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FACULTY OF TECHNOLOGY MANAGEMENT
MASTERS DEGREE PROGRAM IN INFORMATION TECHNOLOGY

Evaluation of the Implementation of BSc IT Curriculum at Tumaini University

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ABSTRACT

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Evaluation of BSc IT Curriculum Implementation at Tumaini University

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In Tanzania computer knowledge is vital to supplement the pace fast growing economic and development activities, which demands high and reliable level of expertise in computing field. In 2006, a research carried out at Tumaini University with purpose to design and implement a contextualized curriculum that can supplement for such needs hence facilitate development in Tanzanian context.

A contextualized curriculum took advantage of six principles namely curriculum contextualization, projects, practical, interdisciplinary orientation, international recognition and continuous research for the program's formative and development. Implementation of the curriculum followed the CATI (Contextualize, Apply, Transfer, and Import) model with emphasis on students to identify societal expectations at the early stage in learning process, in which case the graduates will potentially cater for societal expertise needs on ICT.

This study adopts an emergent exploratory cross-section research design, while employing a qualitative approach. This study was conducted at Tumaini University in Iringa where by purposeful sampling was used to obtain participants such as students, teachers, administrators and employers who participated in several focus group discussions, in-depth interviews and participant observation.

The study reveals that six principles are satisfactorily met,despite of bottlenecks such as incompatibility in pedagogical thinking and technology availability for e-learning, learning attitudes, insufficient experts with actual skills and experience,in academic field among the others. The study recommends that iterative longitudinal study should be carried out to design for proper intervention in response to these problems which will help in improving and stabilize the curriculum.

PREFACE

This master's thesis work was carried out at Lappeenranta University of Technology jointly between three universities namely Lappeenranta University of Technology (LUT), University of Joensuu both located Finland and Tumaini University of Tanzania.

Writing this masters research had been the most intricate moment of my studies. This is due to the fact that the research incorporated modern view of Information and Communications technology (ICT) which intends to promote its education and awareness in developing countries which had to be part and parcel of it.

I wish to express my special gratitude to Prof. Dr. (Tech) Heikki Kalviainen on behalf of the Department of Information Technology at LUT, for guidance and support I received especially on technical constrains during this research. Also I wish to express my special gratitude's to Senior Assistant (PhD), Mikko Vesisenaho for directives, consultation and arrangements that had made this research successful to completion.

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Last but one for my friends, being close to me during this research had provided me courage to work hard tirelessly through out my masters studies. I wish to express my special gratitude to Miss MA (Sociology) Lorraine on behalf of all my friends who have been very close during this time.

Finally I wish to express my humble and very special thanks to my family, mother Mary, sisters Grace, Proscovia, Mercy and brother Andrew, for the courage and financial support during my studies. Special thanks to my father late Longino M Rwegoshora for being my role model and may the almighty God rest his soul in peace

Lappeenranta, September 2nd, 2008

Joseph M Longino

CONTENTS

LIST OF SYMBOLS AND ABBREVIATIONS

ACM	Association for Computing and Machinery.
AL	Algorithm Complexity.
AR	Architecture and Organization.
B.Ed	Bachelors in Education.
BSc IT	Bachelors of Science in Information Technology degree.
CATI	Contextualize, Apply, Transfer, and Import.
CN	Computational Science.
CS	Computer Science.
ELCT	Evangelical Lutheran Church of Tanzania.
GV	Graphics and Visual Computing.
HCI	Human Computer interaction.
ICT	Information and Communications Technology.
IEEE-CS	Computer Society for the Institute of Electrical and Electronic Engineers.
IFIP	International Federation for Information Processing.
IM	Information Management.
IS	Intelligent Systems.
IT	Information Technology.
IUCO	Iringa University College.
KFG	Knowledge Focus Groups.
MDG's	Millennium Developmental Goals.
NC	Net- Centric Computing.
NGOs'	Non Governmental Organizations.
OS	Operating Systems.
PF	Programming Fundamentals.
PFGs'	Pedagogy Focus Groups.
PL	Programming Languages.
SE	Software Engineering.
SP	Social and Professional Issues .
UNESCO	United Nations Educational, Scientific and Cultural Organization.

1 Introduction

1.1 Background

Computing is now becoming one of a vital tool in facilitating learning and development in the world. In developing countries as it is in developed countries, computer knowledge is highly needed to supplement for fast growing needs of economic and development activities, which demands high and reliable level of expertise in the field of computing [1]. In Tanzania for example, there is such a growing need in computer literacy in both private and public sectors. This need for knowledge is not only limited to academic and in workplaces; but it is extended to the integration between knowledge acquisition and challenges that pose to the Developing World in the effort to provide reliable, robust, efficient and cost effective solutions to support the growing emerging economy [2].

In response to these demands, a research was carried at Tumaini university of Tanzania with the purpose of designing, implementing, and later evaluating an Information technology curriculum, contextualized to cater for the needs of developing countries, Tanzania being the prime case. The research was conducted in collaboration with other universities with more expertise in the same field. The universities participated include Joensuu University, Finland, University of Southern Denmark, and Iringa University College in Tanzania [1].

Resulted curriculum had been implemented in two different phases. First phase was initially implemented between 2004 and 2005 as a contextualized programming course at Tumaini University of Tanzania. During this phase the designed curricula aimed at preparing students of Bachelors in Education (B.Ed.) as the future teachers of ICT. The curriculum provided them with the knowledge necessary for them to steer in the profession. It also provide students with application oriented and innovative skills so they can integrate knowledge acquired come up with the solutions with respect to ICT expertise in their respective surrounding communities [3]. Second phase commenced in the year 2006, when university enrolled new students for the Bachelors of Science in Information technology (BSc-IT). This phase was planned to take place for three years, described as the period from when the students enrolled in the program to the time of completion of their degree program.

The implementation of IT degree program at Tumaini University, Tanzania is based on

CATI (Contextualize, Apply, Transfer, and Import) model, which emphasizes mostly early identification of societal expectations from technology. The program follows six principles wich are Contextualization, local problems as starting points for projects, practical and interdisciplinary orientation, international recognition and continuous research for the programme's formative and development [1]. With reference to growing demand of IT workforce in developing countries and globally, prospective career for graduates is very high [2].

However, the identified prospects are not only limited to the growing private sector but also in other areas such as governmental organizations, NGO's, public as well as non-profit organizations. These program extends to the facilitation of reaching the MDG's (Millennium development goals), of poverty eradication by building capacity knowledge to graduates, so as to attain smooth transition from their education to self employment. From this they might be able to establish their own firms with small startup projects, providing support of the IT services to the surrounding community in the long run providing employment for others in their respective communities as their firms grow and expand [4].

The purpose of this research work was to perform an evaluation of IT curriculum at Tumaini University, in Tanzania. This project will involve different levels of conception for which the curriculum design aimed to achieve. Levels I dealt with in my project work included the main objectives, for the requirement of curriculum development, participants and parties involved in it directly and or indirectly, comparison with the existing structures offering alternative curriculum plus the standards, contextualization of the curriculum in use.

Considering the objectives, the research work intended to go through, finding the objectives set in the curriculum design process which extends to its identification of the corporate goals, as well as challenges towards objectives and missing obvious from the implementation point of view. Considering the parties and participants the project was intended to interact with the targeted groups for curricula, to obtain the concise about their feeling, readiness and challenges that they face as far as the process of curriculum implementation is concerned. The participants included but not limited to educators (lecturers), assistants, students, employers, management and administration as well as other members of community. Comparison with the other existing structures with pre-established curriculum was emphasized on its own ground in this research work.

This comparative approach will aim to compare various aspects of the curriculum, with

reference to six principles considered during design of the curriculum in order to device irregularities and extent to which the content will support the main set objective of curriculum. The items on which the project work will concentrate includes but not limited to the design, content, workload, as well as the key theme of the curriculum which is contextualized approach in the provision of ICT education at Tumaini University in Tanzania

1.2 Objectives and Restrictions

The main objective of this study is to perform an evaluation of the implementation of BSc IT curriculum at which is currently being implemented at Tumaini University in Tanzania. So far, the curriculum had been implemented only for one year and therefore the study intends to observe progress through one year of implementation.

However, the study specifically was aiming at assessing such factors which are of value in the implementation of the curriculum. This is through assessing the feeling, readiness and challenges that implementation had been facing from the commencement of the BSc IT degree program; assess and analyze discover the knowledge that necessitates smooth knowledge transfer and facilitating capacity building and therefore promote sustainable development in Tanzania and other developing regions.

Furthermore, the study intends to evaluate areas of strength of BSc IT curriculum in the process of implementation for promoting inbound and outbound competency in ICT knowledge and therefore be able to produce local experts who can also assume ICT duties at the international level, and finally validate the success accomplished so far by observing the set milestones which were set for this phase of curriculum implementation.

The scope of this study is to evaluate implementation of BSc IT curriculum designed for Tumaini University in Tanzania. Since this curriculum is basically designed to suit the demand of ICT industry in Tanzania evaluation of this curriculum is extended to other regions outside Iringa region where Tumaini University is situated. Further more evaluation will only be explored through one academic year period that this curriculum had so far been implemented.

However, since the BSc IT curriculum is designed for undergraduate studies it therefore necessary to define the undergraduate level of knowledge as restriction for this evaluative study. Thus whatever incoming information which tends to be beyond the undergraduate

will be discarded and therefore treated is invalid information unless they seem to add more value for the evaluative study, for instance in determining the future of implementation of the BSc IT curriculum.

1.3 Thesis Structure

This thesis work is comprised of six chapters. In the first session is the introduction of the study which contains background, objectives and scope, terminology, statement of the problem, motivation and structure of the thesis. The second session shows various literatures which had been used throughout the study by visiting computing curricula standards, ICT development in Tanzania, ICT and education in Tanzania, role of ICT in development. The third session explain on methodologies which were used carry out this study, such as research methods, research design, case description, study area, data collection methods, data analysis plan and ethical considerations. Session four describes research plan by highlighting the time table as well as the deliverables for this study. Basically it includes Research plan, time scheduling, milestones, challenges, overcoming the challenges. Session five describes about the data analysis and data presentation through out this study. This session includes introduction, interviews and discussions, observation and participation. Session 6 gives recommendations and conclusion resulted from data analysis of this study.

2 Information and Communication Technology Curriculum for developing regions

Information and communications a technology (ICT) is a giant generous term comprised of several components such as manipulative technologies, communications technologies production technologies among the others. ICT is therefore a combination of such kind of components which facilitates the use of computers and software to manage information. These components are referred to as technological systems [5].

Information and communication technology is considered to be a technology, which can be used to achieve development in developing regions. At the same time the majority of the population in developing regions is without access to the technology and lack basic skills and knowledge required to use it. Rather than importing solutions developed in other regions, there is now an increasing focus on developing context-sensitive ICT tools and educational programs in developing regions [5].

2.1 Terminology

In this study the term ICT had been used instead of IT on several sections of the thesis. The word ICT was used purposely in order to address the technological gap between the vicinity of this BSc IT program, where by it is very important to address the communication issues because of instability or even absence of appropriate communications infrastructure, unlikely in the rival western universities.

2.2 Statement of the problem

In order to measure effectiveness of this curriculum in a Tanzanian context it is important that the core needs of surrounding community in which the curriculum is implemented. The objectives for designing the curriculum should focus on local contexts such as the required knowledge, recurring problems, labor market, research and innovation, available skills to provide implementation of the designed curriculum and the structure and transitions between secondary education and university level education in the Information technology.

Research Questions

The aforementioned constructs leads to the following question.

RQ1. What kind of knowledge is required in order to build capacity and provide sustainable development and continuity of the ICT education in the developing countries like Tanzania?

The designing process needs to oversee available infrastructures that will provide support to implementation of the curriculum and therefore utilizing the local resources available. This will help in enforcement and smooth knowledge transfer in the surrounding community. By having this focus it will ensure a promising and sustainable development in ICT to communities through which the curriculum will be used hence inspire and improve people's livelihood in respective societies.

The aforementioned constructs leads to the following question.

RQ2: What is the appropriate curriculum framework which can promote inbound and outbound competency in learning and transferring of the ICT knowledge?

In implementation of curriculum different roles played by educators needs to cater for challenging evolving IT development in Tanzania. Emphasizing to these challenges will provide students with knowledge on current issues in ICT both at the global and local level while maintaining local context in the delivery of the education from experts. This provides a balance between ideas of delivering the ICT education with international inspiration and consequently introducing the current issues at the international level which promotes or open up the wide scope of learning.

The aforementioned construct leads to the following question.

RQ3: How the is implementation strategy of BSc IT curriculum affecting the internationalization of learning process through the framework, in order to emphasize the standards, continuing education and research?

2.3 Research Motivation

The motivation for carrying out my study arose by the key points from which the existing curriculum was designed. As early mentioned in the introductory clause, initial ideas for development of the curriculum includes, contextualization of the program, practical orientation, international recognition, problem based projects, research based and multidisciplinary orientation. This came to the implication that the evaluative study intends to validate the success and milestones of the curriculum implementation to its purpose. This is due to the fact that many educational institutions have had a tradition of implementing the off shelf curricula from the other highly experienced universities in the developed world. The intention behind such act is to seek for standardization and international recognition.

Thus this study aimed to promote the need for structuring the curriculum that will provide students with knowledge which can be useful in the local context.

This will therefore make it easy for the community to directly benefit from skills, create competitiveness in solving localized problems and in the end being able to promote their living by overcoming such challenges in their localized community. The competitiveness goes hand in hand with a concept of internationalization, in a sense that the curriculum was design to equip the students with sufficient capacity to tackle problems from differing contexts.

Consequently, students will be able to map their respective knowledge to problem solving in such the rival contexts.

2.4 Related work

Many of the curriculum schemes which are developed aim at attaining various purposes. The key motives behind the developing of new curriculums are due to natural drives in the changing world especially in technological aspects as well as the views on the particular education system in that of the process of curriculum development [6]. This is done for purpose of providing guidance to three types of stakeholders whose activities rely on the existing curricula input to their activities.

The first group includes university curriculum developers, and decision makers. The sec-

ond group includes educational management, students, employers and other stakeholders who will prefer to use the curriculum as the basis of comparison to their respective profiles and components. The third group includes funding bodies, accreditation, and professional institutions, who will intend to use the curriculum as the basis of comparison in overseeing and asses the running educational programs [7].

2.5 Curriculum models and Development

2.5.1 IEEE-CS and ACM (1991)

Various efforts had been made to develop IT curriculums by an assortment of institutions and to provide a precise structure through which the IT education is provided. As it is known IT is an interdisciplinary concept of learning centered between computer science, law, business and engineering [1]. Earlier efforts which made a breakthrough from 1991 was as a result of a joint work between ACM and IEEE-CS on their attempt to combine computer science and computer engineering into computing [6]. In the efforts made by IEEE-CS and ACM the main context was to develop a broad view in what is known as Computing or Informatics as commonly known in US and Europe respectively [8]. This was reflected in the 7th world International Conference in Information Processing(Proceedings of the IFIP TC3 Seventh IFIP World Conference on Networking the Learner) which provided opportunity for sharing vision internationally.

2.5.2 IFIP and UNESCO

From recommendations done by the international federation for information processing (IFIP) in 2000, cited in ACM SIGCSE journal volume 33:4 to the curriculum scheme namely ICF-2000; IFIP addressed various areas that need to be taken in to detailed consideration on designing a curriculum schemes. Dynamism of the curricula appeared to be part of a difficult task to manage by educational institutions as well as the educational managers and extends to the publishers plus teaching staff who are either partly or whole confronted by the situational change [9].

ICF-2000 asserts that there is such a difference in the curriculum implementation between countries even institutions within the same country. Therefore, precise considera-

tion needs to be taken into account when designing for the informatics curriculum for a higher learning educational institution, and the ICF2000 managed to decode this through its framework in which all these implementation factors are incorporated.

The factors to be considered included, cultural, societal, economic and institutional in which the curriculum developers would have to oversee in order to provide curriculum which fits to the context specific [9].

2.5.3 IEEE-CS and ACM (CC2001)

Moreover, effort on curriculum development had been realized through the work by Computing Curricula 2001, which is the joint force work between IEEE-CS and Association for Computing Machinery (ACM). The main objective was to conduct a major review of the curriculum guideline for undergraduate programs in computing (BSc) of which they released in the year 1991[10].

Therefore, drive behind the evaluation of guideline was due to the realization that in a decade, computing had undergone numerous changes to an extent of the need of redesign underlying curriculum in order to accommodate such changes. Task force worked in a number of divisions (groups) each of which had a particular target towards the accomplishment of the corporate assignment, namely the Knowledge Focus Groups(KFG's), Pedagogy Focus Groups(PFG's), and the Two Year College Task Force [10]. Knowledge Focus Group KFGs), had the task of identifying the concrete areas which represents the knowledge requirements for computer science at the undergraduate level, of which it identified 14 areas of knowledge groups namely, Discrete Structures (DS), Human-Computer Interaction (HC), Programming Fundamentals (PF), Graphics and Visual Computing (GV), Algorithms and Complexity (AL), Intelligent Systems (IS), Architecture and Organization (AR), Information Management (IM), Operating Systems (OS), Social and Professional Issues (SP),Net-Centric Computing (NC), Software Engineering (SE), Programming Languages (PL), and Computational Science (CN) which could be used to construct computing curriculum. Therefore, for each identified area a small group of people with expertise in domain as well as teaching experience, to recommend to the task force on contribution of particular domain in whole CS knowledgebase [10].

