Proposal for a Revised Programme of Studies at the Faculty of Engineering, Ondo State University Using the Pedagogical Model at AUC as Reference

Ondo State/ Aalborg Universities Linkage

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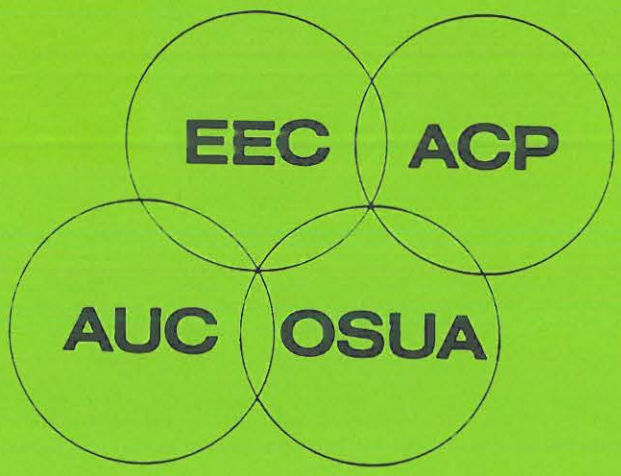

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SUMMARY

The present report suggests a revised Programme of Studies at the Faculty of Engineering at Ondo State University. The proposal is based on the present undergraduate teaching programme at the Faculty but at the same time it introduces the pedagogical approach in use at Aalborg University as a method of training engineers.

The content of the proposed undergraduate teaching programme will to a great extent remain the same as at present and it therefore reflects the objectives of OSUA and the Faculty. At the same time it reflects the ideas regarding the pedagogical approach brought forward by AUC Staff.

It will, of course, remain a requirement that minimum requirements laid down by the National Universities Commission are met. This was taken into account when preparing the proposal.

The report is seen as a first important step towards the introduction of the AUC pedagogical model at OSUA.

It is to be hoped that it will form the basis for fruitful discussions among all parties involved and that it will result in an agreed programme to be implemented at the Faculty of Engineering in a foreseeable future.

1. INTRODUCTION

In June 1989 Ondo State University and Aalborg University signed a linkage agreement under the Lome III Convention.

The agreement was endorsed by the EEC in October 1989 and funds, 1 million ECU, were released in April 1990.

The overall objectives of the cooperation agreement as stated in the contract are:

> to strengthen and develop the teaching and training capability of the Faculty of Engineering at OSUA,
>
> to assist the Faculty of Engineering at OSUA in achieving the University's stated objective of carrying out relevant research into the developmental problems in Nigeria and Ondo State in particular,
>
> through teaching and research to inculcate in the graduates a maintenance culture and orientation in engineering practice and
>
> to provide an avenue that will facilitate academic exchange and cooperation between OSUA and AUC.

The subject of the agreement covers cooperation in teaching, relevant research, and development within the Faculty of Engineering in areas of direct relevance to the social and economic development of the State served by OSUA.

The linkage includes secondment of staff, staff exchanges, staff training and the provision of equipment for use in the laboratories and in the workshop.

The part of the objectives dealt with in this report concerns the teaching aspect.

2. BACKGROUND

As part of the agreement between the two universities AUC Academic Staff are sent to OSUA for periods of four months in order to take part in departmental duties e.g. teaching, syllabus and curriculum development etc.

Six AUC Staff, M. Bitsch Jørgensen, K. Dalgaard-Jensen, S. Kloch, O. Borch, E. Ritchie and P. Isager, have returned from their stay.

All AUC seconded Staff have been involved in syllabus development. Initially they focused on revision of courses lectured by them during their stay but this work was later extended to include other courses within their professional fields. The objective of this exercise is to complete the Faculty's Handbook of Courses and to bring it in line with the Faculty objectives.

From the experience gained by AUC seconded Staff when teaching according to the OSUA

pedagogical model it became obvious, that the AUC pedagogical model modified to fit into OSUA's conditions would be very much in line with OSUA's "philosophy of a Developmental University that is a University whose programme and training are geared towards solving the developmental problems of the state".

It was thought that the AUC model, if employed at OSUA, would create engineers much more suitable to play an active role in identifying and solving technical problems in the environment i.e. Ondo State and Nigeria.

The matter was discussed between the OSUA and AUC Staff during the AUC Project Coordinator's visit in May 1991 and it was decided that efforts should be made by AUC and OSUA Staff to introduce the AUC pedagogical model at OSUA.

Curriculum development using the AUC pedagocical model as reference was then started off by the AUC Staff on the ground and the first seminar on the subject arranged by AUC Staff was held on June 1st 1991.

Since then the Curriculum work has been continuing at AUC.

The decision about introducing the AUC model at OSUA was brought to the attention of the NUC-representative at the NUC Assessment Seminar, 3rd May 1991 in Ado-Ekiti.

3. OSUA AND AUC PHILOSOPHY

OSUA's philosophy and objectives are those of a Developmental University. This implies that the Faculty training programme aims at producing candidates suitable for identifying and solving technical problems closely related to developmental problems of society.

The concept of Developmental University as adopted by OSUA is in harmony with the philosophy of AUC, even though this approach is not clearly stated in our programme.

One of the arguments for establishing a new University in Denmark situated in the northern part of the Jutland peninsula was the fact that this part of the country traditionally is behind in development compared with other parts of the country. Therefore there was a need for boosting existing industries and for establishing new ones. It was believed that AUC, when established, would play a major role in this process and this has also been the case.

AUC assists innovators, industries and public institutions in developing new products, production methods etc. There is a very lively contact and interaction between AUC Academic Staff and industries active in research and development.

Besides this major objective of cooperating/assisting industries and institution in developing, it is a major AUC objective that the research conducted is of a high international standard.

AUC's great awareness of the surrounding society is also reflected in the undergraduate curriculum.

It is a major objective of the AUC study programme to produce engineers that are capable

of solving complex technical problems as they meet them in society, in their professional career.

To meet this goal AUC uses a rather unique pedagogical approach, normally referred to as a problem oriented and project organized study form. This approach is considered on a very important tool for producing engineers with an attitude aimed towards problem solving.

As it will be too extensive to go into details about the AUC pedagogical model here, only a short description will be given.

4. AUC PEDAGOGICAL MODEL

AUC was founded in 1974 and the special AUC pedagogical model was introduced in all the faculties right from the beginning.

The students are organized in groups of 2 - 8. The groups are formed at the beginning of each semester and each group is allocated a group room.

Teaching is done in two ways:

1. By participating in courses.
2. By doing project work.

Each part will take appr. 50% of the students' time at the University.

Each semester has its own theme and a number of project proposals under the theme are prepared by the lecturers before the beginning of the semester, e.g. in Department of Civil Engineering a theme could be Highway design and Construction. The groups will then in cooperation with their supervisors choose one the project proposals under this theme. One project could be planning and designing of part of a road in, or in the vicinity of, Ado-Ekiti where there is a need for a new road or improvement of an existing road. Prior to the beginning of the semester the Supervisor will make contact with authorities/companies in order to identify suitable projects. It is important that problems dealt with by the students in the projects are related to the immediate environment.

At the end of each semester the students submit the results of their project work in a report which includes relevant calculations and drawings. The students present and defend the report at an oral examination.

Some of the courses offered each semester directly support the project work. They are referred to as Project Related Courses (PR). In the theme mentioned above courses in land surveying, highway planning and design, geotechnics, etc. would be offered as Project Related Courses.

These courses are examined as a part of the examination of the project report produced by the students.

Other courses, not having direct relevance to the project, are referred to as Study Unit

Courses (SU). They are examined separately. Courses in mathematics, physics, etc. are typical Study Unit Courses.

Some of the characteristics of the AUC pedagogical model are:

- The AUC model demands that the students acquire not only theoretical knowledge but develop the ability to apply that knowledge.
- The AUC model trains the students in problem indentification and problem solving.
- The students learn to cooperate with colleagues when problem solving and develop the ability to collect information and use it.
- Where practicable, the students are required to include both theoretical and practical work where the students are required to confirm the results of their studies by experiment.
- The students learn skills in presenting the results of their work, both in written reports and at seminars.
- The AUC model simulates the work situation for professional engineers where work must be completed to a deadline.

