FORMULATING
A COMPUTER-AIDED ARCHITECTURAL DESIGN (CAAD) PROGRAM MODEL
IN DISTANCE EDUCATION (DE) AT OPEN UNIVERSITIES (OU)

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ABSTRACT

This paper reports on a project that aims to formulate a CAAD program model in Distance Education (Learning/Teaching) framework, to be applied and implemented in future settings at Open Universities worldwide.

The methodology used to establish the CAAD program model consisted of a worldwide literature review on the subject of Distance Education and Open Universities. It also involved an assessment of the methods and means used in the delivery of materials to students enrolled at Open Universities, together with an analysis of the current program of study and subject related courses. The methods of this investigation consisted of a comparative analysis between the existing models of teaching process at Open Universities and how it relates to CAAD in architecture schools.

The study endeavored to examine several issues that were found to be key factors in any Open University system, namely: the methods of study, program of study, student type/body, academic/degree requirements, and residency/academic calendars. While attempting to establish a conceptual CAAD program model, this study investigated several questions concerning the efficiency of CAAD teaching in Distance Education.

One of the study objectives was to determine which factors were mostly needed to effectively integrate CAAD in DE as a new program in Open Universities. In addition, how would these factors affect the design of CAAD courses in OU systems as a new DE program area? And what structural elements would be most affected by these factors? Another objective of this

study was to determine to what extent the new CAAD program model in tandem with staff, learning environment, and administered materials would be effective in generating supplementary strategies in the virtual design studio. A third objective was to evaluate the personal computer station as an alternative design studio space in future settings of schools of architecture.

Consequently, the principle objective of this study was to develop and establish a CAAD program model to be adopted by Open Universities as a new subject area in DE. Mainly, the study attempted to locate the areas where CAAD teaching excels in the context of virtual design studio of OU system.

FORMULATING A COMPUTER-AIDED ARCHITECTURAL DESIGN (CAAD) PROGRAM MODEL IN DISTANCE EDUCATION (DE) AT OPEN UNIVERSITIES (OU):
A STUDY INTO AN EFFECTIVE INTEGRATION OF CAAD INTO DISTANCE EDUCATION.

1. Introduction

Distance learning programs have multiplied to an unsubstantial extent over the past ten years. Nevertheless, despite its intense adaptation in academe, distance learning remains remarkably controversial. Educators and scholars have been asking many questions about distance education some of which are essentials and require some answers, e.g. will distance learning be able to refine and enhance the conventional/traditional educational endeavour, or will it atomise the educational establishment to an uncertain extremity? (Aoki and Pogroszewski 1998)

It is evident that several conventional universities and colleges have been compelled to embrace distance education because of the students' social and demographic changes. For the most part, this change is due to students' access to efficient and relevant information. Furthermore, students are demanding educational institutions to apply efficient information access resources to theoretical programs and courses. Such resources are adapted in computer-based instruction and asynchronous learning networks. These necessities are forming the "virtual campus" which many institutions have disregarded, or simply are not aware of the magnitude of this new tool. (Stenerson 1998)

But, what does the term distance education/learning signify? The scope of definitions spread from assigning an instructor to a group or individual students, particular distance or location from the main campus, to accommodating all instruction and communication via the WWW, or using the TV as another medium of transmitting information to students. Among these considerations rest various distinct paradigms in different approaches and fashions.

This multiplication of media, which we may label the term "coexistent environment" raises a number of concerns for institutions. A fundamental countenance is the verification of the distant student. which evokes many challenges in connection to the fundamental prerequisites of any higher education institutions' curriculum. Such examples are skill acquisition by students to process information, and how to address its knowledge acquisitions and aptitude. It is then a fundamental task for institutions and mostly architecture schools to acquire a system design so that distance education can be integrated into its educational system as a whole.

In many universities worldwide there has been a number of system models designed to support distance education. However, none has developed a distance education in architecture schools, mainly because each school has a particular approach towards teaching architecture being affected by cultural, social, regional, or even religious factors. Thus, it could be argued that specific system designs must be tailored for the institution to meet the continuous social and demographic changes of student population. Therefore, this paper attempts to design a prototype of a general system model for

architecture application mostly designated to computer aided architectural design (CAAD).

