and various other detail aspects

Attention will be concentrated on the study of

Specialised Problems -

Industrial Buildings

Typical examples of light and heavy industry
Production processes, lighting and power supply
Manufacturing spaces, staff facilities, administration and warehouses
Railheads
Prefabricated construction
Factories Act
Visits to factories
Contamination control

Laboratories

At least one typical example
Special requirements for materials, lighting, safety, etc.
Services including gas, compressed air, vacuum, demineralised water, etc.
Protection from radiation and other hazzards
Temperature and ventilation control
Contamination control

Hospitals

A small example
Wards, ward services, sterilizing rooms and equipment, theatres, sluice rooms, dispensaries, out-patients, staff facilities, etc.

Educational Buildings

General purpose and special purpose rooms
Seating, sight lines, chalkboards, audio-visual aids
Ventilation, lighting, etc.
Site layout

Sports Pavilions and Sports Grounds

A brief study in conjunction with Educational Buildings

Theatres and Auditoriums

Seating, sight lines and film projection requirements
Cinematograph and Building Bye-Laws
Acoustics (In conjunction with the course in Acoustics)

Students will receive formal lectures in the abovementioned subjects. They will undergo an oral examination concerning the Factories Act, Cinematograph and Building Bye-Laws, etc. in addition to the normal design examination.

BUILDING CONSTRUCTION IV.

Timbering and Shoring, etc.

Timbering for excavations in soft earth
Underpinning
Raking shores and dead shores

Formwork for Reinforced Concrete

Timber formwork for reinforced concrete
Timber and steel props
Steel shuttering
Special shuttering boards
Travelling formwork
Formwork for curved shapes
Striking of formwork
Provision for casting in of bolts, timber strips, sleeves, etc.

Ironmongery, etc.

A comprehensive study of door and window furniture, linings, floor springs, curtain tracks, metal lettering, etc.

Thermal Conductivity and Insulation

A study of the transmission of heat through materials and structures
Thermal transmissivity of various materials
An empirical formula for the calculation of the thermal conductivity of various structural systems

Thermal capacity in relation to the above
Pattern staining
The effect of solar heat on various types of structure
Insulation materials
High temperatures and the fire resistance of various materials and structural systems
Fire load and fire resistance
Bye-Laws

Soil Mechanics

A brief introductory course
Engineering geology, expansive soils, collapsible soils and solution cavities
Foundation and structural systems for expansive soils, reinforced brickwork, three-point suspension, normal piles and grade beams, under-reamed piles and grade beams
Basements in expansive soils
The relation between gravitational contours and the occurrence of sink holes
Precautions to be taken in dolomitic areas

Insulation Against Sound

(In conjunction with Acoustics)

Builder's Equipment

A study of builders plant, scaffolding, tools, etc.
Concreting plant
Weigh-batchers, mixers, placing equipment, vibrators
Hoists and cranes
A study of the types of plant available, capacities, first cost, operating cost and suitability for different types of work
Machine saws, conveyors and power tools with regard to the capabilities and labour saving potential, etc.
The general organization of a building site with regard to plant layout, materials storage, sequence of erection, etc.

A Survey of the Building Industry in S.A.

The possibilities and limitations of standardization
Mass production and pre-fabrication
Current overseas systems of modular co-ordination
The architect's role in guiding standardization
The role of the S.A.B.S. and N.B.R.I.

Site Organization

Personnel organization on the site
Pre-planning
Co-ordination of main Contractor's and sub-contractor's work

Supervision of Building Contracts

Selection of tenderers
Compilation of progress schedules
Arrangement of site meetings
Architect's supervision on the site
Progress reports, etc.
Special drawings required during erection
(Note: Tendering procedure in Professional Practice)

During the fourth year course in Building Construction, students will be required to make regular site visits to a building in the course of erection. These visits will be conducted by the lecturer.

THEORY OF STRUCTURES III.

This course remains unaltered.