5. INTRODUCING THE AUC PEDAGOGICAL MODEL IN OSUA'S UNDERGRADUATE PROGRAMME OF STUDIES

5.1 GENERAL

When discussions on the introduction of the AUC approach at OSUA started it was obvious that a direct copying of the AUC model would not be feasible. National and local traditions and requirements hove to be complied with.

It is believed that the present proposal remains true to the Faculty objectives and to the National requirements. At the same time it introduces the AUC model even though it is on a reduced scale.

While at AUC the project work is introduced from the first year of study it has tentatively been agreed not to introduce project work in OSUA's Programme of Studies until 300 level.

Level 100 and Level 200 therefore remain unchanged in the present proposal.

While 50% of the students' time is spent on project work at AUC, except for the final project year where 100% of the time is spent on project work, the time spent on project work at OSUA is tentatively suggested to be less (30 - 40%).

While the project related courses are examined as part of the examination of the project report at AUC they could be examined seperately at OSUA if it is found desirable.

In the following the proposed Study Programme is shown. Semester Plans for all three Departments as well as descriptions of project themes are presented.

It will be noticed that the presentation of the Semester Plans and especially of the project themes and the degree of detailing of the themes varies from department to department and also within the departments. This reflects contributions from different Staff members. The main objective, however, is the same and it was deliberately chosen not to streamline the proposal any further since it is meant as a basis for further discussions and improvements.

5.2 STRUCTURE OF ENGINEERING UNDERGRADUATE PROGRAMMES

The structure proposed is indicated in the table below "Structure og Engineering Undergraduate Programmes".

It is seen that the Programme suggests specializations in all three departments.

In Department of Civil Engineering the specialization will start at 500 level. Four specialities are suggested.

In Electrical Engineering specialization in Heavy Current and Light Current starts at 300 level, 2nd semester. Further specialization takes place at 500 level where four specialities are suggested.

In Department of Mechanical Engineering Specialization will start at 500 level. Three specialities are suggested.

It will not be possible to offer all the specialities to the student until the staffing situation at the Faculty is improved.

Regarding the number of credits allocated project work, see sections 5.3, 5.4 and 5.5, it will be noticed that it differs. The number of credits will depend on the weight given to project work. In Civil Engineering, section 5.3, it has been assumed that 3 hours of project work equals 1 credit. This is the weight given to practicals in the existing programme. But since the project work mainly is theoretical work it should probably be given more weight e.g. 2 hours of project work should equal 1 credit.

It is a matter to be discussed.

STRUCTURE OF ENGINEERING UNDERGRADUATE PROGRAMMES

<table>
<tr><th>LEVEL 100</th><th>200</th><th colspan="2">300</th><th>400</th><th>500</th></tr>
<tr><td rowspan="11">Science</td><td rowspan="11">Engineering</td><td rowspan="4" colspan="2">Civil Engineering</td><td rowspan="4">Civil Engineering</td><td>Environmental Engineering</td></tr>
<tr><td>Hydraulic/Geotechnical Engineering</td></tr>
<tr><td>Structural Engineering & Building Technology</td></tr>
<tr><td>Highway & Transportation Engineering</td></tr>
<tr><td rowspan="3" colspan="2">Mechanical Engineering</td><td rowspan="3">Mech. Eng. Design Production System Construction</td><td>Production & Manufacturing</td></tr>
<tr><td>Mech. Engineering Design</td></tr>
<tr><td>Thermo- & Fluid-mechanical Process Realization</td></tr>
<tr><td rowspan="4">Electrical Engineering</td><td rowspan="2">Heavy Current</td><td>Power Systems</td></tr>
<tr><td>Electrical Drive Systems</td></tr>
<tr><td rowspan="2">Light Current</td><td>Industrial Electronics & Control Systems</td></tr>
<tr><td>Communications</td></tr>
</table>

5.3 DEPARTMENT OF CIVIL ENGINEERING

5.3.1 General

The proposed semester plans for levels 300-500 are presented on the following pages, 9 - 14. An overview of the proposed Project Themes is presented on page 15, and on pages 16 - 28 proposals for Project Themes are presented and commented.

As indicated in section 5.2 four specializations are suggested at 500 level. According to that a semester plan is presented for each of the four lines.

It should be noted that the difference between the four lines at the first semester of level 500 is limited to the choise of one elective course. All other courses and the Project Unit are the same for all four lines.

The elective course gives the students a possibility to choose a course which will be suitable for the specialization they might choose at 2nd semester.

All the courses referred to in the semester plans refer to OSUA's "Handbook of Regulations, Programmes and Syllabuses of Studies, 1989 - 1992". As mentioned in Chapter 2 the Handbook is currently under revision. Further revision will be required before introducing the AUC-model.

Comments to the project proposals are to a great extent also included.

5.3.2 Semester Plans

CIVIL ENGINEERING

LEVEL	300			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Engineering Materials (ENG 301)	2	Engineering Maths II (ENG 382)	3
	Engineering Maths II (ENG 381)	3	Advanced Computer Appl. (ELE 342)	2
	Industrial Course III (ENG 383)	2	Industrial Course IV (ENG 384)	2
	Fluid Mechanics I (CVE 321)	2	Fluid Mechanics II (CVE 322)	2
	Engineering Geology (CVE 341)	2	Civil Engineering Materials (CVE 302)	2
	Laboratory Practice ½ (CVE 361)	1	Structural Mechanics & Design I (CVE 312)	2
			Laboratory Practice ½ (CVE 362)	1
PROJECT UNIT	Introduction to Product Work	1	Road Planning and Design, P 302	4
	Loadbearing Structural Systems, P 301	3		
PROJECT RELATED COURSES	Strength of Materials II (CVE 301)	2	Highway Engineering I (CVE 431)	2
	Theory of Structures (CVE 311)	3	Engineering Survey (CVE 332)	2
	Computer Programming and Applications ½ (ELE 341)	1	Soils Mechanics (CVE 342 + 1/2 CVE 441)	3
	Building Technology I (CVE 553)	2		
	Project Method	1		
STUDY UNIT	Credits	12		14
PROJECT UNIT	Credits	13		11
TOTAL	Credits	25		25

CIVIL ENGINEERING

LEVEL	400			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Engineering Maths. III (Eng 481)	3		
	Engineering Maintenance (Eng 483)	2		
	Hydraulic Engineering I (CVE 423)	3		
	Engineering Survey and P. (CVE 433, reduced)	2		
	Laboratory Practice (CVE 461)	2		
PROJECT UNIT	Design of Structures and their Foundation	4	SIWES, I*, II and III (ENG 390), (ENG 490), (ENG 492)	18
PROJECT RELATED COURSES	Structural Mechanics and Design III (CVE 411)	4		
	Geotechnical Engineering (CVE 541, CVE 542)	4		
STUDY UNIT	Credits	11		
PROJECT UNIT	Credits	12		18
TOTAL	Credits	23		18

* SIWES I is placed during long vacation between 300 and 400 level

CIVIL ENGINEERING

HYDRAULIC/GEOTECHNICAL ENGINEERING

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maintenance Management (ENG 581)	2	Building Technology II (CVE 554)	3
	Civil Engineering Practice (CVE 581)	2	Special Topics Geotecnical Engineering I (CVE 543)	3
	Hydrology/Hydraulics (CVE 522)	3		
	Electives	3		
PROJECT UNIT	Water supply and Sewer less disposal of waste water	6	Final Project	8
PROJECT RELATED COURSES	Hydrology/Hydraulic I (CVE 521)	3	Electives	6
	Environmental Engineering (CVE 421)	2		
	Water Resources and Environmental Engineering I (CVE 523)	3		
STUDY UNIT	Credits	10		5
PROJECT UNIT	Credits	14		14
TOTAL	Credits	24		20