Pedagogy Focus Group (PFGs), had a role of addressing issues that goes down to the underlying borders separating sub disciplines of computer science (area of specialization).

Each of the six groups had the task of providing the precise and influential information from which the respective area of specialization could be structured in successfully incorporated into the CC2001 curriculum [10].

The two year college task force had the role of formulating setting for experimenting a draft curriculum for two year period, providing a report on detailed examination of the draft curriculum CC2001. The prime focus was on introductory computer science topics, learning objectives, mathematics content and electives at the introductory level.

The results from such groups are the ones named to have influenced a final report of the CC2001, and have provided precise approach to design, development and implementation of this curriculum.

2.5.4 Distinctive Comparison ICF-2000 vs. CC2001

A comparative evaluation study of two curriculum schemes namely ICF-2000 and CC2001 was realized in international curriculum discussions, two curricula were presented and discussed under different international perspectives. At the conference the efforts on the two curricula were found antagonistic to one another. Table 1 shows a tabular representation summarizing important elements.

2.5.5 BSc IT Curriculum for Tumaini University Tanzania

The curriculum development process for BSc- IT program at Tumaini University in Iringa, took an advantage for diversification, technological and cultural background of the country. Principally, the curriculum was focusing is contextualization to suit the local needs of Tanzanian society. However a big challenge for the developer was to come up with the a design suitable for students whose computer literacy and experience is limited, backed up by the fact that computer facilities are rarely available at the family level. This case is different from the developed countries where students' awareness and access to computing services and proper and stable ICT infrastructures is almost close to basic needs [11]. Such difference accounted for as digital divide, have a remarkable impact in developing curriculum in the sense that the whole process of designing, planning, structuring and implementing is quite different from every other differing environmental setting in the world.

Table 1. A distinctive comparison between ICF2000 and CC2001 [7].

ICF-2000	CC20001
Is a framework for the design of curricula to be implemented in a specific context; offers a global specification; links to various well-reputed curriculum schemes (among which are the ACM/IEEE-CS model)	Offers curriculum guidelines allowing for model curricula with some variety in approach; specifics content on a detailed level; Is self-contained with no specific reference to other curriculum schemes.
Holds a generic and 'inclusive' view on the field of informatics/computing, including all those areas such as computer science, computer engineering, information systems, and software engineering; follows a top-down approach; is fully available in the form of one overview report.	Holds different specific and exclusive views on the field of informatics/computing, which yields separate reports on areas such as computer science, computer engineering, information systems, and software engineering, follows a bottom-up approach; Vol. II (CS) is available (Steelman version); the foundation Vol.I is not available, nor are the volumes for the other areas.
Is driven both by supply and demand, the latter being accounted for by starting from global work force requirements in terms of various categories of professionals and their required competencies	Is mainly driven by supply, expressed by academic requirements in terms of topics, knowledge and skills; there is a demand drive also but this originates from universities and colleges in the US that want up-to-date practical curriculum guidance.
Incorporates cumulative graduate profiles: basic instrumental, basic conceptual, a minor, a major.	Has its focus on full and separate bachelor programs in CS, CE, SE. and IS.
Refers to a variety of non-informatics subjects, however addressing none specifically in the body of knowledge.	Refers to a variety of non-computing subjects, however addressing exclusively mathematics in the body of knowledge.
Being commissioned by UNESCO, accounts explicitly for the international dimension; has been developed by a small group of IFIP-linked experts.	Expresses international ambition, but definitely has a strong US base in both the development team and its context: is the result of a large project involving many experts, mainly in the US.

The contextualized curriculum for Tumaini University in Iringa, Tanzania is based on the CATI model which is simply abbreviated as contextualize, apply, transfer, import [12]. Supporting the curriculum design process, is a set of the principles that influenced the development process, namely Contextualization of the programme, problem orientation, practically focus, international recognition, research based, interdisciplinary.

Interrelations between computer science and other application domains namely Law and business, had been taken into consideration in order to provide skills supportive enough to cater for such application areas in a contextualized manner [1]. Therefore these constructs were also expected to be taken into account as additional inputs to curriculum design and development process so as to facilitate ICT development in Iringa and Tanzania as a whole.

2.6 ICT and Education in Tanzania

2.6.1 Post Independence ICT situation

History of computer education is dated back since 1965 when initial efforts to modernize and computerize operations were realized by installation of ICL 1500 (Figure 1), first computer in the country at the ministry of finance. Due to little, and or limited literacy on such a technology its use was surrounded by a lot of misconducts, which in turn lead to such a strong reaction by the government to ban importation of computers and all related devices/technologies dated in year 1974 [13] which resulted to the absence of such technologies in the country during that time, and therefore beginning technological backwardness in Tanzania. Six years later, at the post collapsing of the then known East African Community, doors were opened once again for the importation of computers and related technologies. To facilitate these activities in revenue collections especially in the accounting systems, where there was such a need to have the coordination between the Ministry of Finance, Central Bank and other financial institutions [14]. This was followed by the incoming of microcomputers, which whose size was quite smaller and yet with price affordable to many of the firms operated in the country. Figure1 shows a model for ICL 1500 computer

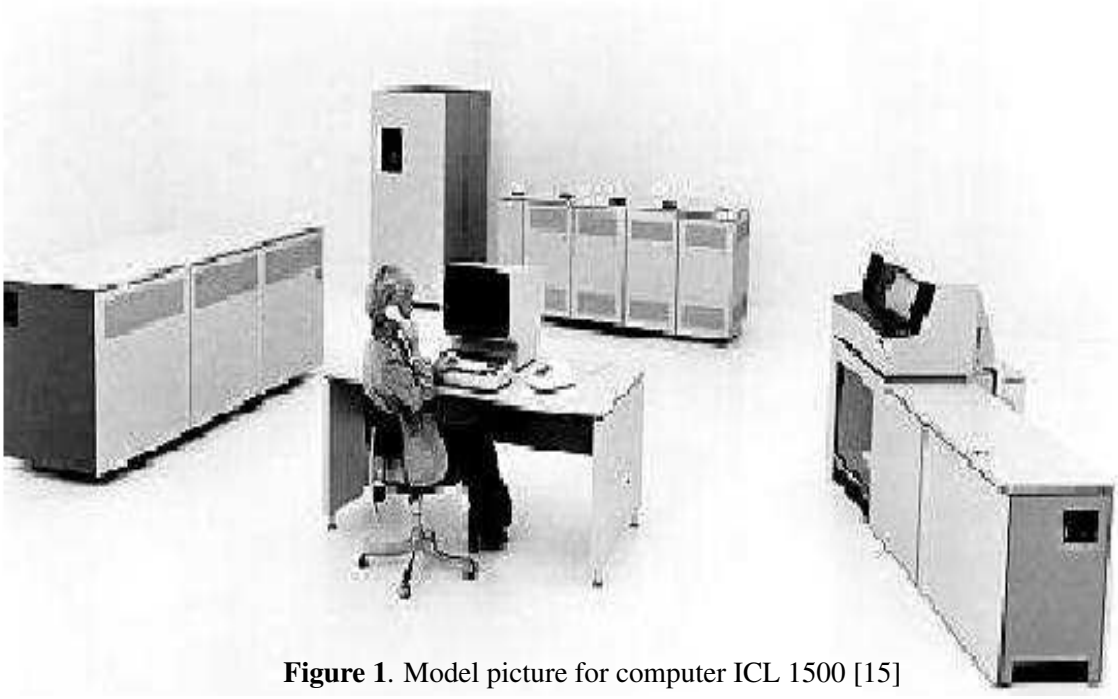

Figure 1. Model picture for computer ICL 1500 [15]

2.6.2 Development of ICT in higher learning institutions

Development efforts in providing for ICT education in higher learning institutions begun in mid 1965, at a largest state owned university the University of Dar es salaam (UDSM). This was preceded by launching of the first informatics training in Tanzania, in its institution namely Institute for Adult Education, and later the university incorporated a programming course called FORTRAN as one of the courses offered to the BSc in mathematics students [14], which was a major success towards the initial incentive to ICT education in Tanzania.

In the recent years, we have observed a remarkable development in the provision of informatics education, followed by liberalization of higher learning education; where by almost 20 institutions had been registered and granted permissions to run private universities and or educational institution [16]. This had been accompanied by the offering basic IT courses in many universities as part of the curricula in other disciplines apart from the computer science and/ or Information Technology.

In additional to efforts towards initiative by Tanzania government, there had been a remarkable support from international organizations such as Swedish International Development Agency (SIDA), World Bank (WB), and International Institute for Communications and Development (IICD). Through such efforts the government had been able to review their educational system and incorporate ICT within educational curricula throughout the country [17]. Table 2 shows the status of ICT infrastructure with respect of ownership of ownership of ICT devices per individuals.

Table 2. Possession statistics of ICT devices and services.

Facility	Quantity
Radio Stations	47 (08)
Television stations	29(06)
Internet service providers	25(08)
Internet service subscribers.	450,000 (08) appx
Mobile Telephone service operators.	6 (08)
Mobile Telephone service subscribers.	7 Mil (08) appx
Landline Telephone service operators.	1 (08)
Landline Telephone service subscribers.	150,000 (08) appx

Furthermore, other efforts towards development information technology in the country on

lower levels of education had been realized from various publications and establishment of introduction to Computer Science Syllabus for Secondary Schools (form I-VI) by the Ministry of Education and Culture (1996) and later reviewed in 2005 [17].

Prior to the release of the computer science curricula for secondary schools, few private owned secondary schools had their own initiatives of offering a basic (Introductory) ICT course which aimed at preparing their students to be familiar to the basic computer applications such as word, excel, file organization, and access.

2.7 Role of IT in Developing Tanzania

2.7.1 Private Sector

Private sector, is one of highly re-known employer for poor people in the third world, countries is a sector which highly relies on the proper IT infrastructure for its growth and survival [18]. This is due to the fact that many SME's operates on short term targets, therefore timely and highly accurate availability of information is the key factor to its success.

Firms, suppliers and their clients who at large represent the private sector will improve their outreach and interaction, hence increasing more opportunities within their vicinity and distant/ remote locations [19].

2.7.2 Public Sector

From early beginning of the third phase of leadership in Tanzania (Dated 1995), there had been a number of reforms especially in the public sector. These reforms aimed at improving efficiency, effectiveness and promote customer orientation approach towards public service offering. This led to the foundation of what is known as the e-Government policy in the country [2].

In general the e-governance promotes the use of ICT to facilitate the daily operations of various governmental units. This is extended to facilitating development, information sharing, dissemination, security e.t.c. Use of ICT improves the process of collecting the local information that can be made cheaply available to access by the public for in-

stance legislation, regulation, procedures, forms, maps, research papers and statistical information. This will promote development at a much faster pace, while eliminating bureaucracies and unnecessary procedures that to a large extent hinders the access of such information hence development [20].

2.7.3 Educational Institutions

As learning process becomes a determinant factor towards global economic competition and so is the growth. This is due to the fact that the learning process affects skill level produced which in turn becomes the workforce to serve in surrounding community in various capacities. The growing economies will hence demand for the skillful labor equipped with sufficient knowledge to be able to professionally and efficiently support the growing economy. In Tanzania this is reflected through the education reform program (ESDP) formulated in the year 1996 by the Government of Tanzania to address the problems and challenges with specific emphasis to areas where there was high shortage of skills [21]. The use of ICT facilities in the classroom as a part of the learning process have been found as the effective way in promoting ICT literacy in developing countries like Tanzania [21]. Therefore introduction of the application of the ICT in the learning process in higher institutions in Tanzania opened a new chapter of success in the organization and delivery mechanism of education in the institutions.

This led to a huge success and/ or improvement in the whole learning process as it improved the information access, interaction between students and tutors, collaborative learning and cost saving as the process do not necessitate the movement of students to campus in order to attend their studies [22, 23]. ICT have been the key factor behind this success as it provides the platform on which such learning process can be facilitated in developing countries [24].

2.8 Summary

This session discussed various issues as far as the development of ICT in Tanzania is concerned. The discussion involved various efforts previously done in curriculum development, taking into consideration three cases namely IFIP-UNESCO that led to the ICF 2000 in the latter case. Also discusses is the rival effort of the latter namely IEEE-CS and ACM (1991&2000), that led to the computing curricula 2001[10], and the last one being

the effort by Tumaini University to come up with the contextualized curricula for the BSc IT, which is currently ongoing implementation at Tumaini University in Tanzania.

Furthermore, computer literacy and history of computing as well as availability of the related devices had been discussed under the two main contexts, namely history and development, which could tell also how the computing education evolved to what it is today in Tanzania. Last part of this chapter discussed about the role of technology in facilitating development in Tanzania. The discussion was based on three sectors whose direct contributions to the workforce and development are known at large. The sectors involved are private, public and learning institutions.

3 Methodology

3.1 Case selection

The methodology to be used by this study is the single case selection. The case selected right from the inception of this study is Tumaini University of Iringa where the intention of my study is to examine, evaluate and therefore recommend the necessary developments of the curriculum. There had been numerous definitions for the case study approach by different researches.

Yin defines the case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon within its real-life context and when in which multiple sources of evidence is used [25]. Further more the author on his description of the ingredient statement points that the case study will only prove successful if the organization understudy will structure out itself in response to the findings.

The case study is categorized to single and multiple-case studies and is bounded by quantitative evidence. In evaluation research the case studies is presented with four different applications which are to explain the linkages in real-life situation which can not be explained by the rival strategies, for instance to describe the scenario (situation) in which things happen, to explore situations in which the events evaluated do not have a single set outcomes, to provide benefit to evaluation in a descriptive manner [25].

Therefore, a single case subject becomes the choice candidate approach of the evaluative. This is because the study is bound to the curriculum which had been designed and implemented in specifically at Tumaini University in Tanzania. The study will focus to examine the major constructs with respect to the objectives in which this curriculum is designed to achieve. Figure 2 shows a diagrammatic representation of a single case study together with the scope though which the research is bounded to.

There are different categorizations of the case studies between the authors, each having their own view on research analysis techniques. Jensen and Rodgers categorized the research analysis process in to five groups namely Snapshot, Longitudinal, pre-post, patchwork and comparative case analysis techniques [26]. The rival researcher, Yin categorized the analysis process into five groups namely pattern matching, explanation building, time series analysis, logical models and cross-case synthesis [26]. Yin asserts that in case of

the singe case study, the choice of the technique is not the determinant factor for good achievement which suggests that the research work should emphasize more on the collection, display and presentation of the evidence, which is the most challenging task in this research study.

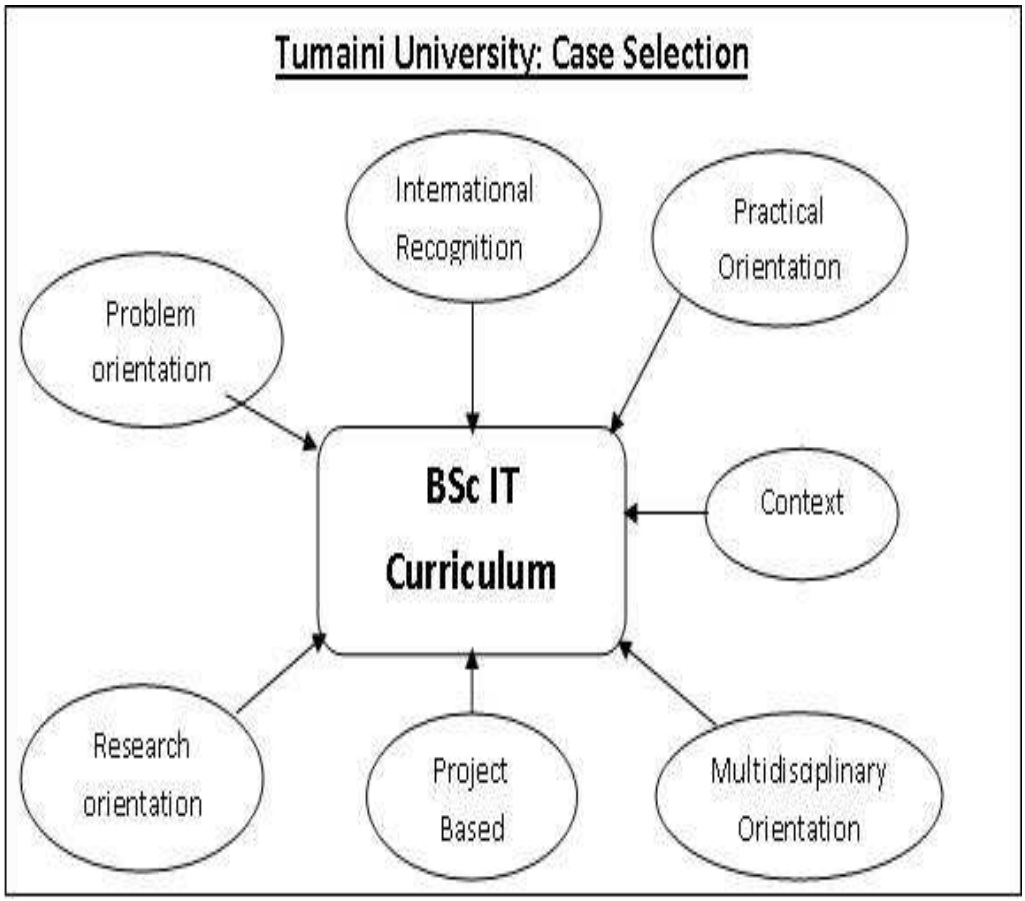

Figure 2. Case selection and bounding contructs.