HISTORY OF ARCHITECTURE AND FINE ARTS III.

Architecture, Town Planning and Fine Arts as an expression of the development of Western Civilization. A detail study of structural and aesthetic evolution from the beginning of the Renaissance period until the present time. A study of 19th Century Cape Architecture. An assessment of present day trends in architecture and Town Planning on the basis of historical experience.

SPECIFICATION.

This course remains unchanged.

ACOUSTICS.

This course remains unchanged but closer liaison will be promoted with Design III and Building Construction IV.

LAND SURVEYING.

This course remains unaltered but will incorporate surveys by students of actual sites chosen for schemes in Design III.

F I F T H Y E A R

In order to gain admission to the fifth year of study a candidate must have passed all the subjects in the third year of study. He must also have passed in Design III, Building Construction IV, Theory of Structures III, History of Architecture and Fine Arts, and two other subjects from the fourth year.

DESIGN IV, DESIGN THESIS AND WORKING DRAWINGS.

First Semester:

Advanced studies in design
The co-ordination between architecture and Town Planning
Townscape and landscaping

Attention will be concentrated on the study of Domestic Architecture and Civic Architecture :-

Advanced Problems in Domestic Architecture
Art Galleries, Museums, Libraries, City Halls,etc.
The aesthetic and functional requirements of civic architecture
Lighting for museums, art galleries and libraries
Library stack rooms, reading rooms, catalogues, work rooms, shelving
Storage for slides, micro-films, records, music, prints, maps, special collections, etc.
Library staff facilities

There will be a close liaison between this course and the course in Town Planning. Critical analysis must be undertaken of existing buildings.

Second Semester:

Design thesis and working drawings

Each student must select a subject which, on approval, will be taken through the whole process from initial research and programme compilation to sketch plans and complete working drawings. The work will be done under supervision and in close liaison with the lecturers in Theory of Structures, Sanitation and Hygiene, Electrotechnics and Valuations and Building Finance.

Initialled approval by these specialist lecturers will be required. Students will not be admitted to the final examination in Design IV before the thesis and working drawings have been satisfactorily completed.

TOWN PLANNING.

This course remains unaltered.

PROFESSIONAL PRACTICE.

This course remains unaltered, but supervision of building contracts as handled in Building Construction IV must be borne in mind.

BUSINESS ECONOMICS.
INDUSTRIAL PSYCHOLOGY.
INDUSTRIAL & COMMERCIAL LAW.
INDUSTRIAL STATISTICS.
PUBLIC ADMINISTRATION.

All as for Civil Engineering. Maths. II is necessary for Industrial Statistics.

ECONOMIC AND SUB-ECONOMIC HOUSING.

A special course of study in the organization, design and execution of housing schemes for Non-Europeans and Europeans
The need for low-cost housing schemes
Economics and low-cost housing
Governmental and Municipal assistance
Special town planning and siting considerations
Minimum standards for health and comfort
The use of non-skilled labour
Standardization and Mass production
Amenities for low-cost townships, etc.

This course will be conducted by a visiting lecturer from either the C.S.I.R., National Housing or the Municipality of Pretoria.

STATE AND MUNICIPAL ARCHITECTURE.

A course of study in the specialised knowledge required of architects in senior official positions; city architects, provincial architects and architects in the government service
The organization of various state and municipal bodies
Ordinances
The compilation and application of Bye-Laws and Building Regulations
Scrutiny of documents
Liaison with other departments within official organizations

The course will be conducted by a visiting lecturer from the Municipality of Pretoria.

ADVANCED STRUCTURAL STUDIES.

A study of the basic principles of shell vaulting, domes, geodesic domes, warped slabs, space frames and other special structural systems

----oOo----

THE DIPLOMA IN ARCHITECTURAL DRAUGHTMANSHIP

F I R S T Y E A R

ARCHITECTURAL DRAUGHTMANSHIP.

As for the degree in Architecture.