A CAAD enhanced learning environment has many distinct factors that can enhance the pedagogical effectiveness of CAAD course content at a distance. It could be achieved through various ways and means such as e-mail, compressed video, group support tools, TV programs, and web-based instruction. Using this technology, CAAD learners can still receive instruction similar to what would have been available to them at a conventional environment. A potential problem might exist when designing a CAAD model for distance education is the application of conventional/traditional pedagogical methods into CAAD enhanced environment. Hammer (1990) argues that one cannot "*pave over cowpaths*" in the redesign of business processes, hence this would accelerate inefficient ways of performing those processes. It could be argued that a similar case might be applied on CAAD distance education. Thus, when designing a distance learning model for CAAD, the full effectiveness that technology can provide to both logistical distance and non distance learning environments cannot be achieved through "force-fitting" traditional learning paradigms into the technologically supported ones.

This paper proposes an integrative CAAD model to enhance a CAAD efficient and effective learning environment through distance learning and provide a framework for instructional processes substituting for the geographic distance obstacle.

2. History and Background

Although there are several universities and colleges offering distance learning/education programs for almost ten years now, yet there is a rapidly increasing necessity to offer instruction and services to learners (students) in a virtual environment at their convenience. During the 90's there has been a growing interest in distance learning/education using personal computers and networks systems. Distance learning/education has gone through enormous modification since the introduction of the personal computer and more recently the superiority of the Internet/WWW. It provides a distance student/learner with theoretical/academic assistance via telecommunications media, thus, giving the distance student/learner the same advantages and privileges a conventional/traditional on-campus learner undergo.

Currently, colleges in the Tennessee Board of Regents System deliver distance learning courses fundamentally in four ways. However, two modes dominate: Compressed video transmissions "smart classroom" over telephone lines and videotapes sent to students' homes or placed in local libraries for use or checkout. Nearly all colleges are attempting to enrol in the on-line market, however the growth of on-line courses has been modest. Stenerson 1998 argues that distance learning can embrace many different forms, ranging from mailed printed materials to desktop videoconferencing.

On the other hand, this increased concern and engagement in distance learning/education among universities and colleges may remain to expand. According to Aoki and Pogroszewski 1998, this area is being fuelled by three major factors:

1) Institutions are looking into increasing enrolment by attracting non-resident students; 2) there are growing needs of adult learners to acquire new skills and college credits while overcoming the constraints of time and distance; and 3) the development of new technologies is making the delivery of distance learning courses more attractive.

Yet, during the last ten years, distance education has managed to question historical apprehension of the concept of traditional teaching. Distance education has been in existence for almost one hundred years. Since its beginning, distance education has acquired a disreputable standing, founding an argument with many traditional universities (Stenerson 1998).

Once again the introduction of computer-based instruction helped greatly in advancing distance learning especially with advents of information technology. According to the U.S. Department of Education (1997), as of September 1995, one third of colleges and universities were offering distance courses and another twenty-five percent were planning to implement distance courses within three years. One-half of the institutions were providing courses to students at home.

As the main objective of this study is not on the examination of different delivery CAAD methods, but rather presenting a comprehensive model of online distance education (i.e., the provision of a CAAD learning environment that utilises computer networks to a large extent to advocate distance learning in architecture schools). Thus, the effectiveness of different CAAD educational delivery methods is beyond the scope of this paper.

3. Distance Education Development

The fundamental conception of distance learning/education from its initiation was composed around separating the instructor from the student. Alternatively, extinguishing the basic concept of one-to-one instruction, which most curricula is built upon at present. Initially, as distance learning started, the correspondence course was the most common model of instruction. Since then, there has been an excessive modification in the concept of distance learning/education that compelled many institutions to confront issues of distance education and the new advent they bring.

Founded over the technological changes that have occurred in the field of distance education and IT, D. R. Garrison proposed three generations of distance education. The first generation was based on the printed word and delivered by mail. The second generation was piloted by the advancement of broadcast media, television and radio. The third generation of distance education arrived with the advent of IT and computers and their use to deliver instruction materials (Chou and Sun 1996). Since then, students anticipated institutions to deliver courses "on-line". It is evident that digital information could yield and prevail a forth generation of distance education that would influence the virtual campus in which many institutions have already adopted.