This study, as a single case study utilized a snapshot approach case analysis technique where by a phenomena was observed as a snapshot of its implementation time to reveal progress and commitment towards the set of objectives of curriculum under investigation.

3.2 Research Design

This study will use an emergent exploratory, qualitative inquiry approach. The basis of selecting such an approach is that it allows diversification in determining the limits of the study, which goes hand in hand with the fact that our behaviors are mostly determined by the influences surroundings. Marshal & Rossman categorizes the surrounding influences as those occurring as the physical setting (schedules, roles, context and values), and the research technique as the prime factors that determine the findings [27].

Kaplan describes the qualitative research methods as the set of tools for the researchers to assist them understand people and their surrounding socio-cultural contexts. In most cases the researchers tends to misunderstand the phenomenon by quantifying the textual data and therefore the view on participants with respect to their surrounding socio-cultural context becomes shielded [28].

Qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them. Qualitative research involves the studied use and collection of a variety of empirical materials case study, personal experience, introspective, life story interview, observational, historical, interactional, and visual texts-that describe routine and problematic moments and meaning in individuals' lives [29].

The suitability of the latter definition is based on the fact that this study is based on single locality and utilizes the naturalistic approach. The study also recognizes the importance of surrounding context and therefore taking it into consideration as the input from differing perspectives for instance historical, observational, and interviews [30]. This necessitates the deeper understanding of the natural setting, utilizing the various means of gathering the information.

3.3 Research Methods

As the most important aspect of the case study, asserts that there is a number of factors to be taken into consideration when selecting a case. Factors such as generalizations, population representation, interactivity and balance, provides with the greater understanding of the critical dependencies of the phenomena and so contribute to the quality for chosen

case [25].

By investigating phenomena we observe different interests of which provides the light to the type of cases which are of importance in the study on which a researcher will concentrate more and as a result providing a large scope and opportunity to acquire more knowledge [29]. Stake asserts that there is a need to understand the interactions between cases, and between their surroundings characteristics, which will make the selection of cases easier without the necessity to construct the sample space and therefore only dependent on the experience and intuition [29].

Jarvinen emphasized on the case selection by asserting that selecting the case requires a choice of specified theoretical population. This is due to the fact that the sampled population determines the set of the entities to be incorporated within the vicinity in which the research will be conducted, while taking into consideration a number of constrains that might lead to the multiplicative variations in the study [31].

As for the case of multiple cases the most important technique is to narrow down the number of cases by choosing the representative cases of which will represent the population of the cases and therefore the chosen phenomena of interest under observation for a particular will the other multiple phenomena within the represented cases [32]. As mentioned earlier, this study is bounded to a single case, as it intends to examine the implementation and development of BSc IT curriculum for the case namely Tumaini University of Iringa. Thus my study examines the curriculum tailored specifically for tumaini university by considering several factors as motivation to come up with a curriculum that belongs to and suits the local needs to the extent of equipping the students with ability to challenge and solve their surrounding and or local problems, competence both in internal and at international level in the academic and research respectively.

From this concept; I decided to choose Tumaini University as the lone case for my whole study is centrally about the curriculum designed particularly for the respective university. The case choice justifies for the understanding of the surrounding and contextual needs in order to evaluate the balance that designers intended to achieve which extends to implementation strategies which will cater for the successful delivery of knowledge to support the curriculum.

3.4 Case Description

Garfinkel identifies a case as a prime referent to the subject of inquiry which must exert the specificity and is bounded to within where the constructs that are used to examine the subject are valid [29]. Kemmis asserts that a useful description of cases should not constrain the case study as being a process of inquiry but also extend this to the product of the particular inquiry, and therefore maintaining objective of the study within a specific bounded system which in turn promotes the usefulness and the rationale describing this study [29]. This is supported by the issues discussed in an introductory clause which dominated the process of curriculum development and therefore will utilize the mentioned issues throughout the process of evaluation and development of the curriculum implemented at tumaini university of Tanzania.

These issues included contextualization, research orientation, multidisciplinary, local problems orientation, international recognition and practical orientation. Figure4 shows these issues, some of which had been generalized and so grouped together to provide more synthesized meaning to the study. In figure 3 the surrounding issues are further more categorized into the sub issues which provide concretization of the understanding of the major issues.

Internationalization in this study is describes the acceptance and synchrony of the curriculum to the international community. Based on the content, Rizvi attempted to define the internationalization of the curriculum by relating specifically to the notion of 'international curricula' having an international orientation in content, with an objective of preparing students to assume professional and/ or social duties in an international and multicultural context, and designed for both the local and international students [33]. This leads to integration of an intercultural dimension implementing the curriculum with the purpose of promoting the globalization of the function delivery in IT education.

Multidisciplinary focus in the curriculum design highlights the societal expectations, for instance promoting the capacity building, producing right skills to the students and therefore leading to the sustainable development of its surrounding community. This extends to the definition of innovative and pedagogical methods that are required to develop the appropriate delivery mechanism of the IT education. Therefore, equipping the students with highly diversity skills and the sufficient knowledge from which they can find immediate application in their activities after completing their studies. In Mapping Interdisciplinary between the studies in the curriculum there must be a conformance that will not only

make sense but also ensure the achievement of high quality results both at the local and international level in providing the IT.

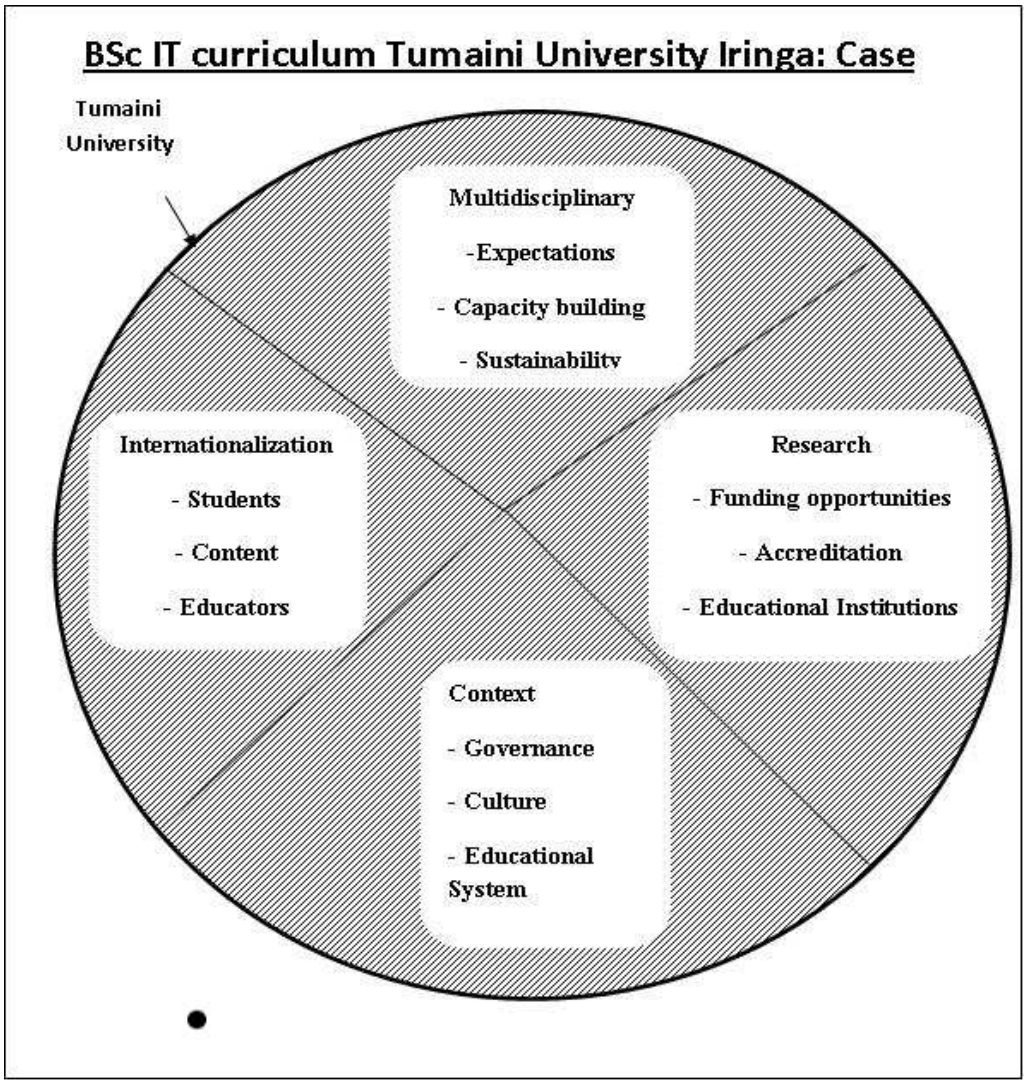

Figure 3. BSc IT curriculum case Tumaini University of Tanzania.

Research is a vital tool for stimulating sustainable development in any society. This extends to the discovery of the new knowledge, understanding the environment and the underlying situations and therefore overcoming the surrounding challenges by the surrounding communities.

Research is in that sense critical at the point that students improve their practice by reflecting, analyzing and developing concepts and theories with respect to knowledge gained from their studies and experiences. The research process and the respective techniques

should be incorporated as part and parcel of the curriculum to promote the learning process and therefore students will be able to synthesize and design solutions within their local context and also at a global level hence providing analytical insights of the students.

Communities and the organizations surrounding the Tumaini University define the contextual needs and expectations from the curriculum. Several constructs which constitutes the contextual needs includes the government, educational system, employment industry, culture, politics among others. These in a way affects the designing and implementation of the curriculum since they influence knowledge availability and foremost the expected outcomes in delivering the IT education within the institution.

3.5 Data Collection Methods and Techniques

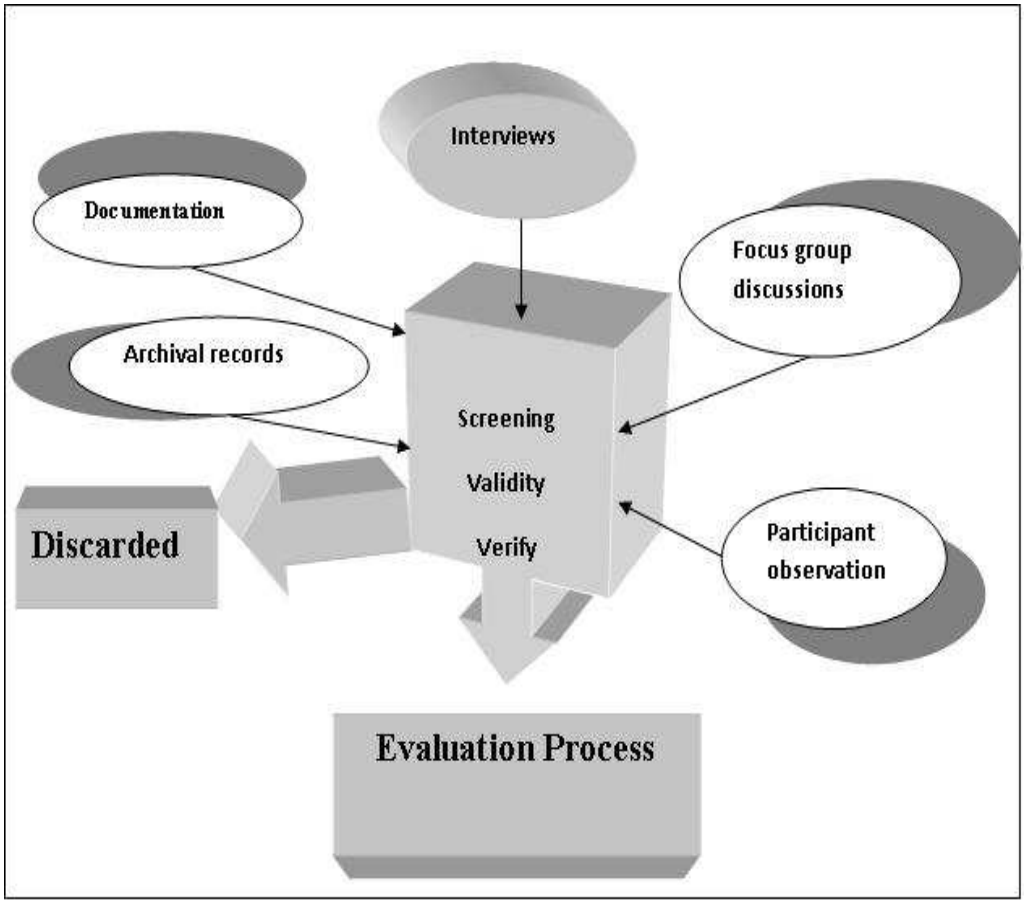

Figure 4. Data collection as input to evaluation process.

There are the various data collection methods that had been indentified by Yin. The most important mentioned data collection methods include interviews, documentation, archival records, direct observation, physical artifacts and participant-observation [25]. This study is chose to utilize interviews, documentation, direct observation and if possible participant-observation as data collection methods for the research work. Marshal and Rossman discuss the overview of these methods and therefore asserting that not a single method has totality advantage over other rivals. A combination of a numerous methods shown in figure 4 is of more advantageous as it yields information from different sources and patterns and therefore the more utilization of multiple methods the better the case study [27].

3.5.1 Documentation

Yin explains the use of documentation as of far beneficial to the study. He is justifying this by outlining the different sources from where the documents can be used to reveal the information. There are several forms of documents that can be accessed to acquire information. Yin categorizes these as the communiqués, written reports of events, administrative documents, formal studies and newsletters [25]. This study intended and therefore utilized documentation in order to collect data and information from the documented facts.

This will provide me with the argumentative support for the validity of the information which later will use this to support the evidence collected in the research work. The documents collected and intentionaly used use included the copy of the current curriculum, the research book produced as a result of the designing a contextualized university level programming course which is actually one of the initial ideas towards the development of this curriculum. The study also intends to use the curriculum standards guides for the CS and IT curricula which are internationally recognized standard curricula. Other documents which will be found on the run but yet demonstrate the usefulness to the study will be incorporated into the study as to provide more support to the evidence of the facts collected in the study.

3.5.2 Interviews

Rubin names the interview as the most important source of information is it create and open room for the observation of the participants' actions towards the subject understudy [34]. Yin asserts that the interview becomes of highly valuable sources since they are likely to open a clear channel of communication between the participants and therefore provides the researcher with more access to the participants or group of participants [25].

However a good design of the interview questions is highly required in order to facilitate the process of accessing and obtaining the proper information from the interviewee end. This extends to the fact that the questions to be asked needs to be precise and clearly understood by the interviewee and so bringing mutual understanding and conformance between the two. This study will highly utilize the interviews as the means of obtaining information for the study. The interview is expected to be conducted at the actual site where the case holds i.e. Tumaini University of Iringa. The questions to be asked are based around the research questions as defined earlier, with the intention to concretizing the outcomes basing from the main constructs of such question. The interview process will involve the curriculum implementers, administrative staff, students and the few organizations.

To maintain the integrity of the interviewing, the process will conducted as a guided conversation and therefore maintaining the precise line of inquiry i.e. having a stream of question which directs the process [34]. However, the newly arising question which intends promote more understanding of the course can be incorporated in the process as to ensure the effectiveness in the collected evidence [25].

3.5.3 Participant Observation

Participant observation is a technique used by the researchers as the novel observation technique on which a researcher has the opportunity to participate as a merely observer by assuming the several roles within the study.

By involvement in the case study, over a certain period a researcher will gain the in-depth understanding of the case through studying and observing the events deeper, contrary as to compare the information that could have been gained through other means for instance documentation and or questionnaire [29].Competence of this technique promotes the re-

liability of the first hand information from the case study, validity and the ease through which the researcher can gain the mutual understanding of the actual scenario of the case and the respective mini-cases, should there be any.