CIVIL ENGINEERING

ENVIRONMENTAL ENGINEERING

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maintenance Management (ENG 581) Civil Engineering Practice (CVE 581) Hydrology/Hydraulic II (CVE 522) Electives	2 2 3 3	Building Technology II (CVE 554) Water Resources and Environmental Engineering II (CVE 524)	3 3
PROJECT UNIT	Water supply and Sewer less disposal of waste water	6	Final Project	8
PROJECT RELATED COURSES	Hydrology/Hydraulic I (CVE 521) Environmental Engineering (CVE 421) Water Resources and Environmental Engineering I (CVE 523)	3 2 3	Electives	6
STUDY UNIT	Credits	10		6
PROJECT UNIT	Credits	14		14
TOTAL	Credits	24		20

CIVIL ENGINEERING

STRUCTURAL ENGINEERING & BUILDING TECHNOLOGY

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maintenance Management (ENG 581)	2	Building Technology II (CVE 554)	3
	Civil Engineering Practice (CVE 581)	2	Structural Mechanics and Design IV (CVE 512)	3
	Structural Mechanics and Design III (CVE 511)	3		
	Electives	3		
PROJECT UNIT	Water supply and Sewer less disposal of waste water	6	Final Project	8
PROJECT RELATED COURSES	Hydrology/Hydraulic I (CVE 521)	3	Electives	6
	Environmental Engineering (CVE 421)	2		
	Water Resources and Environmental Engineering I (CVE 523)	3		
STUDY UNIT	Credits	10		5
PROJECT UNIT	Credits	14		14
TOTAL	Credits	24		20

CIVIL ENGINEERING

HIGHWAY AND TRANSPORTATION ENGINEERING

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maintenance Management (ENG 581)	2	Building Technology II (CVE 554)	3
	Civil Engineering Practice (CVE 581)	2	Highway and Transplantation Engineering I (CVE 533)	3
	Soil Mechanics 1/2 (CVE 441)	1		
	Highway Engineering II (CVE 531)	2		
	Electives	3		
PROJECT UNIT	Water supply and Sewer less disposal of waste water	6	Final Project	8
PROJECT RELATED COURSES	Hydrology/Hydraulic I (CVE 521)	3	Electives	6
	Environmental Engineering (CVE 421)	2		
	Water Resources and Environmental Engineering I (CVE 523)	3		
STUDY UNIT	Credits	10		6
PROJECT UNIT	Credits	14		14
TOTAL	Credits	24		20

5.3.3 Project Themes

The project themes indicated in the semester plans on the previous pages and in the table below are described on the following pages and comments are made to most of the proposals.

Department of Civil Engineering
Project Themes for all lines of Study

Project	Project Theme				Duration
P 300	Introduction to Project Work				2 weeks
P 301	Load-bearing Structural Systems				1 sem.
P 302	Road Planning and Design				1 sem.
P 401	Design of Structures and their foundation				1 sem.
P 402	SIWES				1 sem.
P 501	Water supply and distribution and sewerless disposal of waste water				1 sem.
P 502	Final project	Final project	Final project	Final project	1 sem.

P 300 INTRODUCTION TO PROJECT WORK

OBJECTIVES:
To introduce project work and to teach the students how to organize and carry out project work, and how to prepare a written report and to present it at a seminar.

Since the project period is very limited (14 days) and since the aim of the project is to introduce the project organized and problem oriented study form the problem to be dealt with must be rather simple and limited.

Project Related Course:

Project Method

P 301 LOAD-BEARING STRUCTURAL SYSTEMS

OBJECTIVES:

- to introduce a basic knowledge of load bearing structural systems and their respons to external load.

- to enable the students to analyse simple load bearing Structural Systems and to calculate reactions, internal forces, and stress distributions as well as the stiffness of the overall structure and its components.

- to give an introduction to experimental work as part of the design process.

- to introduce a knowledge of building technology.

- to develop the students' skills in problem solving and communication of results.

A project under this theme could take its starting point in an analysis of the load bearing structural system of an existing workshop building, and in suggesting alternative solutions and possibly the structural system for an (imaginary) extension of the existing workshop.

Alternatively, the project could take its starting point in an (imaginary) workshop to be designed and constructed, and the functional requirements as described by the (imaginary) building owner.

In both cases it would be appropriate to start by studying the structural system of an existing workshop building in Ado-Ekiti. The study should result in sketches of the principal Load Bearing Structural System employed and drawings of the workshop, (plan, section, details), based on site on observations and measurements should be included. The drawings should be accompanied by an overall description of the workshop building, including functional requirements and choice of building materials.

A number of alternative proposals for the structural system are set up, and for at least two of the alternatives reactions and internal forces should be calculated, assuming simplified external loads. Stress distribution in chosen members as well as the deflection of these members should also be calculated. Part of the calculation should be carried out using self made computer programmes. Laboratory tests regarding the strength and stiffness of chosen structural elements are carried out as a supplement to the calculations.

A report including descriptions and drawings of the structural systems dealt with is prepared. The report should also give an evaluation of the final result.

Project related courses.

Strength of Materials II, CVE 301
Theory of Structures, CVE 311
Computer Programming, ELE 341
Building Technology I, CVE 553

Comments to P 301

Reasons for choosing the theme "Structural Systems"

The theme "Structural Systems" is chosen because the students have sufficient background at this stage to handle structures at the level described. And it is important that the theories taught in the following courses are linked to practical application.

CVE 202 Strength of Materials I,

CVE 301 Strength of Materials II and

CVE 311 Theory of Structures.

Methods taught in the computer course ELE 341 can also be applied in the project.

The students will also be required to use their skills in drawing techniques learned at 100 and 200 Levels.

Distribution of courses into study unit courses and project related courses

The courses are distributed as indicated in the table for 300 Level.

The following changes have been made compared to the Faculty Handbook.

Half of the course Laboratory Practice (CVE 361) has been included in the project work since it is assumed that app. ½ of the lab. work will concern structures, i.e. 3 hours are included in project work and 3 hours are linked to study unit courses.

The part application of the course equivalent to one credit (3 hours) of the course Computer Programming (ELE 341) has been included in the project and applications can focus on structures.

The course ELE 313 has been eliminated from the programme in order to avoid too heavy work a load on the students. The Course may be offered as an optional course at 500 Level.

The course Building Technology I CVE 553 has been shifted to this level since it is important
that the students are exposed to the subject at an early stage. The lecture hours are reduced from 3 to 2 per week. The knowledge equired in the course will also give the students a good background when suggesting building components and their assembly in the structure.

It would be desirable if the course CVE 302, Civil Engineering Materials, could be lectured before CVE 553, but it will result in too many courses at Level 300. As an alternative to placing the Course Building Technology CVE 553 at this semester, it could be placed at 400 Level 1st semester.

The programme suggested for 1st semester at 300 Level implies that the number of credits has been increased from 22 to 25, and that the number of hours has been increased from 28 hours to 35 hours.

The present programme at 300 Level, 1st semester includes:

	Credits	Hours
Lectures and tutorials	19	19
Practicals	3	9
Total	22	28

The proposed programme includes:

Lectures and tutorials	20	20
Practicals related to Study Unit Courses	1	3
Project (Two practical credits included)	4	12
Total	25	35

P 302 ROAD PLANNING AND DESIGN

OBJECTIVES:

- to introduce a basic knowledge of geometrical and physical conditions of importance to roadability,

- to enable the students to work out a suitable basis for road-planning purposes by using relevant surveying methods and instruments,

- to enable the students to investigate and estimate the quality of actual soil materials with reference to constructional use,

- to develop the students' skills in formulating, analysing and solving problems and in communicating the results.

A project under this theme could focus on a certain stretch of road in the local area around Ado-Ekiti in which a traffic problem is supposed, or in which the technical standard is found to be unsatisfactory.

The preliminary investigations should include surveyings and mapping of a belt-area around the stretch selected. The road should be carefully described regarding dimensions and lay out i.e. horizontal as well as vertical curves.

If possible, samples should be taken of the existing road materials and of the natural deposits in the area. The samples should then be analysed and used for relevant experiments in the soil mechanics laboratory.

Furthermore relevant information on the actual traffic load must be collected and the future developments must be estimated.

Based on the results of investigations, and on the analyses of these results, the real problems should be identified and described more precisely.

The second part of the project should then deal with alternative proposals for improvements which could be used to solve the problem.

A report including the surveying results, results of analyses and description of solutions should be prepared. Necessary drawings should be enclosed.