4. Distance Education Terminology

4. 1. Distance Education/Distance Learning.

The terms "distance education" and "distance learning" interchanged for years, yet in principal, they seem to have equivalent meaning and objective. Education embodies a systematic approach which interrelates learning, the institution, and the learning environment.

Michael G. Moore and Greg Kearsley 1996, best described distance education as "*Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organisational and administrative arrangements.*"

There is an on-going discussion on which term should be used with the pedagogical arguments concentrating in on the words "learning" and "education". However, in the case of architecture, which is the concatenation of this paper, Lewis (1985) differs that the education of architecture is founded over the curriculum comprising of courses, over all program goals, faculty, physical facilities, budgets, management, and students. Principally, the contents of architectural program are generally divided into three broad areas of design, history, and technology. Thus, this paper will be focusing on the need to develop a CAAD distance system, in which the term preferred, and used, will be CAAD distance education.

4.2. Computer-aided learning (CAL):

The term refers specifically to computers as a learning resource or medium. Thus, proposing that CAL is the use of a computer system to augment or supplement a conventional instructional system (QaQish & Hanna 1997).

4.3. Computer-aided Instruction (CAI) and Computer-aided Teaching (CAT):

The two terms are very similar in their meaning and usage; they both have a common goal and objective when applied. These terms mainly refer to the 'drill and practice' and 'tutorial' varieties. Some authors such as Hooper considered CAI as one type of CAL (QaQish & Hanna 1997).

4.4. Computer-management learning (CML):

The term refers to computer management of learners, which involves the aspects of teachers, instructional materials, media and administrative duties in the computer assisted learning events in CAD. The nature of these three essential domains (factors) is manifested and explored throughout their interdependent relationship with the five domains: cognitive, skills, attitude, creativity, and performance (QaQish 1997).

4.5. Group-based and Individual-based learning in CAL:

The nature of the communication in group-based computer learning and by individual study is such that each involves a distinct process. During the computer-aided learning events differences in what is learnt due to variations in how the communication and learning occur are likely to be found. (QaQish & Hanna 1997) When discussing the issue of co-operative, competitive and individualist goal structures, in terms of the group or the individual, Johnson (1988) argues that computer technology furnishes education with several challenges:

a) The challenge to prevent isolation and alienation of students when promoting the effective instructional employment of computers.

b) Computer assisted learning institutes fewer interactions with teachers and classmates, thus advocating the assumption that CAI is primarily individualistic.

c) Computer assisted instruction may have an effect on educational practice, since interpersonal interaction is a key influencing factor on instructional effectiveness and classroom climate. As a result, the possible use of computer assisted co-operative or competitive instruction is ignored.

4.6. Computer-Mediated Communications and Computer-Based Instruction.

As distance education advances into a third generation, information technology is bond to shape the future of DE and proposes new means and methods to give birth to computer networks that develop the communication channel for delivering instruction. It is evident that the rise of the two terms that are used when discussing computer networks in distance education are computer-mediated communications and computer-based instruction.

A) Computer-mediated communications is a generic term that depicts the command of people to communicate with one another with computers and networks. Prevalent forms of computer-mediated communications are Internet, e-mail, computer conferencing, bulletin boards, and discussion lists.

B) Computer-based instruction is also a generic term meaning student may communicate and exchange information with computer networks, forming a learning environment. Two of the forms of computer-based instruction entails hypertext and hypermedia. Similarities in the pedagogical issues that originate in computer-mediated communications also arise in computer-based instruction. Researchers and scholars maintain that instruction has moved from learning "from" media to learning "with" media (Hannafin et al.1996; Romiszowski and Mason 1996).

C) Asynchronous Learning. According to Hiltz and Wellman (1997) the main focus of an asynchronous learning network is a "teaching and learning environment … designed for anytime/anyplace use through computer networks." (P.16) Thus, an asynchronous learning network is a model of computer-based instruction, engaging inspection place without the parturition of location and time.

5. CAAD Institutional Responsibility and Involvement

As the CAAD program with distance education is being initiated at colleges and schools of architecture, it is important to recognise different levels of responsibilities schools may have to indulge in. Moore and Kearsley 1996 suggest four levels of distance education scheme. Level one is Distance Learning Programs which is usually administered by self-working individuals who have no system resources. Distance Learning Units is a self-contained unit within a conventional institution where assigned resources and the potential exists for the design of a system. Distance Learning Institution and Distance Learning Consortia levels depict a whole and dedicated institutional "system" for the delivery of distance education.