However Yin identifies a set of factors that raise the cons of this technique, for instance the distortion of the case observation by the observer, in this case the researcher, the subjectivity of the results in data gathering which may lead to the inconsistency of the phenomena being observed and the biasness of the results which render the phenomena observation in favor of the researcher, which then entails the predictability of the study [25]. This study intends to use the participation-observation since it involves the interpersonal and intergroup processes and therefore becomes the suitable candidate to the phenomena that the study intends to concentrate on. Participation in this research work assumes the role of student in some of the courses offered at the Tumaini University in Iringa, as part of the process of collecting data. The main idea behind participation is to observe the delivery of the curriculum and also gain the in-depth understanding of the curriculum and the strategy that is being used to deliver the curriculum to the BSc IT students at Tumaini University in Iringa.

3.5.4 Archival Records

Yin reports the archival records as fluently used data collection techniques which can be incorporated with the other rival sources of information which produce a case study, and their importance varies between the cases [25]. The records archival takes the various forms such as service records, organizational records, maps and charts, list and registers, survey data and the personal data. This study intends to utilize the archival records to retrieve recorded information that falls relevant to the case understudy. All the records provided will be treated with highly confidentiality concerns, and those which do not suit for the case will be left out to the archives.

3.5.5 Focus Group Discussion

Sample Design

The study employed purposive sampling in selection of the respondents who were students, teachers and the administrators.

Sample Size

Through out the field work there were six focus group discussions, twenty in-depth interviews, eight participant observations within the class, where by with focus group discussion there were three group sessions conducted with students, two with the teachers, and one with the administrators. Figure 5 shows some of participants' group discussion sessions

Figure 5. Focus groups discussions

In the in-depth interviews, there were ten sessions conducted for in-depth interviews the students, five with teachers and five with the administrators, thus makes a total of twenty in-depth interviews.

Lastly, several participant observations were carried out a with attendance of eight occasions having an intention to have the actual intuitions of what exactly happens in the knowledge delivery process for the BSc IT degree program at Tumaini University. In

totality 8 sessions were observed noticeably with the presence of all the counterparts of implementation. Sessions attended includes four lecture sessions, two seminar sessions and two practical session of which one was organized on campus and another one off campus but in the context where same concepts from lectures could have been used to facilitate the session.

In the event of participation several roles were assumed in order to grasp and experience everything that took place in the process. However assuming roles was based on sessions in such a way that one role could be assumed per event and therefore concretizing on understanding the role's responsibilities, feeling, readiness and acceptance of this implementation of BSc IT curriculum. On the other hand the conformity could be observed between students and their respective lecturers and the content delivered in the process of knowledge transfer of BSc IT curriculum.

3.6 Data Analysis Plan

Knowing that a candidate method for the study is qualitative study, and therefore the data collected from the field is qualitative data, analysis will be conducted on continuous basis where by the qualitative data collected from the field such as recorded interviews, documents collected and any vital information related to the study will be analyzed as they are collected from the field. This will facilitate decoding useful information from the data instantly as it will avoid accumulation of bulks of data and therefore fasten the data analysis process. With data obtained from the in-depth interviews will be recorded in the tape recorder and later transcription of the recordings will be made.

Data collected from focus group discussion, had been documented and respondents were be enlisted into a note book. Later, data obtained from the field were analyzed and projected to the meaning that could be mapped into results which later were used to draw conclusion.

3.7 Ethical Consideration

Before stating field work, several ethical and administrative issues were taken into consideration. For instance the permission from the following officials was granted. a) The permission at the national level was obtained from the Commission for Science and Tech-

nology (COSTECH) which been given mandate by the Tanzania Science Commission (Ethical Board) to grant research clearance to students and staff members who are doing research in Tanzania. b) As well, permission was granted by the Regional Administrative Secretary (RAS), in this case Iringa. c) Lastly, permission from Tumaini University authority was also sought. Informed consent was also soughed from the students, teachers and administrators who participated in the in-depth interviews, participant observation as well as in the focus group discussion. Upon acceptance these participants were to sign an agreement letter which was also signed by the researcher.

3.8 Summary

This session discussed methodologies that were used to carry out this study. The session also describes a case in detailed, study area in which this curriculum is being implemented and other associated facts. Furthermore, methods which were used through out the study are discussed in this session with justification for choice to such methods. Last but least the session discusses about data collection methods that were employed in the study such as interviews, participation and direct observations, focus group discussions, archival records. Lastly this session discusses different data analysis plans and ethical considerations that had been taken into account during the study.

4 Research Plan

This session describes the plan through which the research work will be conducted. Planning for this research work has taken into consideration the several factors, for instance time, the resources availability and allocation.

Also included in the session is the time plan which depicts the various milestones to be accomplished at the defined time intervals of the project. The milestones have been precisely mentioned in terms of the outputs for each stage of the project. The outputs are therefore defined with the intention to further the assessment for which the progress and the achievements of the research work can be realized.

4.1 Time scheduling

This part intends to describe to main purpose for time scheduling together with the criteria used to allocate such time slots. Time allocated to different phases is with accordance to the estimated weight for each phase. Basically the approximation is on the basis of the number and magnitude of activities involved in, taking into consideration the stakeholders and other third party entities involved in the research work. Table 3 is a table that describes the time allocated together with the milestones [31].

4.2 Milestones

Supporting the schedule, Table 4 below is a list of the deliverables (outputs) for the mentioned phases of the research. In the event of producing this schedule and the respective deliverables there were some factors had to be taken into consideration. Tradeoffs made for the scheduling considered factors such as the risks in data collection, delays for instance in scheduling and conducting interviews, time to reconcile for the missing information, and also the schedule on the third parties as a part of the research. Table 4 shows a list of deliverables and their respective time of delivery.

Table 3. Time scheduling.

Date	Activity	Time
10th Feb - 20th Mar	Literature review	10 Days
20th Mar - 20th Apr	Data Collection	1 month
20th Apr - 27th Apr	Data Analysis	7 Days
27th Apr - 06th May	Deductions from Analysis	10 Days
06th May - 15th May	First Draft Report	9 Days
15th May - 22nd May	Interpretation from Deductions	7 Days
22nd May - 29th May	Findings	7 Days
29th May - 2nd June	Second Draft Report	5 Days
2nd June - 7th June	Recommendation from Findings	5 Days
7th June - 12th June	Critical analysis and Justification	5 Days
12th June - 15th June	Report Review	3 Days
15th June - 8th July	Concluding Matters	18 Days
8th July - 26th July	Final Review	18 Days
1st Aug - 4th Aug	Draft Preparation	4 Days
4th Aug - 18th Aug	Final Draft (Ready)	14 Days
18th Aug - 25nd Aug	Final Report	7 Days
2nd Sept- 17th Sept	Presentation Preparation	
18th Sept	Final Presentation	

4.3 Challenges

The initial study of the research work had preliminary been able to highlight to some of the challenges that might pose the inconsistencies in the schedule with respect to the research tasks. The challenges include but not limited to:

- Incorrect data.
- Interviews scheduling.
- Evaluation constrains.
- Willingness and availability of third party participants.
- Timely accomplishment of outputs.

Table 4. Milestones and deliverables.

No	Item	Date
1	Data presentation	30th June 2008
2	Analysis Outcomes(Draft 1)	10th July 2008
3	Findings(Draft 2)	8th Aug 2008
4	Recommendation and Propositions	18th Aug 2008
5	Final Report	2nd Sept

4.4 Conquering the Challenges

Following the challenges is a set of abstract ideas on the various techniques that can be employed to cater success and timely achievement of the research set goals with respect the devised schedule. As it was mentioned once again these are the abstract ideas in a sense that the may or may not me applied to solve a particular scheduling problems but just to give a highlight of what can be done should there be any uncertainties during the course of research work.

Suggested procedures are: " Employing a variety of Techniques for data collection to ensure the consistency of the collected data " Pre-emptive scheduling and periodical follow-ups of interview appointments " Should there avail a possibility, onsite participation of the curriculum implementation sessions is highly recommended to facilitate evaluation, and clear the missing obviousness. " Device a closely integration, importance and sense of belonging to third party and other participants. " Allocate enough time slots for each task and oversee the smoothness in mutual synchronization of the timeline with respect to the progress of a particular task.

4.5 Summary

In this session the attempt had been to device a precise schedule for the research work taking into consideration of the various phases which are incorporated as a part of the research. Including together is the definition and identification of the milestones set as the minor but contributory targets for the individual phases and so the final outcomes. Further more is a set of the deliverables as the outputs which suppresses the realization of milestones as the research work progresses. The allocation of time slots to various phases is expected to be flexible and adjustable in the future should a need arise, for instance

taking into consideration in tasks size variances and uncertainties in some phases of the project. The main target here is overseeing the consistent outcomes in each phase of the research work.

5 Study Area

This study was carried out in Tanzania Iringa region at Tumaini University, where the first phase of BSc IT program is currently being implemented. This section briefly introduces Tanzania by providing some facts concerning the economy and ICT in general. This will be followed by the introduction to Tumaini University and BSc IT program.

5.1 The United Republic of Tanzania

Tanzania is a country located in the eastern Africa. Formally known as Tanganyika the country gained her independence in the year 1961 from the British colonial rule. Together with their neighboring country, the Zanzibar Irelands they united to form a union government of the United Republic of Tanzania in 1964. Figure 6 shows a map of Tanzania, with Iringa regional borders marked in red.

5.2 Economy

Tanzania has a total area of 945,000 Sq Km and it is the largest among the east African countries. The country is occupied by approximately 39.4 million inhabitants [36], of which majority earn their living through agriculture which contributes to almost 46 percent of the GDP of the country, and therefore majority of Tanzanians live in villages [37].

Tanzania has the national gross domestic product (GDP) of approximately 12.8 billion US dollars with the economical growth rate of 6 percent and also the national gross domestic product per capita is 600 US dollars per year as per 2006 and therefore belonging to the poorest three countries in the world [37]. Tanzania has 25 regions each occupied by more than 4 different tribes. The country has more that 120 languages, although English and Swahili are the officially declared languages off communication [36]. Religious distribution of the population is 35 percent Muslims and 30 percent Christians of which majority of the people living along the coastline are Muslims. There exist also other religious dominations such as Hindu, Buddha and many more which shares the remaining 35 percent of the population [36]. The country shares borders with Rwanda, Burundi,

Figure 6. Map of Tanzania: Regional distribution and borders [35].

Uganda, Democratic Republic of Congo, Zambia, Malawi, and Mozambique.

5.3 Education

Educational system of Tanzania was inherited from their colonialists before independence since then had been undergoing a number of modifications in order to suit the slightly changing needs of labor market in the country. The systems can be briefly described as basic, secondary and tertiary where by students will spend two year of nursery school which is non compulsory, followed by seven years of mandatory primary education, four years of mandatory ordinary level secondary school, two years of high school or vocational school and higher education which comprises of three or more years [38].

Prior to liberalization of higher education, there existed only two universities, both of which were state owned i.e. the University of Dar es salaam and Muhimbili medical

college. There existed also other higher educational institutions which by then used to offer non degree programs for instance the college for business education (C.B.E) Institute for Financial Management (IFM), Dar es Salaam institute for Technology (DIT) and many more.

After liberalization of education many other universities were established in the country, some of which are state owned and other as private educational institution, tumaini being one of them and therefore marking up the new beginning of higher education in Tanzania. All these institutions are registered under the commission for universities which oversee the quality of universities, program and education standards.

The newly established universities could offer many programs and so be able to quickly supply the demand in labor market in Tanzania. However many of these universities could not establish ICT degree programs immediately. This was due to the fact that the country had insufficient amount of ICT professionals who could teach ICT education in the respective universities.

However since then there had been special efforts to integrate the ICT education in to conventional educational program starting from primary schools. This had been facilitated with the support from international development organization such as SIDA and World Vision who provide ICT training to groups and individuals who can later be ambassadors to spread the ICT knowledge to their respective communities.

5.4 Tumaini University Iringa

Tumaini University is a combination of four university schools. It is a Christian based foundation which was established with the purpose of producing religious professionals who could assume different roles in spreading the word of god. Tumaini University schools are run by the evangelical Lutheran church in Tanzania (ELCT), while each campus is headed by the provost of the respective school and a board of directors.

Tumaini university of Iringa (Iringa University college- IUCO) was officially established in the year 1993, as a result of liberalization on higher education institutions where by private organizations were allowed to establish universities and provide higher learning education. This resulted from the fast pace growing economy of Tanzania which in turn stimulated the higher demand of educated professionals to serve in different sectors in

supporting the growing economy. Tumaini University of Iringa started with the faculty of theology and later expanded to faculty of arts, business administration, social sciences and law. Currently the university has five faculties offering several bachelor degree programs and the faculty of business administration had proceeded further by offering a masters level business administration degree. The university harbors 2700 students who are currently enrolled in various programs[39].Figure 7 is a map of Iringa showing the district distribution.

Figure 7. Map of Iringa: Districts distribution [40].

5.4.1 BSc IT Degree Program at Tumaini University

BSc IT program commenced in the year 2007 with 27 students out of which 2 are female students and 25 are male students. Tumaini University was selected as a study area due to the fact that BSc curriculum was designed and implemented in this University.

Establishment of BSc IT program at Tumaini University was as a result of a research carried out at Tumaini university of Tanzania with the purpose of designing, implement, and later evaluate an Information technology curriculum, contextualized to cater for the needs of developing Tanzania. A research was conducted in collaboration with other universities with more expertise in the same field. The universities participated include Joensuu University, Finland, University of Southern Denmark, and Iringa University College in Tanzania [1]. The research resulted into curriculum which was designed to offer ICT knowledge to students at Tumaini University. With minor improvement to the curriculum, university managed a more contextualized ICT curriculum was developed and then implemented in two different phases. First phase was initially implemented between 2004 and 2005 as a contextualized programming course at Tumaini University of Tanzania. During this phase the designed curricula aimed at preparing students of Bachelors in Education (B.Ed.) as the future teachers of ICT.

The curriculum provided them with the knowledge necessary for them to steer in the profession. It also provide students with application oriented and innovative skills so they can integrate knowledge acquired come up with the solutions with respect to ICT expertise in their respective surrounding communities [3]. Second phase commenced in the year 2006, when university enrolled new students for the Bachelors of Science in Information technology (BSc-IT).

The second phase of implementation for the curriculum aimed at offering ICT education at the bachelor degree level. Implementation of this phase is based on CATI model, which emphasizes mostly early identification of societal expectations from technology. The program follows six principles:- Contextualization, local problems as starting points for projects, practical and interdisciplinary orientation, international recognition and continuous research for the programme's formative and development [1]. With reference to growing demand of IT workforce in developing countries and globally, the curriculum offers a promising high prospective career for graduates who are expected to be the ambassadors of spreading the ICT knowledge in their respective communities [1].

5.5 Summary

This session introduced the study area from which this research was conducted. Introduction began at country level exploring two major aspects of concern in the study namely aspects economy and education. Study also introduced the actual region where the study

will take place, in this case Iringa region where Tumaini University is situated and this is exactly where the study scenario will be concentrating. Finally the study introduces the BSc IT program, the major subject of this evaluation by describing a short history of the curriculum and its respective development process.

6 Case study: In-depth analysis of BSc IT Curriculum

This session will analyze the BSc IT curriculum which is under implementation at Tumaini University of Iringa. In this session a short analysis of the development and implementation process of the curricula. This analysis will lead to a deep understanding of case study and the respective curriculum. Through this chapter the study will utilize te existing BSc IT curriculum to analyze te existing curriculum.

6.1 Curriculum design process

BSc IT curriculum development process is an incremental process. Earlier this curriculum was designed as a specific course for student majoring in bachelor in education (B.Ed). The curriculum could offer introductory programming, computer basics and applications hence providing students with basic knowledge of computer and respective applications. Later the curriculum was developed into a full curriculum for a newly established BSc IT program at Tumaini University in Iringa.

6.2 The need to establish BSc IT program

From its establishment, tumaini university of Iringa had declared to be such an institution which will promote education and research that will enhance ICT learning in a Tanzanian context and therefore facilitate development of ICT in Tanzania. Thus, establishing of BSc IT degree program is aiming at producing such expert who could assume different roles of ICT, define local problems, discover local ICT projects and define the boundaries where ICT knowledge is applicable. The local context in this research is defined as the whole population of Tanzania and therefore BSc IT curriculum is expecting to produce such ICT experts who will cater for growing economy and development of Tanzania as a whole.

6.3 Objectives

In establishing the BSc IT program at Tumaini University, the administration had a set of objectives for which they intended to meet. These objectives are considered as key guides to implementation of BSc IT program at the university since they clearly mention targets and expectations of the administration at Tumaini University.