BUILDING CONSTRUCTION I.

As for the degree in Architecture.

PHYSICS I.

As for B.Sc.

The first year may be taken full-time in one year. Alternatively Physics and Building Construction may be taken part-time in one year, and on passing both, Architectural Draughtmanship may be taken part-time in a second year.

S E C O N D Y E A R

DESIGN I (SPECIAL).

Candidates for the diploma will do only one design scheme in each semester. Both schemes will be carried through to complete working drawings. Diploma students will be required to attend all design lectures on special subjects.

BUILDING CONSTRUCTION II.

As for the degree in Architecture.

 DRAINAGE /.....

DRAINAGE AND WATER SUPPLY.

As for the degree in Architecture.

T H I R D Y E A R

DESIGN II (SPECIAL).

Candidates for the diploma will do only one design scheme in each semester. Both schemes will be carried through to complete working drawings. Diploma students will be required to attend all design lectures on special subjects.

BUILDING CONSTRUCTION III.

As for the degree in Architecture.

ELECTROTECHNICS.

As for the degree in Architecture.

----oOo----

GENERAL REGULATIONS FOR THE DIPLOMA :

1. A student registered for the diploma course in architectural draughtmanship may not enroll for subjects in the degree course in architecture which are not already prescribed for the diploma.

2. A candidate must pass in every subject in a particular year of study before being admitted to the following year of study.

3. All examinations in Design will be oral and will be based on the students' year work.

4. Candidates who are in possession of the diploma in architectural draughtmanship and then wish to study for the degree in architecture will be admitted to the second year of study, on condition that they do not wish to proceed to Mathematics II.

 They will /.....

They will be required to do Mathematics I while in the second year. If, however, they wish to proceed to Mathematics II, they must take Mathematics I part-time before enrolling for architecture. Candidates in possession of a diploma will be exempted from Sanitation and Hygiene, Electrotechnics and Building Construction II and III in the second and third years. They will also be exempted from working drawings in Design I, II and III. No other exemptions will be allowed and they will be required to attend the University full-time for four years.

----oOo----

METHODS OF IMPLEMENTATION : A NEW STAFF ORGANIZATION : PROBABLE DIFFICULTIES.

It will be seen that the proposed new system does not involve such drastic academic changes that it could not be put into effect immediately by the university. The most far-reaching changes are those concerning the organization of the course - elimination of the diploma in architecture and the regrouping of ancillary subjects so as to provide a better support for the newly planned Design syllabus. Yet from the purely academic point of view, the basic ideas of architectural education have not been altered to the extent that one need fear completely unexpected results, or a large number of unanticipated problems. Difficulties will certainly arise and one can foresee a second stage of revision after some years of experience with the new system - but the radius of uncertainty is relatively small.

- 82 - From discussion /....

From discussion with many members of the profession it is abundantly clear that the system would be welcomed by the majority of architects - with perhaps some minor differences of opinion in various directions. The field is open for the University of Pretoria to take up a lead in architectural education, if the authorities are prepared to recognise a revised curriculum and to strive for its acceptance. It is greatly to be preferred that leadership in educational matters should come from the university, rather than from outside. Furthermore, it is clear that unless the university does take the initiative, a change will eventually be forced on it through the build-up of dissatisfaction within the profession. Time is at a premium.

Much has been said about the probable unwillingness of the Education Committee of the Institute of Architects to co-operate in these matters, - but since this body has not yet been confronted with concrete proposals from an academic institution, there is no valid reason for anticipating that its reaction will be unfavourable. On the contrary, one can only expect that it will meet a logical proposal with logical consideration.