This paper will poise the need for CAAD system model and curriculum design for the Distance Education Programs and Units in schools of architecture.

6. A New CAAD Theory of Virtual Campus

"Virtual campus" and "Virtual university" are two terms referred to in distance education theory often in relationship to the incorporation of asynchronous learning networks. Talley 1997 argues that institutions will have to support the "distributed learning communities" but also maintain a level of traditional interaction providing the sense of an academic community. The term "virtual" is applied in recollection of the asynchronous population and the distributed learning process.

This paper foresees the virtual campus through virtual design studios suggested in CAAD model (see CAAD model), and will mostly use the term virtual campus in awareness of the significance and multi-dimension of traditional architecture curriculum endeavour. Thus, the virtual campus and the virtual design studio might in fact propose the exclusion of the physical CAAD studio.

7. CAAD Model Design

Many fundamental Architectural education programs prepare their graduates to deal with current issues of theory and practice. However, the current trend in architectural education is to respond more to the newest technology and consequently to CAD, thus delivering more up to date graduates who can deal with current architectural issues in various environmental settings. Though computer training is often provided in architectural programs, architects practising in these substitute environmental settings facing an increasing demand for computer skills (QaQish 1997). Today, even the AIA examination is supported by computers and architects are requested to acquire a good knowledge of computing.

QaQish 1998, argues that the employment of technology into architectural curricula whether in relation to theory or practice has continually been constituted as one of the pressing enigma in architectural education. Moreover, the impotent integration in architecture between architectural science and creative designs has been a scholarly and proficiently significant debatable question. Architectural science instigates subject based on objective line of questioning while creative designs instigates subject based on aesthetic and creativity.

In addition, with the tremendous expansion of architecture information and knowledge, much of the content presented in architecture programs becomes outdated. Remaining current is vital for the architecture profession and for architects on the job. Many schools are aware of this and taking rapid and vast steps to stay current. Subsequently, this may be accomplished through continuing education and pursuing advanced degrees in CAAD and architectural Technology. In light of this argument, architecture schools should consider the distance education in architecture education as an alternative because of the student population social and demographic changes.

Instructional uses of the computer are important and may help to address these issues. Many programs have been developed world-wide offering courses partially or completely via computer mediated communications (CMC) (Hiltz 1995). Other institutions as discussed earlier in this paper have taken CMC a step further, offering classes online that can be taken at a distance. Architectural education is not any where close to move in the direction of distance education. This paper describes a proposal of CAAD model, to manage a virtual studio for a CAAD course.

More than ever, architectural education programs need to introduce or expand basic computer skills/ CAAD through distance education. Providing CAAD distance education increases access to information and advanced degrees. Moreover, it facilitates the CAAD teaching/learning process advocating a new trend in CAAD. This may also enhance job skills and decline anxiety associated with computer use (QaQish & Hanna 1997).

Two notable difficulties may be solved for architectural students as CAAD model is introduced in any new institution as a distance education system: time and distance. For non-traditional student who have full-time positions in architectural firms or other related practices with varied work schedules along with family responsibilities, time and distance may indeed be of importance, and distance education would surely solve this problem. This paper proposes online course as the optimal choice for delivery and among the different strategies that were examined to help minimise the time and distance factors.

8. CAAD Theoretical and Applicable Basis

Investigating the theoretical basis for online education is essential to understand the importance of the concept in distance education. The work of Otto Peters (Moore & Kearsley, 1996), Desmond Keegan (Keegan, 1998), and Michael Moore (Moore & Kearsley, 1996) all showed a great interest in this area. Each offered various degrees of insight into the creation of courses, and the successful behaviours of teachers and learners. Theories provide direction and guidance for structuring professional architecural practice, education, and research. Teymur (1993) suggests that the controversial issue of whether to classify architecture as technology, craft, science or art, has deluded the paradox of the notion of architecture. He maintains that architecture should be viewed as a multi-disciplinary, multi-skilled, multi-dimensional and multi-media practice, within which a self-sufficient knowledge strives on the self-reliance and generation of knowledge. Teymur suggests four division domains of historical contexts, cultural contexts, physical contexts and social contexts.