Through implementation of BSc IT program, the university is expecting to bring awareness among ICT students so that they can identify and be able to define societal expectations from technology. Thus, this comes to a precise understanding that once the societal expectation of ICT have been understood then students will be in position to utilize their respective local expertise in solving such problems. Thus, it comes to understanding that Tumaini University intends to build up such a sustainable ICT development. Therefore in doing so, BSc IT program will positively contribute in the Tanzanian economy by promoting understanding of societal ICT needs and therefore devising solutions which are specific tailored to Tanzanian context. Also in ensuring the continuity of ICT learning, BSc IT program is preparing student to be able to pursue further studies after they complete bachelor's degree. This continuity in ICT learning is not limited to local institutions but also to be able to pursue their further studies on ICT and or related fields in developed world.

6.4 Inputs

Developers of BSc IT curriculum took advantage of previous existed efforts invested at Tumaini University as part and parcel to introduce ICT education in this higher learning institution. As mentioned earlier, efforts realized through the design of an introductory to programming course which was offered to B.Ed students at tumaini university was an initiative that led to the discovery of societal local and contextual needs within the vicinity of this university and Tanzanian community as a whole. Another key input was the objective efforts to understand of the cultural surroundings from which a clear understanding of local problems and priorities was established.

Standard

Designers of BSc IT curriculum mentioned to have avoided the use of any known curriculum models. This is because curriculum development process at tumaini university started

as a research on which a precise understanding and analysis of educational requirement was carried out by experts who posses a good command in education technology research and ICT as well.

On the other hand I performed a deep analysis of this curriculum using a comparative approach to the two existing rival curricula models, namely CC2001 and IT 2005. It came into my finding that BSc IT curriculum in a way resembles to the IT 2005 curriculum model which was published by the Association of Computer and Machinery (A.C.M).

In this context, the BSc IT curriculum designers managed to incorporate well the international standards and therefore the curriculum will be close to recommendations which had been made by international curricula development bodies. Thus, this assures students of BSc IT program at Tumaini University that ICT education being delivered through their courses under this curriculum have similar and or related quality. This confirms that ICT education offered at Tumaini University will equip students with sufficient knowledge to conduct research work within Tanzania and abroad without facing major difficulties in their learning activities.

6.5 Principles as the main inputs

Designers of the BSC IT curriculum defined six principles which were to be the guiding principles for the whole process. Designers had a vision of using the principles in order to be able to define specific needs of ICT education in Tanzania and therefore refinement of such principles could provide the understanding of educational, knowledge and pedagogy of ICT education in the vicinity where the curriculum will be implemented. The choice of understanding, choosing and filtering ICT needs can be visualized as such difficult process. This is due to the fact that a deep understanding of cultural, environmental setting, priorities and focus of ICT for a particular society needs to be understood before establishing the actual grounds of driving to such a selection. However, since the process involved characters with such a deep understanding who also had previous experience in such contexts, and incorporating more of local experts in the process, the selection process became simplified leading to precise agreed grounds of establishing the needs of BSc IT curriculum design.

The principles that were chosen as input to design process are Practical orientation in ICT education, curriculum contextualization, local problems as starting points for projects, in-

terdisciplinary orientation, international recognition and continuous research for the programme's formative and development.

6.5.1 Practical orientation in the BSc IT Curriculum

In the BSC IT curriculum the designers addressed the importance of practical sessions. This is in support to the learning theme of curriculum i.e. learning by doing in a sense that students are expected to spend more time doing practical sessions. These practice sessions will improve students understanding of theories and concepts taught during lectures and become more familiar to such concepts. Designers of BSc IT curriculum did consider this in a way by incorporating the application projects which are to be done by students in the final semesters of second and third year of the program. This is further emphasized in the bachelor's project and thesis in which students will attempt to solve different problems by first perform a project work and later writing a report detailing on problem's understanding procedures used and describing any other issues related to the concerned project.

However the designers of BSc IT curriculum could not clearly indicate this in the weekly learning schedule. This is due to the fact that time allocated for practical sessions is included altogether with the time allocated for teaching which comes to the fact that there is no specific time allocated for practical sessions in the program. Emphasizing on practical learning would have make more sense if at all were clearly indicated in weekly schedules and therefore promoting evenly distribution of time between teaching sessions and practical session.

Ever since the BSc IT curriculum is emphasizing on solving problems using programming knowledge, graduates need to have spend more time dedicated with their tutors to emphasize on thinking on solving problems in accordance to programming concepts and therefore precise scheduling of this dedicated time would at large impact the learning process of BSc IT program at tumaini university.

6.5.2 Contextualization and local problem projects

In the process of designing BSc IT curriculum, designers spent time to visualize how contextualization could be included in the curriculum. Thus designers had to come up

with ideas on how to have a sort of preparatory course that will provide students with understanding of general ICT issues surrounding their community. With this general understanding, students could familiarize more with developmental issues and technological availability and advancements in their respective communities. This will promote understanding of the ICT environment and therefore enable to discover strategic ICT application areas. Thus by this discovery, graduate will be able to identify such strategic areas where ICT could be used to yield revenue and therefore utilize their ICT knowledge as a source of income. This is opting to improve the livelihoods within communities for the identified areas could be developed to provide employment for people with ICT skills in the respective communities.

Having identified areas where ICT knowledge can be applied and concrete understanding of development process and priorities in their respective society's graduates will be able to utilize this knowledge to identify a number of ICT projects, giving them more priority and in turn fastening their development process.

However since designer could not fit this idea of contextualization of ICT education directly to many courses in the curriculum it is very clear that this had been left out be emphasized more in implementation. Thus implementers of BSc IT curriculum will have to take a role of guiding students to discover local problems and thereafter establish the projects where ICT knowledge can be used to provide solutions. Implementers also should utilize their contact time with students emphasizing to students such areas of which more priority will be needed to stimulate spread of ICT knowledge and therefore facilitate development in the respective community.

6.5.3 Interdisciplinary Orientation

Interdisciplinary had been at the heart of design of BSc IT curriculum. This is due to the fact that ICT is growing diverse and application areas are in such a rapid increase it is clearly that designers needed to investigate such areas in other disciplines where ICT roles could emerge. As ICT penetrates to find its roots in Tanzania, many organizations are finding it necessary to incorporate IT in their respective functions to improve operations, automate production and cater for competitiveness in business.

This is further extended to modernization of such operations and information exchange that had introduced to companies new ways to communicate, such as the use of emails and

the related services. Such changes as being introduced have proved to affect many business organizations in a positive way leading to being up to date and increased efficiency and profit in their respective businesses.

Although BSc IT curriculum was designed to emphasize in programming it turned out that designers need to incorporate other skills in ICT curriculum so that other disciplines also could benefit from the curriculum. This was made possible by including some general knowledge courses and business modules which will provide students with detailed knowledge general, economic and business issues as well.

6.5.4 International recognition

For continuity in education, it is important that ICT education to be offered using a curriculum which is bound to international standards and acceptance; In this way graduates will be able to cope with current global issues and priorities in technology especially for developing countries. For this reason designers had to apply the concept of "thinking GLOBALLY and acting LOCALLY" [41].

This was such that despite the fact that the curriculum was designed and contextualized to suit the needs for Tanzanian environment but again there was a need to incorporate such a touch of internationalization in a way that it could balance the curriculum contextual needs and international standards. Thus the BSc IT curriculum will produce ICT professionals who would work not only on their Ireland or vicinity of curriculum's context but also outside in a way that they will get opportunity to explore other dimensions of ICT on the rival worlds.

However, designers of BSc IT curriculum decided to utilize a resourceful pool of international academic visitors who would help students to identify problems, provide solutions which are suitable, feasible and of benefit to end users in local context.

6.6 Challenges

In order to design a curriculum which is tailored to target a specific society, it is very important that a thorough understanding of societal needs are clearly understood at the very beginning of the process. Understanding of such needs will make the adaptation

of the curriculum easy since it will address knowledge requirements specifically for the particular society, thus promoting the ownership of curriculum.

In the process of understanding societal needs, it becomes also important to understand the technological availability in a particular society. Availability of technology clearly clarifies as to what level of awareness of ICT is within the society. Thus this information assisted designers to produce a curriculum that can facilitate to address technological awareness among students and the surrounding community.

Another challenge was to understand the societal expectations from technology, in this case the ICT. In any emergent economies like Tanzania there is a tendency of people relying too much on technology; in a sense that they would believe that technology can do everything they want, in order to facilitate development. Thus, designers had to ensure such a design that can address societal expectations and also enlighten the very similar society as to what are the limitations of technology, and where technology could be efficiently used to assist in facilitating development.

6.7 Organization of BSc IT Curriculum

Designers of BSc IT curriculum had categorized program's entry requirements into four main categories. Each of these has its own specific requirements and they all do abide to university's admission standards similar to other courses. Categories are described as "Direct Entry", which is applicable to direct high school graduates; "Equivalent qualifications category", which is for students having similar qualifications to form six graduates such as diploma, or computing certificate; "Entrance examination qualification", which represent a group of applicants that will sit for an exam and secure enough points for admission at tumaini university; and the last group of entrants is the "Mature age entry", which requires that entrants should be mature and above 25 years of age at the time of applying, with further additional requirements. Further detailed information of these pre-requisites is available on the Appendix A

6.7.1 Program duration

The programs duration is termed three years which are specified in to semesters. Each academic year has two semesters of which each semester has specific courses running

through the semester. The first semester is composed of introductory courses, in which several concepts of ICT are introduced to students and bring them into their awareness. Introductory courses includes introduction to ICT and Computing, basics of Information technology, introduction to object oriented programming, introduction to ethics of computing, web page design and administration, development studies and communications skills

6.7.2 Learning experience

Learning process as attributed in the BSc IT curriculum is organized around six different ways and this is variably dependant on the course. These learning attributes includes lecture hours, practice sessions, online and distance learning and discussion or work groups. See Appendix B. Students opting to attend lectures, do so in order to understand the various concepts as being delivered by their lectures. Students participate by listening, asking questions and are part of any learning activity within the lecture hours. This is accounted for as credit hours and the activities taking place during the event might be taken as part of grading or bonus marks to students who show concentration and good participation in such events.

Practice sessions are organized to provide students with deep understanding of concept taught during the lectures. This is the time where students will utilize the laboratory and computer time to practice, design and implement solutions to different problems as presented during the lecture hours. Students have the opportunity to consult lecturers and laboratory assistants for further enlighten should there be any difficulties with their practical sessions.

Online learning is included as the core part of BSc IT curriculum as it is thought to be an important foundation to individual working and exploitation of technology. In this way students participate to online lectures as delivered by lecturers outside the country and therefore gain an international inspiration of their program. Students also get more familiar with the moodle learning environment as they receive instructions, work on assignments and submit their work to the lecturers. The lectures will asses and in return provide students with feedback to their work, by highlighting the important concepts and areas of more emphasis on the courses taught.

6.7.3 Assessment process

The process of assessment is attributed by three important items. Assessment of BSc IT students is based around examinations which are run at the end of academic year, tests which are run between semesters, and practical assignments which usually incorporates projects and assignments that were given to students during the semester for the respective courses. Table 5 shows the percentage by each assessment attribute for BSc IT program.

Table 5. Assesment table.

Mode of assesment	Weight (in %)
Tests	25
Practical assignments	25
University examinations	50

The assessment attributes in combination yields points which are awarded according to the amount of marks earned for each course. Table 11 shows point's values as awarded from the assessment attribute marks. These points are obtained from the grouping of marks in the range as shown in the table. For more information please see Appendix B

Table 6. Grades table.

Grade	Numerical Scores (in %)	Points
A	80 - 100	5
B+	70 - 79	4
B	60 - 69	3
C	50 - 59	2
D	40 - 49	1
E	0 - 39	0

6.7.4 Field work/ Practical experience

The curriculum depicts the importance of students to obtain placements on various organizations in the ICT industry so they can learn more on the important issues in the real world application of ICT. Through such placements students will have a concrete understanding of the needs of ICT in their industry and communities that surrounds their learning

environment. Industrial attachments have to be obtained by the students themselves and this is done by following all the required procedures to the respective organizations.See Appendix C

Tumaini University does not involve itself in finding placements to students but again the university will assist to provide students with the necessary documents so that they can facilitate their process of searching for placements. Industrial placements are accounted for as part of individual student's experience of which will assist them to have obtained industrial experience prior to completion of their BSc IT program.

6.8 Specialization

Specialization in its own way has a vital role in determining the purpose of the curriculum. This elaborate such knowledge areas that implementation of curriculum will be emphasizing. In this case, curriculum design process needs to be preceded by the analysis and understanding of ICT roles which are of most importance within the vicinity of the curriculum implementation. Roles discovered in analysis of contextual surroundings are such a useful input in both designing of courses and devising implementation strategy of such a curriculum. Thus, the designing process needs to ensure that a curriculum includes all courses which target to produce an output of such roles as stated in prior analysis.

Designers of BSc IT curriculum for Tumaini University in Tanzania managed to outline the different roles of which can cater for the local ICT expertise in Tanzania. The major roles are referred to as competency areas, and were taken as into consideration as input in designing courses. The four areas of competency include Network Administration competency, Hardware support competency, Programming and Software engineering competency, Web development and E- business competency. See Appendix D

The areas of competency did not implicate to specialization at bachelors level by used as a focal point to designers in planning of courses in the curriculum which provides such an opportunity to students to have diversity of such roles and perhaps be able to specialize in the future of their career. The design process offered a knowledge base foundation in which students will have a detailed understanding of different roles of ICT and in turn be able to assume such roles in industry and or business organizations.

However, despite of the fact that implementation of this curriculum is emphasizing on

programming, which in a way depicts that the main knowledge focus is on software engineering, the key theme of curriculum which is "Learning by doing" plays a vital role in ensuring that other knowledge areas as mentioned above are well understood through taught courses which in turn will facilitate such diversity to students and therefore satisfy the needs of local ICT expertise in Tanzanian context.

6.9 Benefits

The BSc IT curriculum promises a bright future in ICT development in Tanzania. This is due to the fact that Tumaini University will be the first Tanzanian university to produce graduates of bachelors in information technology who had been trained to specifically become local experts. Thus graduates will be able to construct solutions tailored to local problems and avoid the old time syndrome of porting solutions from other worlds which in a way could not meet the actual ICT demands in Tanzania.

Graduates of BSc IT programs are expected to assume a number of duties in their communities where ICT knowledge will be utilized. Thus graduates will benefit from employment in all sectors, and in turn they will utilize their knowledge to stimulate the use of ICT in order to simplify their work and therefore increase efficiency in their respective working areas.see Appendix E for further details

Furthermore graduates will stimulate the use of ICT knowledge to facilitate development in their country. In this way graduates are expected to motivate and or be motivated to solve problems of their surrounding communities using ICT, and also device projects that can be facilitated by their governments that can create employment to themselves and other people in their communities who happen to be inclined to such projects.

Through interaction with their communities and working on local projects graduates will spread knowledge of ICT. This can be facilitated by providing training to users of systems deployed in the respective communities. Also they can establish projects that intend to spread the ICT knowledge in such areas with little or no technological outreach in the process of raising awareness and therefore make they use of technology familiar in such areas.

The spread of ICT knowledge will empower local citizens with ability to use explore and utilize technology. Through e-commerce citizens are expected to improve the way they

conduct their business, and therefore be able to utilize online services such as e-banking, e marketing e.t.c ICT will equip them with the very current and updated information; revolutionize the traditional way of conducting business and in turn taking a total control of running business with no interference by third parties. Thus ICT will provide them with more efficient and sophisticated means of conducting their business.

6.10 Summary

This section introduced the Bsc IT curriculum, designed for Tumaini University of Iringa by analyzing it in detail. The section focused on the main factors that influence development and implementation of the curricula as well. Furthermore the section introduced most important factors that were considered in designing curriculum and for which purpose each of these factors were considered.

Lastly the section explores the organization of the Bsc IT program and challenges that are being brought about by this organization, proceeding with areas of specialization in focus and benefits which the graduates and the community should expect as a result of implementation of the BSc IT degree program

7 Curriculum Implementation and the Underlying Principles

7.1 Introduction

This section will explain in detailed the different methods which were used to collect data from the field. Furthermore the section is comprised of interpretation of the data as it was collected during the study, and presents these as the results of data analysis process. These results will be discussed in further details in the next chapter. Although the interviews and documentation have been used at large to come to the results, other methods which were incorporated in data collection process will be used to add more value and support the validity of the results presented in the section.

Through out the study observations had been limited to the following issues namely; Assessing the level of practicability of the concepts they learnt in class; Ability of student to interact and understand the concepts they were taught in class; Observing the mechanism the teacher used in presentation of the issues concerning to ICT.

In narrowing the broad area of observation, the study set observation's limit only to such activities which are in the interest of the study. However, such unorganized activities that provided useful information to the study were also taken in to consideration in order to facilitate more understanding of this study.

Hence, as a means of collecting data, participant observation commenced on May 27th 2008 where observations begun by attending a practical session for a course namely Logic and circuit design. In this practical session students were given different questions concerned with solving the logic gates design problems using a variety of techniques which were taught on lectures. Students were allowed to form groups with the maximum of six members.