In undertaking to champion a new system of architectural education, the university will no doubt give the system full recognition and help within its own academic boundaries. It has often been said that a five year course merits more than a B.Sc. degree - which is true from the viewpoint of duration at any rate. If the course is a concentrated one and includes a good stiffening of mathematical and scientific subjects, it should enjoy a fairly high academic status - something a good deal more important than the exact choice of alphabetic symbols that follow a

 graduate's name. /...

graduate's name. It is to be hoped that the university will recognise this status in making it possible for graduates in architecture to take the normal B.Sc. in one year after having gained their B.Arch. - the idea being that they should take Maths. III and Physics II, or alternatively Physics III and Maths. II, in order to qualify for the B.Sc. in addition to the B.Arch. Any such recognition would be a very great lever in gaining acceptance and support for a revised course in architecture.

When we come to the matter of a staff organization we must be wary of simply matching up with the staff numbers at other universities. The architectural school is at present under-staffed, but one must avoid the easy temptation to over state the requirements. The number of lecturers needed stands in direct relation to the amount of time each one will devote to the architectural school. We have already seen that this will vary from lecturer to lecturer - and that a properly balanced staff structure will achieve more with limited manpower than will an unbalanced staff structure with considerable numbers. Facts and figures are of little assistance in arriving at reliable conclusions. One must rely entirely on experience, bearing in mind that the new syllabus in design will be considerably more exacting than the old.

Thus we can say that one lecturer could cope with both Architectural Draughtmanship and Design I, provided he has at least two competent assistants. Design II and III are now of such specialised nature that they would require one lecturer and one studio assistant each. Design IV and the Thesis would require an additional lecturer and a senior assistant. The total so far is four lecturers and five assistants.

In addition to this we have the head of the school who should not be tied down to any particular Design course, but should be free to move from year to year in order to co-ordinate and promote liaison. It is most important that the head should not be so laden with lectures and studio work that he is unable to organise the faculty properly. So far as other subjects are concerned we need no more internal staff, since each design lecturer and the head of the school can undertake a certain number of additional subjects. We will however require the services of paid visiting specialists in Theory of Structures, Sanitation and Hygiene, Electrotechnics, Advanced Structural Studies, State and Municipal Architecture and Economic and Sub-Economic Housing. In certain fields of Building Construction it will also be necessary to have lectures by specialists, but these specialists will almost certainly give their services on a pro deo basis since they will only be required to give occasional lectures.

The total staff should consist of ten members, which incidentally is equal to the number employed at Wits, to administer a somewhat smaller architectural school - but of course lecturing staff is determined more by the curriculum than by the total number of students. The comparison with Wits. is purely numerical for their staff consists of eight fully fledged lecturers and only two very junior assistants, whereas our proposal envisages five lecturers along with an executive personnel of five assistants.

The difference goes even further - at Wits. the lecturers have only token interest in the practicing field whereas we would actually look for people with fairly extensive practices in order to fill some of our posts.

Take the head of the school, - he should have extensive experience in the practicing field and should show that he can in fact produce architecture as well as teach it. Much the same holds true for the lecturers in charge of the three senior years. Whether one likes it or not, these three people will in effect be part-time personnel rather than full-time, - but so long as they are recognised as such all is well. If the mountain will not come to Mohammed, Mohammed must go to the mountain. Allow them offices and other facilities on the premises of the architectural school from which they can conduct their practices, and lay down a certain number of lecture and attendance hours per week as is the case with part-time staff. These people do not necessarily want either the designation or the salary of full-time staff.

The person in charge of the first and second years should be a full-time, senior lecturer of rather academic leaning. This particular lecturer would probably be equivalent to the normal lecturer at Wits. and would be afforded considerable status in the school. So far as the executive personnel are concerned, one must arrange matters so that they stay executive - and the best way of doing that is through making the appointments of limited duration. The present system of using students as demonstrators will not be practicable when the course becomes more intensified. Post-graduate lectureships of from two to three years duration should each year be offered to the most promising graduates in architecture; salaries being almost comparable with what these people could expect from employment in positions outside the university. The posts will demand almost full-time attention, but not to the exclusion of post-graduate study or the gaining of a certain amount of

practical experience. There will be a considerable demand for such posts from those wishing to study further or those wishing to establish themselves in the profession. When these young people have reached the stage where their interest in private practice exceeds their devotion to the school, their term of office will have expired.