Project related courses:

Highway Engineering I, CVE 431
Engineering Survey, CVE 332
Soil Mechanics, CVE 342 + 1/2 CVE 441.

Comments to P 302

The theme "Road planning and design" is proposed for the following reasons and intentions:

First: It should be easy within this framework to find suitable subjects for incentive project works, dealing with actual problems of importance to the local society and to the rural development. The net of roads around Ado-Ekiti contains many possibilities.

Second: A need will be created for cooperation with outside institutions like The Local Administration and The Highway Department - hopefully for the benefit of all parts.

Third: The disciplines and skills which will be trained and used in an interdisciplinary connection are central to the studies of civil engineering. The courses proposed as a relevant support for the project works are already found and described in the present programmes and syllabuses. Only the following changes should be necessary:

- CVE 431, Highway Engineering I, should be transferred from 400 Level programme to 300 Level, second semester.

- CVE 342, Soil Mechanics I, should be extended with som relevant topics described in the present course CVE 441, Soil Mechanics II.

- CVE 332, Engineering Survey, should need only minor revisions.

- CVE 362, Laboratory/workshop Practice, should partly be included in the project work. Therefore only 1 unit is proposed in the list of courses.

- MEE 324, Thermodynamics II, might be removed from this semester to reduce the work on the students.

The programme suggested implies that the number of credits on 300 Level, 2nd semester will be increased from 22 to 25 corresponding to an increase of hours pr. week from 32 to37.

The present programme at 300 level, 2nd semester includes:

	Credits	Hours
Lectures and tutorials:	17	17
Practicals	5	15
Total	22	32

The proposed programme includes:

Lectures and tutorials	19	19
Practicals	2	6
Project work	4	12
Total	25	37

P 401 DESIGN OF STRUCTURES AND THEIR FOUNDATION

OBJECTIVES:

- to enable the students to set up an analytical model from a complex structure.
- to enable the students to analyse different types of structural systems by means of both elastic and plastic methods,
- to enable the students to design structures in concrete and in other building materials in accordance with relevant codes of practice,
- to introduce geotechnics and its application in foundation engineering.
- to develop the students' skills in problem solving and communication of results.

A project under this theme could take its starting point in a draft proposal of a project for a new building structure, for instance a minor road bridge, a workshop, or an office building. Alternatively the project could take its starting point in an analysis of an existing structure.

To identify the problem to be solved a list with all relevant data such as functional requirements and local conditions has to be prepared. From this list of information the students have to decide the content and limits of their design project.

The principal load-bearing structural system is analysed and a number of alternative proposals are set up. For each proposal the stiffness of the overall structure should be studied.

Based on Building Regulations and relevant Codes of Practice a preliminary Structural design is carried out for one of the structural systems in order to obtain dimensions of the main structural elements.

Detailed design is carried out on chosen structural elements and their connections. Besides, structural elements in concrete - also steel- and/or timber-structures - should be included in the design process.

Different methods of foundation should be taken in consideration and relevant geotechnical calculations carried out.

A report is prepared with a description of the designed structure including static calculations and drawings. The report should also give an evaluation of the final result compared with the functional requirements drawn up.

Project related courses.

CVE 411 Structural Mechanics and Design II
CVE 541 Geotechnical Engineering I (to be transferred from 500)
CVE 542 Geotechnical Engineering II (level 1st and 2nd semester)

Comments to P 401

The theme 'Design of Structures and their Foundation' is a natural continuation of the P 301 project 'Structural Systems' and has been chosen because it gives an opportunity to train the students in theories and methods learned from the following courses

CVE 411 Structural Mechanics and Design II
CVE 541 Geotechnical Engineering I (transferred from 500 Level)
CVE 542 Geotechnical Engineering II (transferred from 500 Level)

Also a number of courses lectured on 300 Level 2nd semester form an important basis for the students' work with the project, so the students learning of these courses will also benefit from this project. This concerns the following courses

CVE 302 Civil Engineering Materials
CVE 312 Structural Mechanics and Design I
CVE 342 Soil Mechanics I
CVE 441 Soil Mechanics II (transferred from 400 Level)

Compared with the present programme it has been necessary to exchange some courses between 400 level 1st semester and the 300 and 500 Levels to ensure that the students have sufficient knowledge to work with the proposed design project and that the number of working hours is reasonable.

Courses CVE 431 and CVE 441 have been transferred to 300 Level 2nd semester because they match the P 302 project and courses CVE 421 to 500 Level 1st semester to support the proposed P 501 project.

Courses CVE 541 and CVE 542 (Geotechnical Engineering I and II) have been combined to a 4 unit course and transferred from 500 Level to 400 Level, 1st semester as a project related course.

Finally, course CVE 433 has been reduced from 3 credits to 2 credits (1 lecture + 3 practical hours).

Course CVE 312 has been reduced from 3 to 2 credits because the practical hours will be replaced by work within the P 401 project. Subjects included in courses Structural Mechanics I and II (CVE 312 and CVE 411) should be reorganized in order to obtain a more rational order. For instance, the analysis of statical indeterminate structures should be given in CVE 312 while design of structural elements in concrete and steel and possibly also in timber, should be given in course CVE 411.

The concrete material has been considered the most important building material and should therefore always be dealt with in the P 401 project but designing of simple structural elements in either steel or timber should also be a requirement.

The programme suggested for 1st semester at 400 Level implies that the number of credits has been increased from 22 to 23 and that the number of hours has been increased from 28 hours to 37 hours.

The present programme at 400 Level, 1st semester includes:

	Credits	Hours
Lectures and tutorials	19	19
Practicals	3	9
Total	22	28

The proposed programme includes:

Lectures and tutorials	16	16
Practicals	3	9
Project	4	12
Total	23	37

P 501 WATER SUPPLY AND DISTRIBUTION AND SEWERLESS DISPOSAL OF WASTE WATER

OBJECTIVES

- To give the students insight into the possibilities of exploiting water resources
- to introduce related theories and methods in design of fresh water supply system and sewerless waste water systems,
- to introduce a basic knowledge of the hydrologic cycle,
- to introduce environmental aspects (legislation) with special reference to water supply systems sewerless and waste water systems,
- (to give an introduction to design principles and solutions for waste water treatement and discharge),
- to give an introduction to the construction aspects.

A project under this theme could take its starting point in an analysis of the need for water supply and prospects for water recovery in a chosen urban area (e.g. Ado-Ekiti).

The quality of the water resource available is analysed and assessed, and the extent of the resource is estimated.

Based on the initial analyses, planning and design of a superior water distribution system are carried out. A smaller local distribution system net is designed in detail. The design will be supported by drawings and calculations.

Furthermore, a survey of existing sewerless systems for discharging domestic waste water is carried out.

Based on the survey an alternative solution for a sewerless system is planned and designed (i.e. sewerless toilets, septic tanks etc.). The design to be supported by drawings and calculations.

Principles for treatment and discharge of the waste water are established on the basis of existing regulations and on recipients available).

Project related courses:

CVE 521	Hydrology/Hydraulic I
CVE 421	Environmental Engineering
CVE 523	Water Resources and Environmental Engineering

Comments to P 501

The programme suggested for 1st semester at 500 Level implies that the number of credits is 24 and that the number of hours is 36.

P 502 FINAL YEAR PROJECT

OBJECTIVES
To give the students an opportunity to specialize within their area of interest.

Comments to P 502
The Final year project will be chosen from one of the four project themes indicated in the four lines of Study.

The number of courses is reduced compared to previous semesters and some of the courses are offered as electives.

This will give the students more time to work on their project and to choose courses which are direct related to the problems they are dealing with in their project.

The programme suggested for 2nd semester at 500 Level implies that the number of credits is 20 and that the number of hours is 36.

5.4 DEPARTMENT OF ELECTRICAL ENGINEERING

5.4.1 General

As it is seen in section 5.2, pages 6 - 7, Electrical Engineering is specialized in Heavy Current and Light Current at 300 Level 2nd semester, and further specialisation take place at 500 Level.

On the following pages, 30 - 33, the semester plans for Heavy Current and its specialities at 500 level are presented. The semester plans are followed by proposals for project themes for Heavy Current and its specialities at 500 Level, pages 34 - 41.