Interviews were conducted with administrators at Tumaini University in Iringa who serves different capacities at the university and have been playing a number of roles in implementation and administration of BSc IT curriculum and the university as a whole.

7.2 The Interview organization

In this session students were also required to use their extra knowledge for instance the use of presentation skills to arrange and present their work, using drawings and other visual aids to elaborate and give the pictorial presentation of their respective work. In each group each individual were to participate on every aspect of the assignment, as from searching the appropriate ways of devising solutions, finding alternative solutions and also to optimize the best way to arrive to the solution.

The groups managed to perform their assignments and some of them went an extra mile by showing best ways to tackle such problems and also could respond very well to a number of questions as presented by the audience. In these presentation sessions there were no specific opponent groups and therefore the audience had an opportunity to take charge both as listeners and opponents.

Assuming the listeners' role the audience could listen to solutions presented to them and ask questions where more clarity was necessary. Assuming the role of opponents members of the audience were allowed to challenge solutions from presenters and were also allowed to suggest and show their respective alternative solutions as the challenge to the presenters. The tutor in these sessions took part assuming the multiple roles. At first the tutor could assume the role of listener in the audience. Secondly as the opponent, the tutor could verify the justification of the techniques chosen by presenters to arrive to the solutions.

On another role as the tutor could promote and therefore motivate challenges to the audience by providing in-depth understanding of the techniques that can be used to arrive to solutions. The third role was more of importance as it provided students with the motivation to think of the variety problems and their respective solution and widen up their knowledge gained from the lectures and different literatures as provided to them.

Therefore, from the observation point of view students were observed to posses to the ability to participate and practice what the teacher has taught them. It also enables the students to challenge their understanding of various concepts that they have been taught in the class.

7.3 Observation and participation

As a means of collecting data, participants observation begun on may 27th 2008 where a practical session was attended for a course namely Logic and circuit design. In this practical session students were given different questions concerned with solving the logic gates design problems using a variety of techniques which were taught on lectures. Students were allowed to form groups with the maximum of six members.

In this session students were also required to use their extra knowledge for instance the use of presentation skills to arrange and present their work, using drawings and other visual aids to elaborate and give the pictorial presentation of their respective work.

In each group each individual were to participate on every aspect of the assignment, as from searching the appropriate ways of devising solutions, finding alternative solutions and also to optimize the best way to arrive to the solution. The groups managed to perform their assignments and some of them went an extra mile by showing best ways to tackle such problems and also could respond very well to a number of questions as presented by the audience. In these presentation sessions there were no specific opponent groups and therefore the audience had an opportunity to take charge both as listeners and opponents.

Assuming the listeners' role the audience could listen to solutions presented to them and ask questions where more clarity was necessary. Assuming the role of opponents members of the audience were allowed to challenge solutions from presenters and were also allowed to suggest and show their respective alternative solutions as the challenge to the presenters. The tutor in these sessions took part assuming the multiple roles. At first the tutor could assume the role of listener in the audience. Secondly as the opponent, the tutor could verify the justification of the techniques chosen by presenters to arrive to the solutions.

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Therefore, it could be deduced from observation that student are in possesion of the ability to participate and practice what the teacher has taught them. It also enables the students to

challenge their understanding of various concepts that they have been taught in the class. Table 7 show the summary of ratings on the observed components in curriculum implementation with 5 being the highest 3 moderate, 1 the lowest and NA for not applicable cases.

7.4 In-depth Interviews and Focus group Discussions

The interview process begun on Friday 30th may 2008. Interview questions were derived from the research questions and the participants did not have any prior knowledge about the questions. However, the questions were simply inquisitive enough to collect sufficient data from the answered provided by different interviewees. Interview questions were categorized into three groups as general questions, knowledge and development, and implementation and delivery techniques. Participants of interviews were categorized into four groups, as administrators, teachers, students, and industry with each of these groups had specific questions addressed to them in order to collect sufficient information to answer the research question.

Table 7. Observation of BSc IT constructs in implementation.

Constructs	**Actors**			
	Lecturers	**Students**	**Administration**	**Industry**
Acceptance	5	5	5	4
Courses	5	4	5	5
Support	4	3	5	3
Practicability	4	3	5	NA
Professionalism	5	4	5	3
Specialization	5	5	5	3
Interraction	5	2	5	NA
Delivery	5	4	5	4
Benefits	5	4	5	3

Key: *(5 - High, 4 - Better, 3 - Moderate, 2 - Satisfactorily, 1 - Poor, NA - Not Applicable).*

Since the number of students is too large to be treated as a single group i.e. 27, I decided to break this group in to mainly four groups, the first three groups having seven students each and the remaining group having six students. These groups were named as the groups as focus group discussions in a way that the interview was meant not only to concentrate to

the questions mentioned on the interview sheet but also be able to discover more detailed information from the other questions arising from the interview. Through the focus group discussions character filtering was performed to people from various groups by selecting a few students who could be of more informative and therefore taking the second round in in-depth interview.

Again from these focused groups there was an attempt to make separate interview with the female students so as to obtain enough information on analyzing the gender issues as far as the implementation of the curriculum is concerned. Although issues such as gender do not influence much in the learning process in the western countries, in Africa gender is one of the issues given higher priority as far as the learning process is concerned.

Furthermore, the interviews involved authorities and administration at Tumaini University in Iringa who at their different capacities oversee and the implementation of the curriculum on different aspects, the university lecturers and other staff who are part and have been playing a number of roles in implementation of BSc IT curriculum in the university.

7.5 The Interview organization

The first focus group discussion was scheduled on interview was scheduled on 28th and a list of student who could volunteer as for the first day of interview was obtained on a day before the actual interviewing day, i.e. on 27th who registered to their council representative voluntarily. In this way it was observed that students were very confident and happy to contribute for the evaluation of their BSc IT program and on the other hand it demonstrated and promote ownership and belonging feelings to the development of BSc IT degree program.

The interview questions were divided in to three sections namely general, knowledge and development, implementation and delivery techniques. General questions section as it is involved general questions about the Tumaini University, for instance its history, location, commencement of the ICT program, number of students enrolled at the university, prior occupation of students, consideration and contribution to the learning process of the BSc ICT program, and also the affordability of the tuition fees and other living costs for the program. For further detail see Appendix F.

7.6 Interview results

After conducted several of such interviews recorded from the various participants the study needed to have an interpretation of such recorded information in order to come up with the understanding of various aspects of curriculum implementation process understudy. Below are the interptreted results as grouped in to various sections and therefore providing meaningful understanding of results. Table 8 shows the rating summary of results of interviews as related to the six core principles of the BSc IT curriculum during implementation with 5 being the highest 3 moderate, 1 the lowest and NA for not applicable cases.

Table 8. Realization of six principles in BSc IT implementation.

Constructs	**Actors**			
	Lecturers	**Students**	**Administration**	**Industry**
Contextualization	4	3	5	3
Practical Orientation	4	2	5	3
International recognition	5	5	5	5
Problem and project based	5	5	5	NA
Interdisciplinary	5	3	5	5
Research based	4	3	5	NA

Key: *(5 - High, 4 - Better, 3 - Moderate, 2 - Satisfactorily, 1 - Poor, NA - Not Applicable)*.

7.6.1 Understanding the curriculum development process

Knowledge and development, involved a number of questions which was meant to be discussed by the focus groups of students to assess their general knowledge and also basic ideas as far as the curriculum development and ICT is concerned. Basically the questions for example the general understanding of ICT, contribution of the ICT towards community development, ICT skills required to support the community development, and the reflection between these skills and the BSc IT program and so basically how is the BSc IT program organized to produce such skills. Also other questions were meant to assess the correlation between community development and the ICT development especially on the nature of such relationship and interactions. Implementation and delivery techniques was another section that had a set of questions to assess the general perception of the discussion groups on the delivery and the way curriculum is being implemented to them.

The first questions collected views from the groups on relevance of some of curriculum models which seem to be irrelevant to the global market by reasoning and justifying for such a choice, and also mentioning the relationship between such modules to the needs of the local communities. Also applicability of the learning outcomes at the international level by mentioning specific courses which can be applied at global level and are included in the curriculum.

Also to emphasis more on the objectives, in terms of practical sessions, the resources allocated and time for the sessions. Last assessment from the focus group discussion was on changes that made on the curriculum from the commencement of the program, emphasizing on impact of the strategy chosen for implementation, factors that were taken into consideration and effect caused to original curriculum goals.

7.6.2 Discovering the age groups and gender issues

On collecting answers from the general questions the discussion revealed that there is such a noticeable age difference among the students participating on the BSc IT program. The students range from 19 to 40 which is quite diverse especially for students undertaking the similar courses. This diverse of age affects the implementation at large since the teacher will then need to adjust delivery of courses and therefore balance the teaching in a way that slow learners shouldn't be left out without grasping the actual concepts being taught.

The gender distribution on the program is observably quite uneven. This is because many of the applicants are males and females occupy 5 percent of the whole. Statistically the total number of students is 27 out of which two students are females. From the discussion such a distribution happened by default because the administration accepted the applicants who successively qualified to join the program. When asked, students as to know the effects of such a gender distribution to the program it was explained that having female students within the work groups especially during practical session stimulates the pace of working and maintaining the focus to objectives of the practical work.

This in turn was observed as time saving and more efficient in meeting the goals set to complete the assignments and practical works by students. On a private interview with female students who represent five percent of the intake the study intended to know their feeling, as being under represented group. Both of them mentioned the feeling of being few as it was hard for them to get unused to the learning environment easily but as the

time passed by it then became easier for them to cope with the other members. The reason behind this is that they later gained confidence after receiving enough cooperation and encouragement from fellow students and administration of the BSc IT program and therefore at the moment they feel very equal to other members.

On the interview with one of the administrators of BSc IT degree program at Tumaini University in Iringa, it was revealed that gender issue in ICT program is almost common in all institutions who provide these programs and which means that male students tends to dominate in terms of number. Also during the selection period there was no any special consideration to favor female students to join this program. This is because the program was advertised a little bit late and therefore there was a very few number of applicants, and those who met the mere qualifications were selected to join the BSc IT degree program.

7.6.3 Understanding the transition from B.Ed to BSc IT program

On the other hand some other students who were previously selected to join bachelors in education, (B.Ed) and found it interesting to join the BSc IT program were allowed to change and join the IT degree program provided they could meet the admission requirements for the program and also pass the entry exam for BSc IT program. The university also do not give extra points on gender basis but program is willing to accept as many female applicants as possible provided they meet admission requirements for the BSc IT program although so far they have not received any applications from the female students to join the program for the next academic year. While observing the trend of the students for example their computer literacy and competence, many of the students who joined the program had no prior knowledge with computer and some of them had not even came across with computers and this was very difficult from the begin with such a group. This situation necessitated some minor changes in the curriculum and therefore some of the courses were shifted to the next semester and some to the current on allowing more time to students to familiarize with computers, technology and other aspects of learning in ICT education.For furter details see Appendix G.

7.6.4 Constructing foundational use of ICT

However, on first three months from commencement of the program they could demonstrate very fast understanding and competently use of computer program for instance the

use of the e-learning tools such as moodle, the e-learning environment which is a wonderful pace as far as the learning is concerned. Although students could manage to understand the computing concepts and learning environment very quickly it also became clear that at departmental level different plans could have been made to ensure that students are easily integrated to their studies by providing them extra assistance to ensure that they could easily adapt to the computed knowledge and respective learning environment. In this case technological literacy was highly emphasized from the beginning of curriculum implementation, in a way to promote understanding of various technological concepts for instance the digital and analogue concepts.

This was in hand to hand with IT literacy as the understanding of basic technological literacy could in a way make it easy to understand basic IT concepts and therefore facilitate the learning process to BSc IT students. To achieve this there was no any specific strategy that was devised to facilitate learning at such a pace and students could learn courses according to curriculum arrangements. Tumaini university provides also ICT courses to all students in the university that equip them with sufficient ICT skills and understanding of packages that are useful in their learning process such as introduction to spreadsheets, power point, database, networking concepts etc. These similar courses are also provided to the BSc IT students with basic ICT knowledge and therefore be able to manage the studies and learning environment.

7.6.5 Learning by doing: Spreading ICT knowledge

However, the only different between BSc IT students and students from other disciplines in Tumaini university is that BSc IT students have unlimited computer time. In this way, student can spend much time utilizing computing facilities to learn and therefore be able to easily adapt to their learning environment while of course consulting their tutorial assistants and teachers to achieve the latter i.e. learning by doing. This type of learning is used as a tool to enhance creativity among students in a sense that students are able to analyze various problems of their surrounding communities, design and implement appropriate solutions to such problems using ICT knowledge. This will stimulate the community development since problems are being solved using modern technology and therefore fastening the pace of development in respective communities, which had been emphasized by the Tanzania development vision 2025. The report further highlights on importance of having ICT development starting from small community levels (grass roots level) going up to the national level and not otherwise in order for such development to

be sustainable.

However, there is such a need of having an inclusive information society, so that all the groups in communities are participating in such development without excluding any for example poor people, rural people indigenous and other under represented communities. This will lead to evenly distribution of development in ICT to all communities without having other groups left behind which will result to real sustainable ICT development. As the contribution to this vision the BSc IT program is focusing on producing ICT literates who can also spread their knowledge by teaching other people from their communities and therefore creating opportunities for people working on different levels and therefore creating endless possibilities for utilizing ICT towards development. This requires a lot of input, ambition, risk taking and a lot of assumptions from the society that in a way those solutions will be delivered from a lot of input in to thinking and designing of such solutions instead of importing solutions from other communities which are geographically further apart and differing in conception.

7.6.6 Searching for ICT knowledge base

Also there must be clearly defined boundaries as to where ICT can be used and where it cannot be used to reach to such solutions. Other issues to be considered extends to peoples perception, expectations, hopes and fears on ICT before taking ICT to a large scale as a tool to stimulate and support development. Talking about the process of curriculum development at Tumaini University in Iringa, it is clear that the process is a continuous and or iterative development process. This means that after every academic year end there should be evaluation and improvement of the curriculum. This is very possible as it is clearly indicated that the implementation process goes hand in hand with curriculum evaluation and development especially after completion of certain phases of implementation, having gained enough understanding as to which particular areas needs to be improved. Since the curriculum development at Tumaini University was based on IT2005 curriculum standard there are some features observed to be similar in the two curricula. However, curriculum was designed and implemented at Tumaini University emphasize more on programming than IT2005 and technology more than CC2001.

7.6.7 Contextual framework in BSc IT curriculum

Considering contextualization of BSc IT curriculum, it works on different levels which are curriculum, topic, and pedagogical levels. Pedagogical approach has been different as compared to many other programs since it was contextualized specifically Tumaini University. Through this, the university will be able to produce professionals who will be specialists to ICT problems within Tanzania but at the same time these professionals will be able to compete, work and pursue their further study abroad which is defined in a broad term as internationalization which is clearly defined on the considerations which were taken into account during designing of this curriculum.

7.6.8 Concretizing on practical orientation

The BSc IT curriculum uses a problem and project based, hands on which means using less efforts in lecturing but emphasizing on practical sessions of doing, implementing and finding solutions to different problems on individual and group wise basis. At the curriculum level, implementation emphasizes on course contents and problems those IT professionals in Tanzania are facing which are always different from those faced by their counterparts in Europe for instance the corrosion effects on the grounded electrical wires, availability of proper infrastructures. At this level the curriculum is made to give knowledge to students to understand their environment and therefore be able to deploy proper ICT solutions with respect to available conditions such as environmental, cultural issues as such. Based on the six principles the implementation of the curriculum seems to be progressing very well as observed during the first academic year of the BSc IT program.

However, its is still quite early to overlook for ambitions among students, for example if at all they are willing to go abroad to pursue further studies especially in advanced IT programs and therefore it is such a restriction to implementers to really know the precise level of skills that they can provide to such students. This is expected to have been learnt in the second year, after having identified students' expectations and focus on their study in the BSc IT program. Contribution of ICT in Tanzania had been very rapid, noticeably by the presence of facilities for instance the ATMs which are ubiquitous in a way that people can perform visa transfers in any of them. Also on a survey done at Tumaini University by sampling 61 students to examine the percentage of possession of cell phones, it was revealed that all of them had cell phones which shows incredibly use of ICT facilities.

However, it is not yet clear as if the possession of cell phones to students and other communities has either positive or negative impact on development i.e. does it either increase or reduce poverty in the respective communities. Technology is a very good tool if at all it is used in a right way. As it is, technology is just a piece of metal or plastic, which do not help to solve problems and therefore this necessitates the need to have people with proper skills to facilitate the use of technology towards bringing the positive impact to development. If used wisely and for right purposes, technology can bring wonderful changes to the community.

7.6.9 Understanding technology contribution in learning

Considering learning environment for example at Tumaini University, technology could have been used much more but the use of technology for educational purposes is not extensively utilized. This is due to the fact that education is not only concentrating about technology, but also other things surrounding the learning environment for example delivering lectures, doing assignments on paper work etc and therefore technology do not provide quick replacement of anything rather than just an enhancement of doing things in an advanced or easier way.