The advantages of this arrangement will be clear. On the one hand we have an experienced and practical directive and on the other hand an ever fresh and enthusiastic executive. Furthermore it is economical, because we use funds to the best possible advantage. The directive draws its main income from the profession, where it devotes the most time. There is no reason why the three lecturers in charge of senior years should earn much more than their executive assistants - nor would they want to, if their commitments were of a limited nature. The university would recognise the arrangement by giving its own projects to these people in a private capacity - but since the university is no longer dealing with its own full-time employees there can be no controversy regarding these lecturers' hours of attendance in the school, or the fact that the university itself stimulates their outside interests.

The arrangement is novel but not completely impracticable. Admittedly it is out of line with normal university custom, but then the circumstances surrounding architectural education are rather unique. Many of the difficulties that have arisen in the past have sprung from an attempt to handle an unconventional problem by purely conventional means. At the same time it must be realised that while it is possible to inaugurate a new architectural curriculum almost immediately, a new staff organization along such lines might take many years to evolve.

There is a good deal more uncertainty here than with the cirriculum, for we have to do with such indeterminates as the personality of individuals, the availability of the right people, and the general economic state of the country. Clearly one will be expeditious when it comes to these matters - one will adjust the broad idea according to the dictates of circumstance and ever increasing experience. Never-the-less it is in the direction of such an arrangement that the best solution lies.

Only one more staff requirement needs attention - that is the matter of typing and secretarial help. In an architectural school there is a great deal of typing and secretarial work to be done if the school is to be run efficiently. The typing, duplicating and filing of some 30 new design schemes every year is in itself a considerable task. It seems unreasonable to expect highly skilled and expensive personnel to undertake work that can be done more cheaply and more efficiently by a secretary. At all other schools of architecture, with the possible exception of the small new school at U.O.V.S., the head of the school has a secretarial assistant at his disposal. At Pretoria the creation of an official secretarial post for architecture will be ruled out by the general policy adopted by the authorities towards other departments and faculties. An oblique approach will have to be made to the problem, via the outside interests of the various senior lecturers. There might be at least one secretary on the premises to cope with the demands of private practice - this same secretary could also deal with school affairs on an unofficial basis.

It is difficult to assess exactly how great the additional outlay on staff salaries would be.

- 88 - But it must /.....

But it must be borne in mind that if additional outlay would bring increased efficiency, it might also attract more students and thus bring in more revenue. The over-riding consideration however is that unless a course of education can be handled properly, it is best left alone. With things as they are today one cannot afford to produce half-baked graduates in the hope that their inefficiency will be balanced by their weight of numbers. A cheap educational varnish weathers very quickly.

Numerous other aspects of staff organization, such as the need for frequent staff gatherings, staff co-ordination, rotation of work in order to maintain enthusiasm and so forth, could be discussed at length. There is however little object in doing so, since all these things will follow automatically from a proper overall organization. The finer details will in practice depend to a large extent on the individuals concerned. Faculty status for architecture is however a matter well worthy of discussion. The present incorporation of architecture in the faculty of Science has been a source of inferiority complex on the part of architects, and a source of long suffering irritation on the part of that distinguished faculty itself. Science would be delighted to be relieved of architecture - architecture on the other hand feels that it is time that arrangements at Pretoria were brought into line with those at other universities. The suggestion has been made that architecture should be incorporated in engineering, but if architectural training were properly organised, this would be akin to the incorporation of medicine in dentistry. Alternatively, it has been suggested that architecture should be put in quarrantine with fine arts - no doubt with the righteous intention of keeping suspects together.

It is however clear that the only sensible solution lies in combining architecture and quantity surveying in one independant faculty, as is the practice at other universities in the Union. This would bring about general relief and would make the architects very pleased with themselves - which is not an undesirable thing.