The appropriateness of forcing traditional teaching/learning paradigms into this new medium is yet another aspect to consider. In that regard, the Miller/ Padgett model of efficient and effective distance education was used (Miller & Padgett, 1998). Miller & Padgett three-dimensional model addresses place, group size, and time formulate the various dimensions of the conditions both inherently found and needed in a successful distance learning environment. The distance education environment takes place in real time (synchronous) and part of it renders at students' discretion (asynchronous). With the help of this model, current topics in CAAD were embedded to meet the needs of the CAAD distance learner.

9. CAAD Systems Models

Bachelor of Science in Architecture Technology:
Computer Aided Architectural Design (CAAD)

A bachelor's degree in architecture technology with a concentration on computer aided architectural design (CAAD) provides students with hands-on application-oriented education pertaining to both architecture and information technology along with the real world buildability and CAD. This degree can be completed through distance education with various flexible options. The freshman and sophomore requirements can be fulfilled either at a pre-entry level on campus or through distance education at an equivalent community

college level. The junior and senior level courses can be obtained through Instructional Television (ITV) from the University (excluding lab courses unless a virtual lab is available.)

Information Technology (IT) using PCs as a Medium/Tool has reformed the design process thus affecting to great extent architectural tuition and, consequently, the built environment. Therefore, CAAD course through DE emphasises design using state-of-the-art equipment and practices. Graduates are employed by mechanical, industrial, and biomedical engineers, construction related industries, and graphics/advertising firms. Once initiated, the CAAD program should be accredited by the appropriate Accrediting Commission of the Accrediting Board at the designated country.

9.1. Suggested CAAD Degree Requirements:

*University Core Courses (68-80 hours)

English: Vocabulary and Technical Writing (6 hours)
ENGL 1
ENGL 2
 Local Language (for non-English speaking Countries) (6 hours)
LANG 1
LANG 2
Mathematics (6 hours)
MATH 1
MATH 2
Natural Sciences (6 hours)
PHYS 1
PHYS 2
Social Sciences (6 hours)
Cultural Heritage (6 hours)
Military Practice (3 hours) (applicable to some countries)
Country History (6 hours)
HIST 1
HIST 2
Country Government (6 hours)
POLS 1
POLS 2
Physical Education (2 hours)
PHED
PHED

*General Technology (9 hours)
CIVT
ITEC
TECH

*CAAD Core Requirements (45 hours)

Introductory CAAD Stage:
Intro to CAAD
CAAD Seminar 1

CAAD Computer-aided architectural design 1
CAAD Programming 1
CAAD Virtual Studios: Designing with Computers 1

Intermediate CAAD stage:
CAAD Seminar 2
CAAD Computer-aided architectural design 2
CAAD Programming 2
CAAD Virtual Studios: Designing with Computers 2

Advanced CAAD Stage:
CAAD Seminar 3
CAAD Computer-aided architectural design 3
CAAD Programming 3
CAAD Virtual Studios: Designing with Computers 3

Graduation Project
CAAD Virtual Studios: Designing with Computers 4

Computer Drafting Design (12 hours)
CADD 1
CADD 2
CADD 3

CAD Electives (6 hours)
Elective
Technical Elective

Free Electives (6 hours)

CAAD External Course (6 hours)

Supplementary Courses (12 hours)
• Structures
• HVAC
• Environmental Control Systems
• Scheduling/Project Management

In order to graduate, students must complete a minimum of 138 semester hours (36 hours must be advanced) with the last 30 hours in residence. However, Up to 66 hours may be transferred from a community college. In Addition, students must also pass a Writing Proficiency Exam.

9.2. Description of Required Architecture Technology Courses

For CAAD model course, the students should register in the Bachelor of Science in Architecture Technology. Enrolment of students who must have an access to a computer with Internet capabilities, is indeed not limited, but

depends on the facilities and staff provided by the institution. Students admitted to CAAD program self-described level of experience ranged from novice to knowledgeable. CAAD program, new students and new to the online environment are introduced to a number of courses to help them behave, and get clear guidelines about what is expected of them in online discussions.