Semester plans and proposed Project Themes for Light Current and its specialities at 500 Level are presented on pages 42 - 58.

All courses indicated in the Semester Plans refer to OSUA's "Handbook of Regulations, Programmes and Syllabuses og Studies, 1989 - 92". As mentioned in chapter 2 the Handbook is currently under revision. Further revision will be required before introducing the AUC model.

5.4.2 Semester Plans, Heavy Current

ELECTRICAL ENGINEERING

HEAVY CURRENT

LEVEL	300			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maths. III	3	Maths. VI	3
	Engineering Mathemathics	2	Electronics Cts.	2
	Cct. Theory I	3	Advanced Computer Applications	2
	Computer Prog. & Applic.	2	Industrial Course IV	2
	Ind. Course III	2		
PROJECT UNIT	Elec. Energy Systems	2	Electrical Machines	7
	Electromagnetic Cts. & Measurements	5		
PROJECT RELATED COURSES	Electromagnetic Waves & Cts.	3	Electrical Machines	6
			Circuit Theory II	3
	Electronics Devices Theory	1		
	Measurements & Instrumentation	1		
	Project Method	1		
STUDY UNIT		12		9
PROJECT UNIT		13		16
TOTAL		25		25

ELECTRICAL ENGINEERING

HEAVY CURRENT

LEVEL	400			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Maths. V	3		
	Electrical Engineering Materials	2		
	Control Theory	3		
	Principles & Methods of Engineering Maintenance	2		
PROJECT UNIT	Power Electronics	7	Siwes	18
PROJECT RELATED COURSES	Electric Power Principles	3		
	Power Electronics	2		
	Microprocessor Interfacing Applications	3		
STUDY UNIT		10		0
PROJECT UNIT		15		18
TOTAL		25		18

ELECTRICAL ENGINEERING

HEAVY CURRENT

ELECTRICAL DRIVE SYSTEMS

LEVEL	500			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Electrical services design	2	Computer Eng. II	3
	Advanced Cct. Theory	2	Technology Policy & Planning	3
	Computer Eng. I	3		
	Maintenance Management	2		
PROJECT UNIT	Electrical Drive Systems	10	Final project	12
PROJECT RELATED COURSES	Electric Drives	2	Electronics Instrumentation II	2
	Control System Eng. I	2	Control System Eng. II	2
	Electronics Intrumentation I	2	Reability & Maintainability of Systems	2
STUDY UNIT		9		6
PROJECT UNIT		16		18
TOTAL		25		24

ELECTRICAL ENGINEERING

HEAVY CURRENT

POWER SYSTEMS

LEVEL	500			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Electrical services design	2	Computer Eng. II	3
	Advanced Cct. Theory	2	Technology Policy & Planning	3
	Computer Eng. I	3		
	Maintenance Management	2		
PROJECT UNIT	Power Systems	10	Final project	12
PROJECT RELATED COURSES	Electric Power Systems	2	Electronics Instrumentation II	2
	Control System Eng. I	2	Control System Eng. II	2
	Electronics Intrumentation I	2	Reability & Maintainability of Systems	2
STUDY UNIT		9		6
PROJECT UNIT		16		18
TOTAL		25		24

5.4.3 Project Themes, Heavy Current

The project themes indicated in the semester plans on the previous pages and in the table below are described on the following pages, 35 - 41.

Department of Electrical Engineering
Project Themes for Heavy Current

PROJECT	PROJECT THEME			DURA-TION
P300	Electrical Energy Systems (How to execute a project)			2 Weeks
P301	Electromagnetic Circuits & Measurements			1 Sem.
P302	Electrical Machines			1 Sem.
P401	Power Electronics			1 Sem.
P402	SIWES			1 Sem.
P501	Power Sys-tems	Electrical Drive Systems		1 Sem.
P502	Final Project			1 Sem.

P 300 ELECTRICAL ENERGY SYSTEM

OBJECTIVES:

- To introduce the students to the systematic methods of problem solving, by breaking a problem into its components, which can be solved separately, and synthesizing a complete solution from the component solutions.

- To develop skills in problem formulation, project definition, project planning, problem solving, project execution and dissemination of results.

- To provide a basis for the students to make the choices available in the course of his education.

CONTENTS:

- Presentation of a solution for a typical problem arising in electrical energy systems, within local community.

- A breakdown of the problem into its component parts, scope of the project identification, of the resources required and available, plan of activities, of the component problems generation of alternative solutions, reasoned selection of feasible and practical solutions, conclusion.

- Quantitative evaluation based on the laws of physics, to identify the optimum solution of at least one of the component problems.

- A review of the problem solving process, as experienced during the project, the difficulties encountered, and how they were overcome.

Project Related Course:

The following project related course is offered:

- Project Method.

P 301 ELECTRICAL CIRCUITS AND MEASUREMENTS

OBJECTIVES:

- To enable the students to apply the concepts and principles of electromagnetics, and electrical measurements in solving a practical problem.

- To develop the skills of the student in problem solving and dissemination of results.

- To develop skills in decision making, based on a reasoned selection of a solution from various options.

CONTENTS:

- An analysis and description of practical electromagnetic problem, culminating in a proposed solution, and function specification.

- Optimization of all or part of the electromagnetic solution proposed, using appropriate laws of physics, mathematical tools, and a simple computer program. Experimentation of all or part of the calculations performed using the modelling technique.

- A review of the proposed solution, based on the results obtained, indicating any further work necessary for validation of the solution.

- A critical review of the problem solving process, as experienced during the project, the difficulties encountered, and how they were overcome.

Project Related Courses:

The following project related courses are offered:

- Electromagnetic Waves and Circuits.

- Electronics devices theory.

- Measurement and instrumentation.

P 302 ELECTRICAL MACHINES

OBJECTIVES:

- To teach the students the basic principles of electrical machines, their construction and application.

- To develop skills in problem solving, decision making based on the selection of feasible and practical options, and the dissemination of obtained results.

- To extend the skills of the student in computer application and design and execution of laboratory experiments.

CONTENTS:

- An analysis and description of a real problem situation requiring the use of one or more electrical machines, culminating in a proposed function specification.

- Generation of a set of possible solutions, with a reasoned choice of a suitable solution to be investigated in the project, using appropriate engineering methods, and with reference to the function specification.

- Optimization of all or part of the electrical machine proposed, using appropriate engineering tools, and a simple computer program. Experimentation of all or part of the calculations performed using the modelling technique.

- A review of the proposed solution, based on the results obtained, indicating any further work necessary for validation of the solution.

- A critical review of the problem solving process, as experienced during the project, the difficulties encountered, and how they were overcome.

Project Related Courses:

The following Courses:

- Electrical Machines

- Circuit Theory II

P 401 POWER ELECTRONICS

OBJECTIVES:

- To teach the students the basic principles of electrical power control using power electronics devices and systems.

- To develop the students' skills in computer applications, and to introduce the concept of interfacing computers with electrical measure systems.

- To give the students a basis on which to make the choices available in the course of his profession.

CONTENTS:

- An analysis and description of a real problem situation either from industry,commerce or residence, which can be solved using a power electronics system,culminating in a proposed function specification.

- Generation of a set of possible solutions, with a reasoned choice of a suitable solution to be investigated in the project, and with reference to the function specification.

- Detail design of all or part of the power electronic system selected, using criteria based on the function specification.
  Experimentation of all or part of the design using the modelling technique.

Project Related Course:

The following courses are offered in support of the project:

- Power Electronics
- Electric Power Principles
- Micro-processor interfacing applications.

P 402 SIWES

OBJECTIVES:

- To expose the students to real engineering practice in an industrial environment.
- To consolidate the acquired engineering concepts and principles in engineering processes.
- To inculcate in the student a work culture, necessary for engineering sites.
- To inculcate in the student the practical aspects of maintenance and repair of engineering devices, equipment, and systems.

CONTENTS:

Project related courses:

SIWES ENG390, ENG490, ENG492

P 501 ELECTRICAL DRIVE SYSTEMS

OBJECTIVES:

- To introduce the students to the concept of linear control systems involving electrical machines, regulated by power electronics systems.