Doubtless there are many difficulties inherent in the proposals that have been made during this brief study of architectural education. Furthermore, many of these difficulties may for the present be unknown - and they will only be uncovered through the circulation of the study.

At a later stage when comment has been gathered in, one will be better placed to deal with these difficulties - to decide which are to be overcome at all cost, and which are to be circumnavigated.

----oOo----

P A R T IV.

A C K N O W L E D G E M E N T S

The author wishes to express his gratitude to the administrative staff of the University of Pretoria for having made records available and having been helpful with the compilation of statistical data.

He further wishes to acknowledge gratefully the assistance given by the staff of the Department of Architecture and the Department of Applied Mathematics at the University of Pretoria.

----oOo----

A P P E N D I X I.

THE 1960 SYLLABUS FOR ARCHITECTURE AT THE UNIVERSITY OF PRETORIA

B.ARCH.

First Year:

Design I
Building Construction I
History of Architecture I
Applied Mathematics
Geometrical Drawing

Attendance only :-
Freehand Drawing
History of Fine Arts

Second Year:

Design II
Building Construction II
History of Architecture II
Theory of Structures I
Surveying
Physics I

Third Year:

Design III
Building Construction III
History of Architecture III
Theory of Structures II
Applied Hygiene
Afrikaans I or English I

Attendance only :-
Equipment of Buildings

Fourth Year:

Design IV
Building Construction IV
Acoustics
Specification

Attendance only :-
Town Planning I

Fifth Year:

Design V & Design Thesis
Building Construction V
Applied Theory of Structures
Professional Practice
Estimates & Building Finance
Town Planning II

DIPLOMA

First Year: (full-time)

Design I
Building Construction I
History of Architecture I
Applied Mathematics
Geometrical Drawing

Attendance only :-
Freehand Drawing
History of Fine Arts

Second Year: (part-time)

Design II
Building Construction II
History of Architecture II
Theory of Structures I
Surveying

Third Year: (part-time)

Design III
Building Construction III
History of Architecture III
Theory of Structures II
Applied Hygiene
Afrikaans I or English I

Attendance only :-
Equipment of Buildings

Fourth Year: (part-time)

Design IV
Building Construction IV
Applied Theory of Structures
Acoustics
Specification

Attendance only :-
Town Planning I

Fifth Year: (part-time)

Design V & Design Thesis
Building Construction V
Professional Practice
Estimates & Building Finance
Town Planning II

NOTE: The Fourth Year for Degree and Diploma consists only of the first academic semester and examinations are held in June. The remainder of this year is devoted to the gaining of practical experience.

Language courses were shifted from first to third year in 1959.

----oOo----

A P P E N D I X II.

THE 1960 SYLLABUS FOR CIVIL ENGINEERING AT THE UNIVERSITY OF PRETORIA

First Year:

Mathematics I
Physics I
Applied Mathematics I
Engineering Drawing
Chemistry IB or Economics & Metallurgy

Attendance Courses :
1. Introduction to Engineering
2. Workshop Practice (4 weeks practical in workshop

Second Year:

Mathematics II
Applied Mathematics II
Building Construction or Physics & Mechanics
Civil Building Construction
Graphics
Machine Parts & Drawing
Thermodynamics
Metallurgy or Chemistry (only if B.C. is chosen)
Introduction to Electrotechnics
Economics & Commerce (Special)

Attendance :
Technical Language (or Machine Parts if
Hydraulics Chemistry is chosen)

Third Year:

Mathematics III or Industrial Statistics
Geology
Electrotechnics
Land Surveying
Hydraulics
Heat Transmission
Strength of Materials
Theory of Structures
Design
Business Economics
Industrial Psychology

Fourth Year:

Industrial Statistics
Commercial Law
Land Surveying
Theory of Structures
Soil Mechanics
Hydraulics
Civil Engineering Practice
Planning & Design
Thesis & Laboratory Work

----oOo----