Contemporary Issues in architectural design and CAAD, given to students through CAAD seminars, provide the student with the opportunity to explore professional issues and human values related to contemporary CAAD issues.

Since learning to use the technology effectively is an important skill to be acquired early in the teaching process (Gunawardena, 1992), students were required to complete the university's online tutorial whenever applicable. CAAD teaching strategies included selected readings, online asynchronous and synchronous classroom discussion, research, guest and student presentations, and CAAD projects.

* Lab courses must be taken on campus, unless prior arrangements have been made with the instructor. Some laboratory work may be completed at home or work; other lab work must be done on the main campus, usually on weekends.

General Technology (9 hours)
CIVT : Graphics Cr. 3. Concepts and practices in lettering, geometric construction, multiview and auxiliary projections, sections, dimensioning, and isometric and oblique pictorials. Emphasis on freehand sketching.
ITEC : Technical Communications Cr. 3. Procedures and techniques of preparing technical memoranda, oral and written reports, manuals, and other source documents that fit the pattern of industrial and institutional communication.
TECH : Computers in Technology Cr. 3. Introduction to computers and their application to various disciplines. Concepts of hardware, software, number systems, basic computer organisation, and structured programming.

CAAD Core Courses (45 hours)

Introduction to CAAD Cr. 3.
Seminar Oriented (Video + TV channels)

STRUCTURES: This is an interdisciplinary seminar, whose goal is to reason on a series of fundamental questions that affect altogether such different fields as art and architecture, perception, architectural theory, computing, and philosophy. The seminar is divided into five distinct parts, each having the notion of STRUCTURE as a common denominator: TEXT, SHAPE, OBJECT, SPACE, and LIGHT. A weekly theoretical introduction on the subject is followed by an exercise. Starting with the first exercise, students present their work on the Internet.
The following computer tools / programs are introduced and used in the exercises: Unix operating system, HTML, XV, Adobe PhotoShop, AutoCAD, VRML, and Cosmoworlds.

CAAD Case Studies Cr. 3

This is an individual study dedicated to the modelling of an architectural object. The outcome of this individual study is a two-dimensional and three-dimensional representation of the studied object. In addition, a written report summarising the major features of the CAD program being used and comparing it with previously used programs or modelling techniques is required. The following programs are available for use : AutoCAD, Microstation, Archicad, Architrion, FormZ.

CAAD Virtual Studio:
CAAD Designing with Computers 1, 2, 3, 4, Cr. 4 (a total of 16 Cr. hours)
This is a core course of the CAAD degree. Students are obliged to attend the lectures and do the exercises.
In this course students have the opportunity to use the computer in the design studio.

CAAD Programming Cr. 3
The goal of this course is to teach students basic programming skills in AutoLISP, as well as an introduction to higher level languages, such as C, C++, and Java. The course consists of a series of lectures followed by exercises.

CAD External Courses Cr. 6
Upon approval by the program advisor, a student selects a course from a related discipline such as Computer Science, Robotics, Computer vision or Neurological Sciences.

CAAD Seminar:
Architectural Analysis and Representation: Cr. 3
The goal of this seminar is to make a comparative analysis of the different conceptions of architecture that are embedded in the projects of famous architects like Le Corbusier, Mies, Aalto, Terragni, Rietveld, and Loos. Internet is the medium in which this analytical work is carried out. Computer tools are to represent architectural works, to search for new relationships between concepts, and ultimately to convey a new conceptual framework derived from the intertwining of computing and architecture. In this seminar, students acquire the necessary knowledge in PERL and CGI scripting that enables them to create web sites displaying dynamic pages and handle Internet-based databases.

CAAD Computer-Aided Architectural Design 1 + 2 Cr. 4 (a total of 8 Cr. hours)
This is an elective course of the Architecture Department. Students are obliged to attend the lectures, but they do not have to do the exercises.

Computer Drafting Design (12 hours)

CADD 1: Computer-Aided Design Drafting I (Lab) Cr. 3
Introduction to commercial CADD systems, and computer graphics hardware and software programming in two and three dimensions.

CADD 2: Computer-Aided Design Drafting II (Lab) Cr. 4

Use of commercial graphics software. Systems development. Use of graphical and non-graphical data bases. Networking, interfacing, and data communications. Graphics application programming in Fortran. Selection and evaluation of CADD systems.