  To consolidate the students' skills in the application of Computer Aided Design (CAD), as well as computer interfacing and application.

CONTENTS:

- An analysis and description of a practical control system problem, culminating in a proposed solution, and function specification.

- Optimization of all or part of the control system proposed, using appropriate engineering tools, and a computer program. Experimentation of all or part of the calculations performed, using the modelling technique.

- A review of the proposed solution, based on the function specification and the results obtained, indicating any further work necessary for validation of the solution.

- A critical conclusion, assessing the progress made towards solving the original problem, and indicating possible new problems, which can form the basis of new projects, arising from the current project.

Project Related Courses:

The following courses are offered in support of the project:

- Electric Drives (ELE553)
- Control System Engineering I (ELE543)
- Electronics Instrumentation I (ELE513)

P 502 FINAL PROJECT

OBJECTIVES:

- To enable the students to demonstrate their ability, skills, and originality in working as an engineer, by carrying out a meaningful and complete piece of work.

CONTENTS:

The report should as a minimum comprise the following:

Consideration of a real problem, preferably from the local industrial, agricultural, or domestic environment. A description of the problem in engineering terms, including a functional specification of the solution. Definition of the work to be carried out in the project, e.g. whether it is intended to solve the whole problem, or only a portion of it, the means intended to be used to generate a set of solutions, and selection of a suitable solution.

The set of solutions generated should be described, analysed, and a reasoned choice made of one or more of the solutions for detailed examination. The solution selected should be described in detail and dimensioned to suit the function specification suing appropriate theoretical engineering methods. The finished design, or a part of it should be verified by experiments on a laboratory model. The report should on conclude the suitability of the design to fulfil the requirements of the original function specification, and comment on any points not satisfactorily fulfilled, with suggestions for improvements or further work.

Project Related Courses:

The following courses are offered in support of the project:

- Electronics Instrumentation II
- Control System Engineering II
- Reliability and Maintainability of Systems.

5.4.4 Semester Plans, Light Current

DEPARTMENT OF ELECTRICAL ENGINEERING

LIGHT CURRENT

LEVEL	300			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	This semester same as Heavy Current		Maths. IV (ENG 382) Electronic Circuits (ELE 322) Advanced Compiler Application (ELE 342) Industrial Course (ENG 384)	3 2 2 2
PROJECT UNIT			Analog Electronics and Measurements	9
PROJECT RELATED COURSES			Circuit Theory II (ELE 314) Control System Engineering (ELE 543) Advanced Electronics (ELE 421)	3 3 3
STUDY UNIT PROJECT UNIT TOTAL	Credits Credits Credits			9 18 27

DEPARTMENT OF ELECTRICAL ENGINEERING

LIGHT CURRENT

LEVEL	400			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Communication Principals (ELE 431) Control Theory (ELE 441) Maths. V (ELE 481) Principals and Methods of Maintenance (ENG 483)	3 3 3 2		
PROJECT UNIT	Digital Systems	9	SIWES, I*, II and III (ENG 390), (ENG 490), (ENG 492)	18
PROJECT RELATED COURSES	Microprocessor Interfacing Application (ELE 443) Digital Electronic Circuits (ELE 522) Introduction for Digital Communication (ELE 534)	3 3 2		
STUDY UNIT	Credits	11		
PROJECT UNIT	Credits	17		18
TOTAL	Credits	28		18

* Siwes I is placed during vacation between 300 and 400 level

DEPARTMENT OF ELECTRICAL ENGINEERING

LIGHT CURRENT

COMMUNICATION

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Telecommunication Engineering (ELE 531)	3	Microwave Engineering (ELE 535)	2
	Power System Communication and Control (ELE 554)	2	Reliability and Maintainability of Systems (ELE 582)	2
PROJECT UNIT	Digital Communication	12	High frequence Communication	14
PROJECT RELATED COURSES	Communication System Engineering (ELE 536)	3	Radar System Engineering (ELE 532)	2
	System Modelling and Simulation (ELE 583)	2	The C Programing Computer Application (ELE 541)	3
STUDY UNIT	Credits	5		4
PROJECT UNIT	Credits	17		19
TOTAL	Credits	22		23

DEPARTMENT OF ELECTRICAL ENGINEERING

LIGHT CURRENT

INDUSTRIAL ELECTRONICS AND CONTROL SYSTEMS

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Applied Electronic Magnetism (ELE 533)	2	Reliability and Maintainability of Systems (ELE 582	2
	Introduction to Signal Processing (ELE 537)	2	Industrial Electronics Design (ELE 526)	2
	Advanced Computer Programing and Real Time Systems (ELE 341)	2	Analog and Digital Computers (ELE 545)	2
PROJECT UNIT	Control Systems	12	Industrial control systems	14
PROJECT RELATED COURSES	Control System Engineering (ELE 543)	3	The C programming Language in Computer Application (ELE 541)	2
	Electronic Instrumentation (ELE 513 + 514)	3	Control System Engineering (ELE 544)	3
	System Modelling and Simulation (ELE 583)	2		
STUDY UNIT	Credits	6		6
PROJECT UNIT	Credits	20		20
TOTAL	Credits	26		26

5.4.5 Project Themes, Light Current

The project themes indicated in the semester plans on the previous pages and in the table below are discribed on the following pages, 47 - 58.
The specilatization into Light Current and Heavy Current starts at Level 300, second semester. P 300 and P 301 are therefore as indicated on pages 35 and 36.

Department of Electrical Engineering
Project Theme Titles for Light Current

<table>
<tr><th>PROJECT</th><th colspan="3">PROJECT THEME</th><th>DURA-TION</th></tr>
<tr><td>P300</td><td colspan="3">Electrical Energy Systems
(How to execute a project)</td><td>2 Weeks</td></tr>
<tr><td>P301</td><td colspan="3">Electromagnetic Circuits & Measurements</td><td>1 Sem.</td></tr>
<tr><td>P302</td><td rowspan="4"></td><td colspan="2">Analog Electronics</td><td>1 Sem.</td></tr>
<tr><td>P401</td><td colspan="2">Digital Electronics</td><td>1 Sem.</td></tr>
<tr><td>P402</td><td colspan="2">SIWES</td><td>1 Sem.</td></tr>
<tr><td>P501</td><td>Industrial Electronics & Control Sys-tems</td><td>Com-munication Systems</td><td>1 Sem.</td></tr>
<tr><td>P502</td><td colspan="3">Final Project</td><td>1 Sem.</td></tr>
</table>

P 302 ANALOG ELECTRONICS AND MEASUREMENTS

OBJECTIVES:

- To intoduce the students to electronic components, their approximate models, application and limitations.
- To introduce the students to basic calculation methods for analog, electronic circuits and to introduce them to the scopes of the methods.
- To introduce the students to calculation methods that are applied when electronic circuits are combined into larger units with given specifications.
- To introduce the students to measuring methods and equipment which are achieved by control and documentation of structured electronic circuits.

CONTENTS:

The starting point is taken by way of presenting problems of which solutions naturally let themselves be realized as an analog, electronic system.

Project related courses: Type PR

- Circuit Theory II
- Control System Engineering
- Advanced Electronics

Study related courses: Type SU

- Maths IV
- Electronic Circuits
- Advanced Compiler Application
- Industrial Course

Typical projects:

- HI-FI amplifier
- Baby Crying Detector
- Noise Measurement
- Spy/rubber Alarm
- DC motor Controller

Courses:

NAME	OSUA NUMBER	CREDIT	TYPE
Circuit Theory II	ELE 314	3	PR
Control System Engineering	ELE 543	3	PR
Advanced Electronic	ELE 421	3	PR
Maths. IV	ENG 382	3	SU
Electronic Circuits	ELE 322	2	SU
Advanced Compiler Appli.	ELE 342	2	SU
Industrial Course	ENG 384	2	SU

Credit:

PR	9
SU	9
Project	9
Total	27

P 401 DIGITAL SYSTEMS

OBJECTIVES:

- To introduce the students to the concept of the system, methods of description and to analysing complex systems in terms of sub-systems.
- To introduce the students to the mathematical background for the design of combinational and sequential networks.
- To introduce methods for synthesis of digital systems, including an introduction to fundamental digital circuit elements, their application and limitations.
- To introduce development systems, operating systems, and digital machine environments.
- To provide a basis for the specification, design, implementation, test and documentation of software.
- To give practical experience with the specification, design, implementation, test and documentation of complex digital hardware.