Employing technology to facilitate learning on traditional learning environment requires also adjustment of other factors which are in a way associated and or affected by technological change.

7.6.10 Pedagogical thinking in contextualized ICT education

Considering introducing the e-learning environment, for example, the pedagogical thinking must be changed and students must be made to understand as to why they are learning things in a new way, and also what are the new ways and what are the things that they should focus when learning in new ways. This will promote students to change their attitudes towards learning and respective objectives, and therefore, smoothen the transition from traditional to the e-learning environment.

One research work conducted on the attitude of teachers and students on their use of PowerPoint presentations and multimedia technologies it revealed that they both utilize these technologies to facilitate presentations and lectures, but again if such technologies

for instance the PowerPoint isn't carefully used then it becomes such a bad tool to achieve the expected results. This comes to confirms that technology as it is do not do anything and it benefits are context dependent.

Relating to the use of technology, BSc IT program at Tumaini University had adopted the moddle learning environment where by students participate to virtual courses offered by teachers from South Korea and Finland where by students receive their grading from South Korea and feedback from Finland respectively.

7.6.11 Emphasizing on internationalization of BSc IT curricula

This confirms that BSc program at Tumaini University is at the international level and therefore students receive their lectures and feedback from international teachers and or professors who have a remarkable experience on particular field in education and technology. In this case collaboration between continents makes the program more of international as students happen to understand the various concepts from different experts on the same. However despite of such factors that makes it easier for student to adapt e-learning environment in this case moodle it is also very difficult especially for such students who had never had a precise experience on the use of computers and therefore internet service. This raises a need to have new pedagogical ideas to teachers and students in a way that clarity, honesty and efficiency of e-learning environment can achieve. Also there had been a lot of people doing research who come to visit Tumaini University and interact to students giving them lectures and other things related the program and again lecturers at Tumaini University travel to partner universities for research and exchange programs.

Also there had been a plan made to secure a funding that can facilitate for students to participate for exchange program to other universities world wide and therefore in the mean time it is important that they learn the basics and become competent in computer usage before they get to participate in exchange programs. However, due to limited funding available at this time, Tumaini University is considering to get more teachers and lecturers to come and teach in Iringa rather than flying 27 students of BSc IT program to participate to exchange programs. Despite the fact that Tumaini University is in area of Tanzania it posses such facilities that make it possible for internationalization for instance the university posses a decent internet connection which makes it possible to achieve communications via internet, and therefore facilitating collaborations with many other universities worldwide, and also enhances the international publicity of the university

worldwide. This had brought about a positive impact about the university and since then there had been a number of researchers and volunteers coming to perform their activities at the university which makes the program and university grow.

7.6.12 Discovering the missing variables in BSc IT curriculum

Considering the six key principles, they were very broad concept and could cover almost everything except technology availability. In this sense, designers could not visualize on how modern technology could be made available to students and also how to use this technology, again how this technology can be used to bring about a positive impact on development and therefore be used as tool to facilitate development of which could last longer leading and sustainable.

Noticeably, the beginning of implementation of BSc IT program suffered some inconsistencies in areas such as scheduling, and availability of staff among the others, it was thoughtful to have a form on strategic thinking specifically to overshadow these missing components on the earlier days of implementation. This is later to be discussed in detailed in this subsection.

Also in ensuring that the local community and its inhabitants are also part and parcel of this implementation there needs to be a way of incorporating a plan to spread ICT knowledge to these local inhabitants so they can benefit in one way or another from this BSc IT program and therefore facilitating the sustainability local ICT development through this program.

Technological availability

At the moment the ratio of students to computer is 2:1 which means two students per one computer. Comparing to other students in other educational institutions especially in sub-Saharan region and also western universities this is a very high ratio. However in the case of western universities students are assumed to have their own computer facilities at their homes and therefore computers available their campuses are mainly used for demonstration and presentations during sessions at the university. Therefore this ratio of 2:1 is extra ordinary in Tanzanian context because with other universities for instance the University of Dar es Salaam the ratio is almost 20:1.

This confirms that despite of the fact that technological availability was not taken as an

input in to curriculum designing process it had been highly considered in implementation of the curriculum and therefore it had made the learning easier because students have more time to access computers, learn and therefore become competent in a very short time. With the fact that almost all of these students do not possess their own computing facilities, and they had such a low knowledge to computer technology, considering the technology and therefore computers availability as the most important aspect of curriculum implementation had rendered the BSc IT program running very successful in the first year of its implementation.

Strategic thinking in implementation

Considering implementation of curriculum, despite the fact that there have been some missing components in beginning of curriculum implementation there had been no specific strategy that could be either imposed or ported in order to cater for such shortages with curriculum. This is because the number of students enrolled was such a few in a sense that if a need arise its therefore becomes very easy to adjust and incorporate such changes in implementation.

However there had been contingent strategies which were devised for instance based on the availability of staff and their respective competence in different areas. Most important things in defined by curriculum designers have been achieved and administration had understood need of accessibility to technology and other issues necessary for delivery of ICT knowledge. This is evident from the fact that a BSc IT program was not put under any of the existing faculties as shown on prospectus of the university. This makes it easy to make changes and improve the BSc IT program since it allows more flexibility and easily cope with any arising changes, unlikely other programs which have to go through a number of steps before granted a permission to make minor amendments to the program.

Preparing community for curriculum adaptation

Concerning the readiness of students who join the program, so far there is no any strategy of establishing sort of preparatory courses for incoming students who have little or no computer knowledge for instance a computer driving license course where students will be prepared with basic skills of computing and technology. However Tumaini University is keen to establish a community oriented teaching program where by BSc IT students on second or third year of degree program will be teaching computer basics and technology to anyone in Iringa who will be interested to participate and obtain this knowledge on the basis of spreading this knowledge to local communities and therefore arising computer

technology awareness in such communities.

7.6.13 Smoothness in knowledge delivery

Considering the implementation there are some areas which are so far promising that objectives will be met. However since the BSc IT program had been running for only one academic year again it is too early to assure that all objectives of this curriculum will be met. However there had been some difficulties at the beginning of the program and this was a communication problem between a teacher and students who were attending the course. Students were having a very hard time to understand this teacher and therefore knowledge delivery could not be achieved to student's expectations as detailed in Appendix G. Despite of that issue other teachers are doing well and so students are coping well with other courses the program. Also extra efforts are being put into practice by lecturers to ensure that students do really understand the contents of courses they are giving for example by using a local language, called Swahili to emphasis and ensure that students really do get the concepts which they intend to convey to students. See Appendix C for detailed clarification.

7.7 Summary

This session described a process of data analysis in detailed and also data presentation as it appeared in the session. Various data collection technique used to obtained data were explained in detailed and data was analyzed that lead to discussions. The data analyzed was collected from the field using techniques described in the previous session and were used to build up conclusion and recommendations as it will be observed in the next session.

8 Discussion

In this section the study will consider the most important parties affected by the BSc IT curriculum implementation process as with their respective role as the key personalities towards improving the implementation process. The roles of such personnel will be discussed as such factors whose change will in one way or another change and therefore empower the BSc IT curriculum as the tool to promote knowledge sharing, spread the ICT knowledge, facilitate sustainable development in the local community, and promoting the awareness of importance of ICT and its associated services toward development.

8.1 Students

Students at their capacity are the main actors in implementation of BSc IT curriculum. This is the main targeted group of implementation process from which the success of knowledge transfer and implementation progress of this ICT program can be measured. As part of analysis it revealed that students at the their capacity they hold an important position drive a change in them in order to facilitate successful implementation of the BSc IT curriculum. Below are such factors which students as the main actors need to change and adapt in order to benefit from BSc IT curriculum

8.1.1 The Learning attitude

Students should accept and change their learning attitude, from spoon feeding to individual learning and creativity attitude. Since the curriculum is designed to enhance creativity to students, in a sense that students should learn by doing therefore it is quite clear that they will benefit at large from the course if they are willing to spend enough time learning on their own and in groups. This will promote information sharing and searching among students while utilizing the available consultative time with their lecturers for guidance and clarification whenever they encounter difficulties in the learning process.

8.1.2 Use of internet, technology and other online resources

Because of the importance of practical learning in the ICT education especially in programming courses, Tumaini University's administration has dedicated a specific laboratory for ICT students with unlimited time for the use of such available facilities in the laboratory. The study recommends students to utilize most of the time to exploit and use the available resources in the laboratory so as to promote their understanding of technology and access the various sources of information on the internet. This will therefore concretize their learning as well as widening their understanding of various lectures and modules taught, thus improve their technology competency in ICT education.

8.1.3 Extending learning: Overcoming knowledge limitations

Students should also be able to exploit technology and knowledge outside their learning environment. This will help their understanding of surrounding technological environment as well as identify problems and specific areas as to where ICT can intervene. These will in-turn improves the curriculum towards the direction that serves the market demand in ICT industry.

8.2 Lecturers

The study oversees a position of lecturers as group with influence in the knowledge delivery, as far as the BSc IT curriculum is concerned. Because of their role in supervising students on their daily activities in learning, this group influences at large the quality if knowledge from which graduates will either benefit and of posses in the end of 3 years of studying ICT. Thus, the more intact is this group in terms of academic experience and ability towards problem solving is the easier implementation process and knowledge transfer succeeds. Below is some of the views revealed from the study as a result of analyzing the role played by this group in curriculum implementation

8.2.1 Updating knowledge on the current ICT issues

The study asserts that lecturers should keep their knowledge updated so as to know the current whereabouts in the ICT industry and therefore be able to properly deliver knowledge which is modern and useful to students in their learning process.

Due to the fact that ICT knowledge is very dynamic especially in developing countries where by fast growing economies especially in the banking sector are always on the run to new technologies, study recommends that lecturers provide modern challenging problems that will enhance students to easily understanding the modern ICT technologies, and therefore be able to provide best solutions within dynamic ICT environment which supports industrial demands.

Also considering the fact that the BSc IT curriculum is specializing in programming and its implementation emphasizes on learning by doing, lecturers should dedicate more time for consultancies and be friendly to students so that students will feel free to meet them and discuss various problems encountered in the learning process.

8.2.2 Interactive tutoring

The study asserts that lectures should be conducted in an interactive manner. This will benefit from obtaining instant feedback from students while teaching the various courses. Instant feedback will assist lecturers to be able to adjust the way they deliver lectures so that the delivery is in accordance to students understanding and therefore facilitate efficient implementation of the curriculum.

In additional to interactive tutoring, lecturers should promote closeness to their respective students who will be attending their lectures. Promoting this relationship will facilitate students to overcome fears among themselves and be able to ask questions for further clarifications whenever they encounter difficulties in learning process.

8.3 Administrators

BSc IT degree program is at its infancy stage, in a sense that at its position a lot of things might be need too be changed in order to improve the curriculum and the quality

of knowledge that it intends to deliver. At this point the administration group plays a vital role in promoting the program, allocate resources and allow a room for reviews to be conducted several times in order to stabilize the curriculum.

Also the administration should provide opportunities to lecturers and emphasize the importance of its staff to develop their skills more and keep up-to-date with current world trends on ICT and development as a whole. Below is a more detailed discussion of dimensions to which the administration should extend on order to promote success of the BSc IT program and the respective curriculum

8.3.1 Pedagogical design and practical sessions

Since the BSc IT program focuses on programming and e-learning in such a way that some of the courses are being conducted and delivered online, the administration should put more effort to a pedagogical design which will emphasize on the use of technology in learning ICT and therefore promote technological awareness among students.

The study recommends that administration at Tumaini University should provide opportunities to students to participate in practical sessions solving the real world problems in the industry. This can be extended to student's full participation for instance in network design, installations, configurations and such kind of related training which are more practical in the real world. If possible this could be extended to administration putting more efforts to secure practical sessions opportunities in the industry in a form of arrangement with organizations offering the ICT services.

8.3.2 Incorporating views to improve the curriculum

The administration should be willing to accept positively recommendations on various courses from students and lecturers so as to facilitate improvement of the curriculum. This is due to the fact that this group is the one having ideas on what is going on in ICT industry and therefore incorporating some of their ideas will lead to a modern and acceptable curriculum to all parties participating in implementation of the curriculum. This will also promote the sense of ownership and belonging of the curriculum to all stakeholders of this ICT education.

9 Conclusion and future work

Implementation of the BSc IT curriculum at Tumaini University in Tanzania had at large been successful. This is due to the fact that this curriculum had managed to cover almost all the important aspects of implementation for the first academic year of the BSc IT program. However it is important to realize that whatever the purpose a curricula is designed to fulfill, it is not possible to cover all aspects of knowledge requirements by 100 percent success. This necessitates the tradeoffs and balance between many issues associated with implementation and insisting on what is important to be learnt in ICT for a particular context, in this case Tanzanian context.

Moreover, it is true that implementation of this curriculum have faced several challenges which had been mentioned earlier in the discussion, and it is therefore a task to each noted group as being the immediate beneficiaries of ICT knowledge delivered from BSc IT curriculum to act on the suggestions as commented on the discussion. Thus, there are things that need to be prioritized for each identified group to ensure the success in the roles that they play. Issues like learning habits for students, lecturer to student interactions, administrative view on BSc ICT program and awareness of ICT by decision makers if overlooked will bring about the noticeable effects on implementation and the lasting of this BSc IT program.

Furthermore, there exists a contradiction in the named main principles of this curriculum. As it is understood, curriculum intended to produce local experts who can discover local problems and be able to initiate ICT projects that will cater for development demands in Tanzania. Another principle advice on importance of internationalization BSc IT curriculum to produce professionals who can assume international ICT duties at a global level hence a contradiction between the two extremes.

Finally the study recommends that iterative longitudinal study should be carried out to design for proper intervention in response to these problems this will help in improving and stabilize the curriculum. Furthermore, the study recommend an in-depth focus in the direction to discover and expand the six principles which were used to design this curriculum so as to gradually to improve and cover other aspects in the ICT education.

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Tumaini University BSc IT Curriculum Admission Requirements

The student entrance requirements are based on the following conditions and categories:

Category A: Direct Entry (Form Six Graduates)

Applicants eligible for direct admission to the degree programme must have earned:

(A) A Certificate of Secondary Education Examination (CSEE) with passes in four subjects, obtained prior to sitting for the Advanced Certificate of Secondary Education Examination (ACSEE) AND

(B) An Advanced Certificate of Secondary Education Examination (ACSEE) with at least two principal passes and a total of 4.5 or more points.

Category B: Equivalent Qualifications (Diploma holders)

Applicants eligible for equivalent admission to a degree programme must have either:

(A) Minimum equivalent requirements specific to the programme of study as listed under the Faculty; or

(B) Met entry requirements at an accredited University in the applicants home country (for foreign applicants) subject to approval by the IUCo Academic Board and the Tumaini University Senate.

Category C: Entrance Examination Qualifications

Applicants who have at least two principal passes, but have less than 4.5 total points on the ACSEE must pass the Tumaini University, Iringa University College Entrance Examination.

Category D: Mature Age Entry

Applicants eligible for mature age admission to a degree programme must:

1. Be 25 years of age or older in the year of application
2. Have completed Form IV (or equivalent) at least five years prior to the year of application applicants) subject to approval by the IUCo Academic Board and the Tumaini University Senate.
3. Have attended extra-mural classes or residential courses and submit a letter of recommendation from the tutor

   or Have attended a residential course at an Adult Education College and submit a letter of recommendation from the Principal
4. Pass the Tumaini University, Iringa University College Entrance Examination

Examination and Grading System

Course grades are delivered from numerical scores obtained on tests, practical assignments and examinations as follows:

Table 9. Assesment table.

Mode of assesment	Weight (in %)
Tests	25
Practical assignments	25
University examinations	50

Table 10. Grades table.

Grade	Numerical Scores (in %)	Points
A	80 - 100	5
B+	70 - 79	4
B	60 - 69	3
C	50 - 59	2
D	40 - 49	1
E	0 - 39	0

The course instructor, the external examiner, or the Faculty Board may implement a different grading system based on the performance distribution of all members of the class.

The minimum pass mark in each diploma and undergraduate course shall be C.

GRADE POINT AVERAGE (GPA)

Courses shall be weighted by multiplying the points associated with the final grade of a given course by the number of credit hours assigned to that course. A candidates overall performance is then found by dividing the total number of course credit hours into the weighted total number of credit points of all courses taken.

$$\text{Grade Point Average (GPA)} = \frac{\text{Weighted Point Total for all Courses Taken}}{\text{Total Number of Course Credits Taken}}$$

Graduation Classifications for Bachelor of Science in Information Technology (Bsc-IT)

Candidates must have a minimum grade point average of 2.0 to receive a degree. Bachelor of Science in Information Technology degrees is classified according to the following grade point averages:

Table 11. Assesment table.