CADD 3: Computer-Aided Design Applications (Lab) Cr. 3
Use of commercial CADD software for mechanical, civil, and architectural technology applications. Substantial design programming required.

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Appendix
A Comparative Analytical Review of the Distance Learning Programs at a Number of Universities World-Wide.

OPEN UNIVERSITY/ INSTITUTION NAME	PROGRAM/S	GRADUATE/UNDErgraduate	DELIVERY MEDIA	(SEE #)	EVALUATION	RESIDENCY
Common Wealth Open University	BA & BSc MA, MSc & MBA PhD	Grad & Undergraduate	Internet	NA	Assignments & A Final Project	None
The Open University	BA & BSc Diplomas & Certificates Postgraduate Certificate in Education MBA Taught Higher Degrees Research-Based higher degrees	Grad & Undergraduate	Internet Online Conferencing, Printed texts. Computer Software, Videotapes, television broadcast	NA	Assignments, Final Examination & Project Work	For Some Courses
The Open University Israel	Life Sciences Natural Sciences Mathematics Computers Sciences Social Sciences Management Jewish Studies Education Humanities Psychology Communications Music & Art	Bachelor	Textbooks, Satellite, Computer-mediated studies, Telecourse, multimedia & internet.	NA	Assignments & Exams	None
Massey University	Business Studies Social Sciences Humanities Education & Information Mathematical Sciences Agriculture Horticulture Science & Technology	Undergraduate Certificates & Diplomas Bachelor Degrees	Printed study notes & readings, e-mail & Internet, audiotapes & videotapes	NA	Assignments & A Final Examination	Partial Attendance (Optional)
The Open University of Orlando/ Florida	Bachelor's & master's Degrees in Enter prenurship	Grad & undergraduate		NA		Residency Program & Non-Residency Program
Boston University	Manufacturing Engineering		Picture Tel Videoconferencing System	Identical		
ACADIA University	Arts, Purge & Applied Science Professional Studies Theology		Internet & E-mail CD-ROMs, Videoconferencing, Videotapes, Audiocassettes, print packages			
AUBRN University	MBA Engineering Acrospaces Chemical Civil Coup.S. Industrial Materials Mech.		Videotapes, email, Internet		On Campus oral exam, and a written thesis	1 quarter of Full-time residency
Rochester Institute of	BS Applied Art		Intranet on-	Identical		

Technology	Sciences BS Engineering Elect/Mech. or Manufacturing Technology BS Environment management MS Software Development MS Information Technology MS Health Systems		line course materials, on-line testing, On line conferencing. Email fax & phones. Audiotapes, electronic blackboards, Videotapes			
New Jersey Institute of Technology	B Arts in information Systems. B. Sciences MS Information Systems MS Engineering Management		Telelecture (Video) Electronic Discussion		Written thesis	3 weeks on Camps
Goucher College	MA in Historic Preservation MPA in Creative Non-fiction MP in Administration		Electronically by Telecommunication and E-mail			2 weeks on Camps
Chattanooga State Technical Community College	CAD/CAM Technology Among others		Videocassette mailout, cable broadcast, on-line comp.service.	Identical of 2nd year degrees of the college		
MIT	SDM System Design & Management Industrial (Product Development)		Mixture of real-time MIT courses, via videoconferencing and videotapes	Same Curriculum		Fewer Visits to campus
University of Houston	Under Graduate: Computer Drafting Design Computer engineering Technology Earth Sciences English Hotel management Industrial Supervision Psychology Graduate: Computer Sciences Education Electrical Engineering Hospitality Management		Television, Vidotapes, On-line, Face to Face	Identical	Masters-Non Thesis	
Syracuse University	Under/ Graduate: MA in Advertising M of library Science (MLS) MS Communication management MS Telecommunications Management MS Nursing MS Social Science MBA Associate of Arts Bachelor of Arts in liberal Studies		Mail, Telephone, fax, Computer	Identical		Limited
New York University (The Virtual College)	MS management Control Systems (4 Years) Certificate in information Technology Advanced Prof. Certificate (		Digital Network (Lectures, Seminars and Labs)	?		None

	APC) 2 Years					

\# Similarity to on campus Courses