CONTENTS:

- The starting point is taken by way of presenting problems of which solutions naturally let themselves be realized as micro-computer systems and/or a complex digital hardware.
- A specification of functions is established.
- In preparation of the implementation, an analysis of the system in function blocks is made and described separately.
- A detailed specification of the function for hardware/software that allows actual implementation is established.
- The system is implemented, tested and documented.

Project related courses: Type PR

- Microprocessor Interfacing Application
- Digital Electronic Circuits
- Introduction for Digital Communication

Study related courses: Type SU

- Communication Principles
- Control Theory
- Maths. V
- Principles and Methods of Maintenance

Typical projects:

- Trafic light system
- Weight unit
- House sensing via two-wire cable
- Motor speed measurement
- Frequency meter

Courses:

NAME	OSUA NO.	CREDIT	TYPE
Micro-processor Interface Application	ELE 443	3	PR
Digital Electronic C	ELE 522	3	PR
Introduction to Digital...	ELE 534	2	PR
Communication Principles*	ELE 431	3	SU
Control Theory	ELE 441	3	SU
Math. V	ELE 481	3	SU
Principles and Methods...	ENG 483	2	SU

Credits:

PR	8
SU	11
Project	9
Total	28

*This course is proposed here instead of ENG 441

P 501 DIGITAL COMMUNICATION

OBJECTIVES:

- To give further knowledge of theories, methods and techniques that are to be mastered in order to design transmission equipment for digital transformation to presented trasmission channel.

- To give practical experience in design of digital transmission systems. Each project group specifies, designs and assembles a specific digital data tranmission system or essential parts of it.

CONTENTS:

- The starting point is taken in a specific communication task in which analog or digital data is described transferred digitally from a physical position to another.

- A description with system specifications and a block diagram for the whole system is prepared.

- At least one project unit should be specified, designed, tested and documented.

In connection with the project unit courses in the field of:

- Analog and digital signal transmission
- Phase locked loops and oscillators
- Analog filter theory

Project related courses: Type PR

- Communication System Engineering
- System Modelling and Simulation

Study related courses: Type SU

- Telecommunication Engineering
- Power System Communication and Control

Courses:

NAME	OSUA NO.	CREDIT	TYPE
Communication System Eng.	ELE 536	3	PR
System Modelling Simulation	ELE 583	2	PR
Telecommunication Eng.	ELE 531	3	SU
Power System Communication and Control	ELE 554	2	SU

Credits:

PR	5
SU	5
Project	12
Total	22

P 502 HIGH FREQUENCY COMMUNICATION

OBJECTIVES:

- To give practical knowledge of the theories, methods and techniques that are applied in design of high frequency communication.

- To give practical experience in analysis, design and implementation of and measuring on high frequency equipment.

CONTENTS:

- The starting point is taken in a specific practical occuring way of presenting problems, which require design of high frequence communication equipment.

- Preparation of description with system specification and a block diagram for the whole system will be performed.

- At least one high frequence unit should be specified, designed, tested and documented.

Project related courses: Type PR

- Radar System Engineering
- The C programming Computer Application

Study related courses: Type SU

- Microwave Engineering
- Reliability and Maintainability of Systems

Courses:

NAME	OSUA NO.	CREDIT	TYPE
Radar System Engineering	ELE 532	2	PR
The C Programming Computer Application	ELE 541 (AUC)	3	PR
Microwave Engineering	ELE 535	2	SU
Reliability and Maintainability of Systems	ELE 582	2	SU

Credits:

PR	5
SU	4
Project	14
Total	23

P 501 CONTROL SYSTEMS

OBJECTIVES:

- To give an introduction to theories and methods that are applied in modelling, analysis, simulation and dimensioning of automatic control systems with both analog and digital control installations.

- To give practical experience of the above mentioned theories and methods in modelling a laboratory installation.

CONTENTS:

- The following should as a minimum contain:

- A laboratory test stand is used as target for the control.

- A mathematical model is developed for the target as basis for the design of the control system.

- Different methods used for designing analog and digital control are evaluated. One way is to make a simulation.

  One method is chosen for the implementation and the control is tested on the target.

In connection with the project unit courses are offered in the field of:

Modelling of mechanical and terminal systems, analog and digital control engineering, simulation of dynamic systems.

Project related courses: Type PR

- Control System Engineering
- Electronic Instrumentation
- System Modelling and Simulation

Study related courses: Type SU

- Applied Electronic Magnetism
- Introduction to Signal Processing
- Advanced Computer Programing and
- Real Time Systems

Typical projects:

- Regulation of room cooling

Courses:

NAME	OSUA NO.	CREDIT	TYPE
Control system Engineering I	ELE 543	3	PR
Electronic Instrumentation	ELE 513 (+ 514)	3	PR
System Modelling and Simulation	ELE 583	2	PR
Applied Electro-Magnetism	ELE 533	2	SU
Introduction to Signal Processing	ELE 537	2	SU
Advanced Computer Programing and Real Time Systems*	ELE 341 AUC	2	SU

Credits:

PR	8
SU	6
Project	12
Total	26

* See attached course description.

P 502 INDUSTRIAL CONTROL SYSTEMS

OBJECTIVES:

- To give possibilities for evaluating existing control systems. To make specifications for large control systems. In both cases taking technology and maintenance into consideration.

CONTENTS:

- A case from the real environment is chosen. The control system is analysed and evaluated.Technonoly power consumption, pollution, maintenance, economy etc. are taken into concern. Possible improvement are developed and implemented and (or) reported.

Project related courses: Type PR

- The C programming Language in Computer Application
- Control System Engineering

Study related courses: Type SE

- Reliability and Maintainability of Systems
- Industrial Electronics Design
- Analog and Digital Computer

Courses:

NAME		OSUA	CREDIT	TYPE
The C Programming Language in Computer Application	*	ELE 541 (AUC)	2	PR
Control System Engineering		ELE 544	3	PR
Reliability and Maintainability of Systems		ELE 582	2	SU
Industrial Electronics Design		ELE 526	2	SU
Analog and Digital Computers		ELE 545	2	SU

Credits:

PR	6
SU	6
Project	14
Total	26

5.5 DEPARTMENT OF MECHANICAL ENGINEERING

5.5.1 General

As it is seen in section 5.2 Mechanical Engineering is specialized in three lines of study at 500 Level.

On the following pages, 60 - 64, the semester plans for all levels are presented. They are followed by short descriptions of project themes, pages 65 - 67.

All courses indicated in the Semester Plans refer to OSUA's "Handbook of Regulations, Programmes and Syllabuses og studies, 1989-92". As mentioned in chapter 2 the Handbook is currently under revision. Further revision will be required before introducing the AUC model.

5.5.2 Semester Plans

MECHANICAL ENGINEERING

LEVEL	300			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Engineering Maths. I (Eng 381)	3	Engineering Maths II (ENG 382)	3
	Engineering Materials (Eng 301)	2	Fluid Machanics I	3
	Adv. Computer Programming (ELE 341)	2	Comp. Appl. (CAD/CAM)	2
	Industrial Course III (ENG 383)	2	Industrial Course IV (ENG 384)	2
	Electrical Machines I (ELE 351)	3	Mechanical Eng. Laboratories (MEE 361)	2
PROJECT UNIT	Introduction to Project Work	1	Product Design & Production Processes	6
	Basic Mechanical Functions	5		
PROJECT RELATED COURSES	Strength of Materials (MEE 301)	2	Mechanics of Machines (MEE 312)	3
	Mechanics of Machines (MEE 311)	3	Heat Transfer	3
	Machine Design I (MEE 332)	3	Mechanical Measurements & Instrumentation (MEE 314)	2
STUDY UNIT		12		12
PROJECT UNIT		14		14
TOTAL		26		26

MECHANICAL ENGINEERING

LEVEL	400			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Engineering Maths. III (Eng 481)	3		
	Metallurgy (MEE 401)	2		
	Mechanical System Analysis (MEE 411)	3		
	Principles of Control System (MEE 413)	3		
	Mech. Eng. Laboratories (MEE 362)	2		
PROJECT UNIT	Mechanical Engineering Design, Production, System Constr.	6	Siwes I	6
			Siwes II	6
			Siwes III	6
PROJECT RELATED COURSES	Machine Design II	3		
	Principles & Methods of Engineering Maintenance	2		
	Thermo Dynamics (MEE 326)	3		
STUDY UNIT		13		
PROJECT UNIT		14		18
TOTAL		27		18

MECHANICAL ENGINEERING

PRODUCTION AND MANUFACTURING

LEVEL	500			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Metrology and Quality Control (MEE 538)	3	Fundamentals of Tribology (MEE 533)	2
	Manufacturing Processes (MEE 535)	3	Technology Policy and Planning (ENG 582)	2
	Synthesis of Mechanisms (MEE 513)	3	Machine Maintenance and Overhaul Technology (MEE 512)	3
PROJECT UNIT	Production and Manufacturing	10	Final Project	12
PROJECT RELATED COURSES	Production Engineering (MEE 531)	3	Electives	6
	Electives	3		
STUDY UNIT		9		7
PROJECT UNIT		16		18
TOTAL		25		25

MECHANICAL ENGINEERING

MECHANICAL ENGINEERING DESIGN

LEVEL	500			
SEM	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Analytical Dynamics (MEE 511)	3	Fundamentals of Tribology (MEE 533)	2
	Synthesis of Mechanisms (MEE 513)	3	Technology Policy and Planning (ENG 582)	2
	Principles of Energy Conversion (NEW)	3	Machine Maintenance and Overhaul Technology (MEE 512)	3
PROJECT UNIT	Mechanical Engineering Design	10	Final Project	12
PROJECT RELATED COURSES	Production Engineering (MEE 531)	3	Electives	6
	Electives	3		
STUDY UNIT		9		7
PROJECT UNIT		16		18
TOTAL		25		25

MECHANICAL ENGINEERING

THERMOFLUIDS

LEVEL	500			
SEM.	1		2	
	Course	Credits	Course	Credits
STUDY UNIT	Analytical Dynamics	3	Fundamentals of Tribology	2
	Synthesis of Mechanisms	3	Machine Maintenance and Overhaul Technology	3
	Principles of Energy Conversion (new)	3	Technology Policy and Planning	2
PROJECT UNIT	Thermo and Fluid Mechanical Process Realization	10	Final Project	12
PROJECT RELATED COURSES	Production Engineering	3	Electives	6
	Electives	3		
STUDY UNIT	Credits	9		7
PROJECT UNIT	Credits	16		18
TOTAL	Credits	25		25

5.5.3 Project Themes

On the following pages a short description is given of the project themes indicated in the semester plans on the previous pages and in the table below.

Department of Mechanical Engineering
Project Themes for all lines of Study

Project	Project Themes			Duration
P300	Introduction to Project work (How to execute a project)			2 Weeks
P301	Basic Mechanical Functions			1 Sem.
P302	Product Design & Production Processes			1 Sem.
P401	Mechanical Engineering Design, Production, System Construction			1 Sem.
P402	SIWES			1 Sem.
P501	Production & Manufacturing	Mechanical Engineering Design	Thermo- & Fluid- mechanical Process Realization	1 Sem.
P502	FINAL PROJECT			1 Sem.

OBJECTIVES FOR THE PROJECT THEMES IN MECHANICAL ENGINEERING

P300

Theme: **Introduction to Project Work**

Objective: To teach the students how to organize and carry out project work, and how to present the project work in a seminar and by a written report.

Duration: 2 weeks

P301

Theme: **Basic Mechanical Functions**

Objective: To introduce the students to the mechanical design process. To teach the students how to analyze forces and movements in mechanisms. To introduce the students to analysis of stresses and strains. Introduce the students to the use of standardized machine components.

Duration: 1 semester minus 2 weeks

P302

Theme: **Product Design & Production Processes**

Objective: To introduce the students to manufactoring/production processes and how they affect the design of a mechanical construction.

Duration: 1 semester

P401

Theme: **Mechanical Engineering**
Design, Production, System Construction

Objective: To continue the process started in P302 by involving system analysis and production preparation.

Remarks: This project can be used for all kinds af machinery and mechanical systems such as: processing machines, hydraulic machinery, thermomechanical energy machines.

Duration: 1 semester

P501

Theme: **Mechanical Engineering Design**

Objective: To give the students an extended knowledge of construction/design methods combined with Stress & Strain Analysis. Introduction to Computer applications for Design and Analysis. (Computer Aided Design, Finite Element Methods).

Duration: 1 semester

P501

Theme: **Production and Manufacturing**

Objective: To give the students an extended knowledge of Production. In this semester a single process and its machine tool is analysed and optimized qualitatively and quantitatively.

Duration: 1 semester

P501

Theme: **Thermo & Fluidmechanical Process Realization**

Objective: To give the students an extended knowledge of the realization of Thermo and Fluid Mechanical Processes. The thermo and fluid mechanical aspects of an energy converting plant or system are analysed in order to clarify the impact on system design, functionality and dimensioning.

Duration: 1 semester

6. FUTURE WORK

As mentioned earlier the proposal presented in this report is considered a first important step towards the introduction of a Study Plan based on the AUC pedagogical approach.

There is, however, much work to be done before a Study Programme in line with the proposal can be implemented.

Also the implementation phase will require intensive participation and efforts by OSUA and AUC Staff as well.

Prior to implementation of the programme the following steps are envisaged.

Agreement by OSUA and AUC on a study plan based on the present proposal

It is only natural that the revisions suggested in this report have been prepared almost solely by AUC Staff since they reflects the experiences made by AUC Staff from their own University. But using the report as a basic document it is now very important that OSUA and AUC Staff get equally involved in order that their experiences can be combined in an optimal solution for the Faculty.

Approval by the Authorities of the agreed plan

It is a prerequisite that the plan will not violate the regulations of the National Universities Commission and the agreed plan should therefore be presented to the NUC for approval. It is suggested that the presentation takes place at a Seminar similar to that arranged by NUC at OSUA in 1991.

AUC would be happy to host the Siminar as indicated in Plan of Operation for 1992. It would give the participants a good opportunity to get acquainted with AUC and her way of teaching.

We have learnt, however, that funds will not be available for that in the present project period ending October 1992.

Physical frame work etc.

Introduction of group work will require group rooms for the students where they can do their project work. An analysis of the area required and a suggestion on how to arrange and equip the rooms should be made, and the necessary improvements should be made accordingly.

There will be a need for printing facilities for printing of students' reports and project drawings. The organizational aspects as well as maintenance and running costs of theeese facilities should be looked into.

Implementation.

Prior to and simultaneously with the introduction of the problem oriented and project organized teaching at AUC a number of seminars and pedagogical courses were held and furthermore intensive preparations were made by the Academic Staff in order to describe semester themes and to identify suitable project proposals.

Similar preparations will need to be done at OSUA and it will require extensive participation by OSUA Staff and by AUC Staff as well. It is important that funds are allocated this activity in the extended programme.

It is deliberate that a time schedule for the future work indicated above has not been suggested since a schedule will depend on the availability of funds but it is hoped that implementation of the prepared Study Plan can tak off within the first year of extension of the programme period which we hope will be granted, i.e. 1993.

7. CONCLUSION

The present report suggests a Study plan for the Faculty of Engineering at OSUA based on the pedagogical approach used at Aalborg University.

It is meant as a basic document for future discussions between OSUA and AUC Staff and it is hoped that it will result in a proposal agreed upon by the two Universities and approved by the Nigerian Authorities.

It is recognized that it will require extensive participation from OSUA Staff and from AUC Staff as well to make the introduction of the AUC pedagogical approach a success at OSUA.

It is thought, however, that it will be worthwhile since a successful implementation of the AUC approach at OSUA will be a major contribution to the development of the Faculty of Engineering and its ability to produce graduates trained to identify and solve technical problems related to the development of the State.