Class	Score Interval
First Class	4.4-5
Upper Second Class	3.5-4.3
Lower Second Class	2.7-3.4
Pass	2.0-2.6

Graduation Requirements

In order to receive a Bachelor of Science in Information Technology Degree, the candidate must:

1. Attend classes regularly and meet the minimum number of 75 of scheduled class periods for each periods, for each course and have completed all course requirements
2. Complete all courses required by the Bachelor of Science in Information Technology programme
3. Earn a minimum grade of C in all course in the Bachelor of Science in Information Technology programme
4. Demonstrate research competence in the required practical and Internship
5. Conduct research and Write a research paper of between 10000 and 12000 words, which is accepted by the examining committee

Recorded Interviews

The information will be provided upon request. They include recorded interview with various groups and participants of the study.

Specialization Roles

Hardware Support Competency

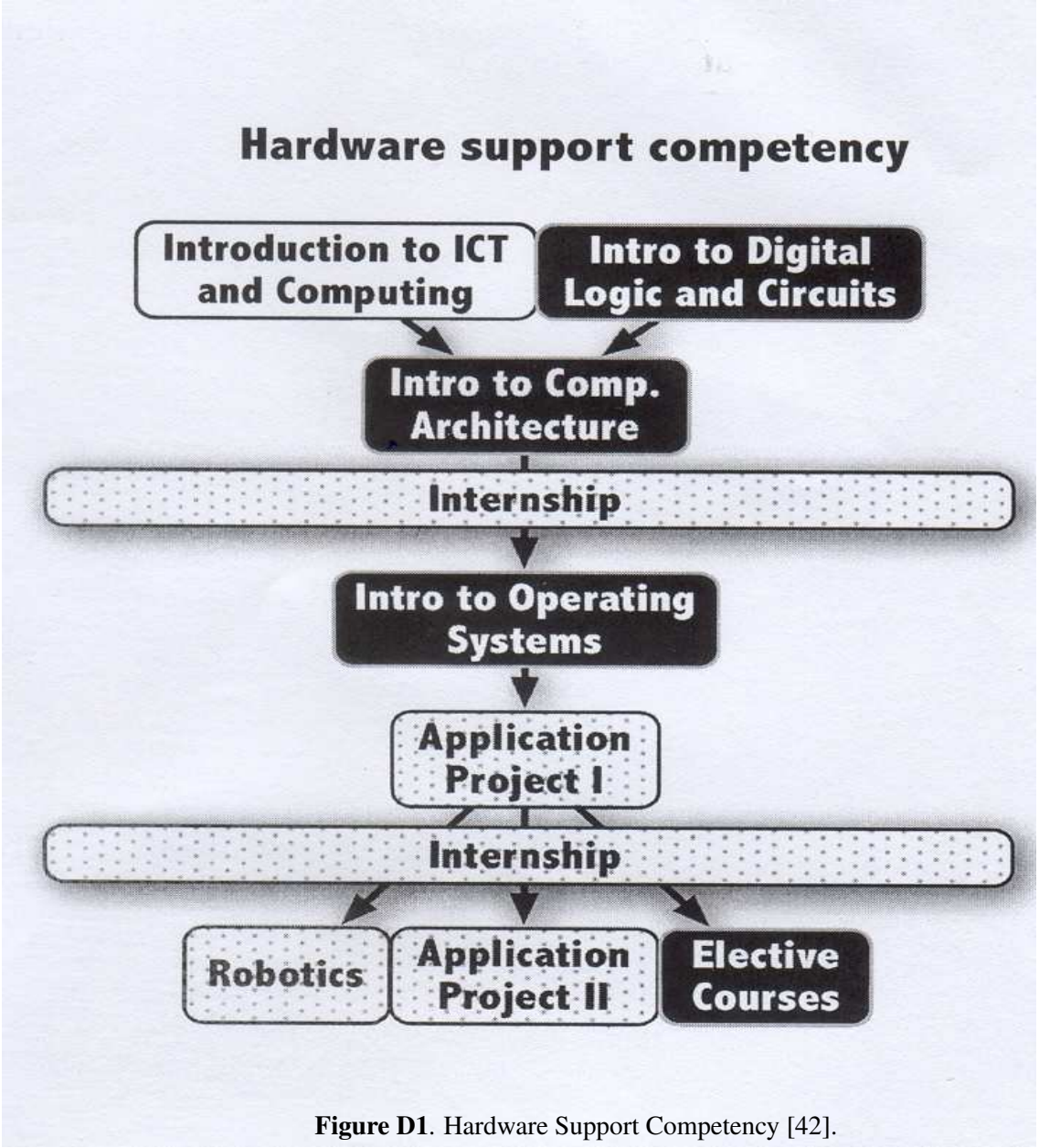

Figure D1. Hardware Support Competency [42].

Network Administration Competency

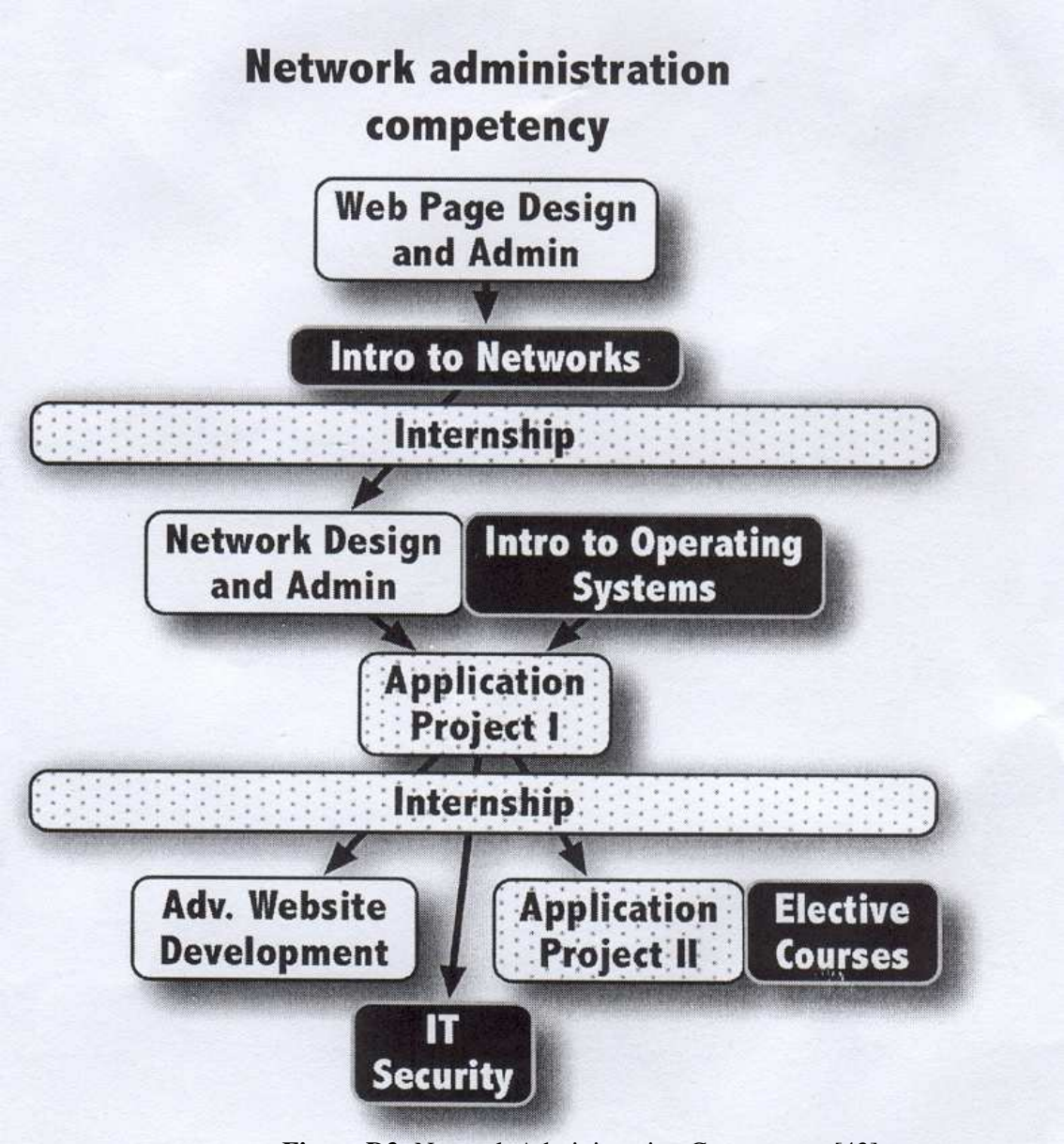

Figure D2. Network Administration Competency [43].

Proramming and Software Enineering Competency

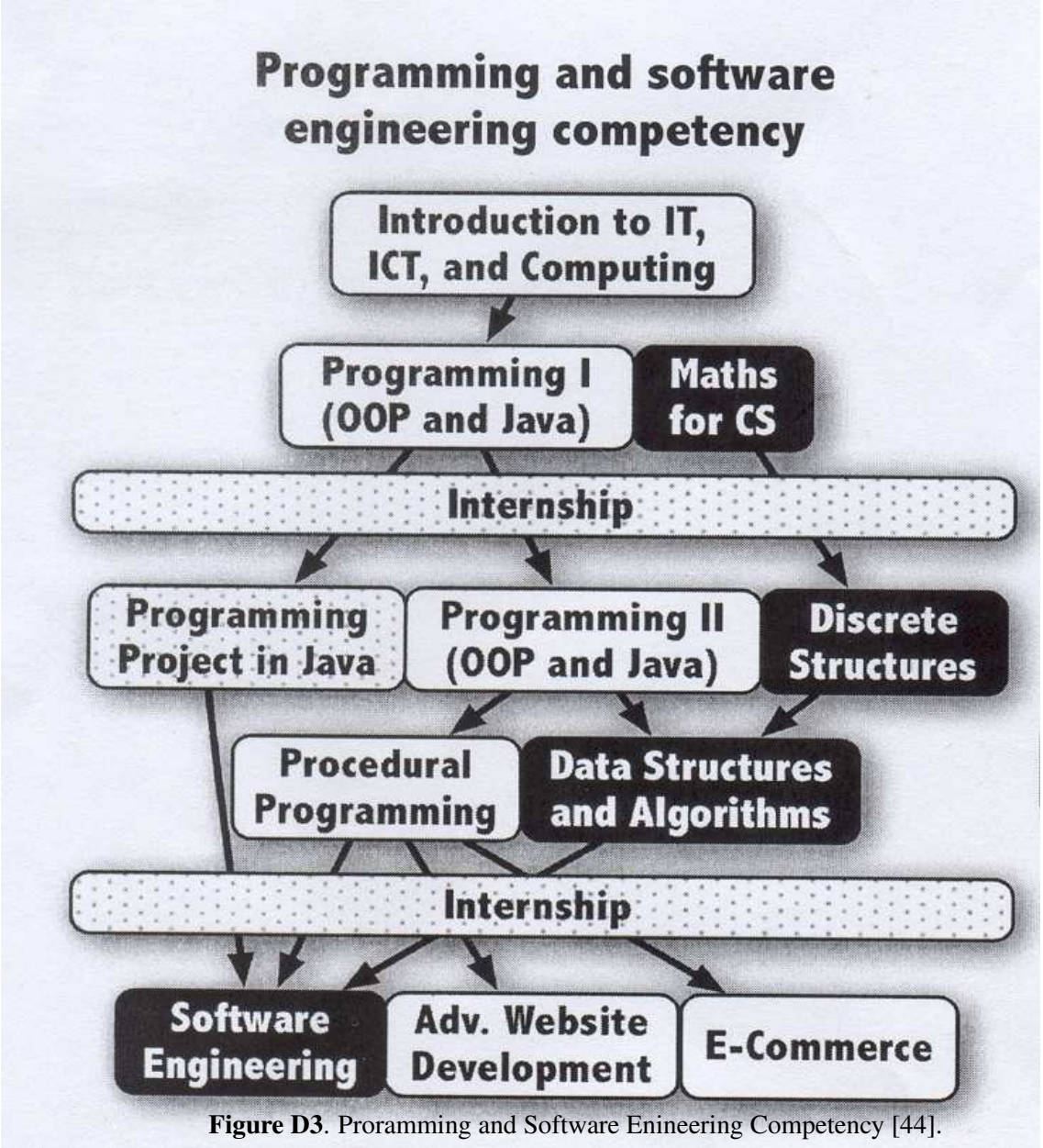

Figure D3. Proramming and Software Enineering Competency [44].

Web development and e-business competency

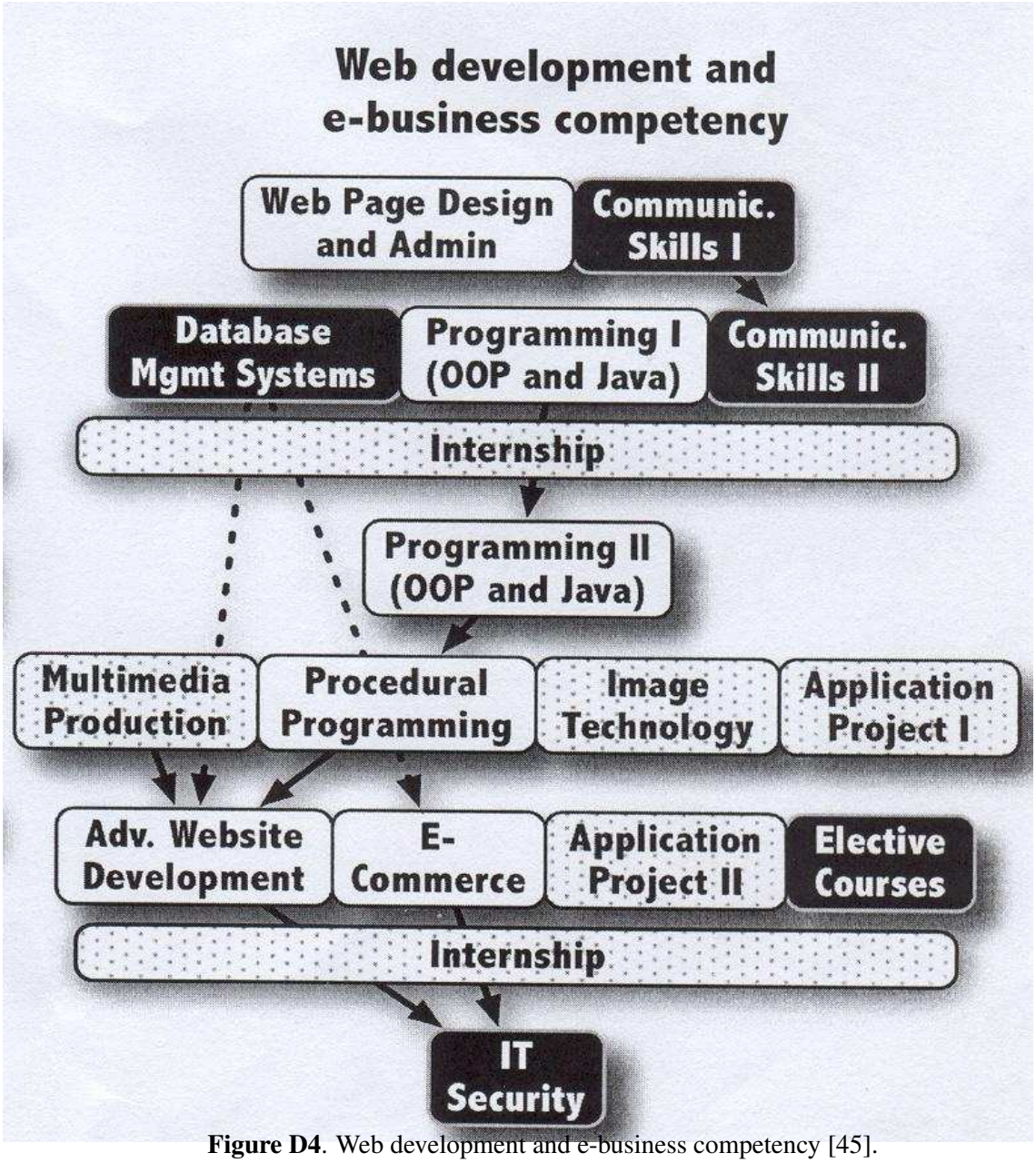

Figure D4. Web development and e-business competency [45].

Tumaini University BSc IT Curriculum

FIRST YEAR

FIRST SEMESTER

Introduction to ICT and Computing (course code), 33h

A. Course Description

An introduction to the basic concepts of Information and Communication Technology (ICT) and Computing, the course includes: computer hardware components, computer programs and operating systems, data communications and local area networks, network services and digital communication, controlling the risks of information technology, basics of Unix, and an introduction to HTML.

B. Course Objective

The aim of this course is to give a general overview of Information Technology to the beginners.

C. Course Content

- 1.Computer Hardware components
- 2.Computer programs and Operating Systems
- 3.Data communications and local area networks
- 4.Network services and digital communication
- 5.Controlling the risks of information technology
- 6.Basics of Unix
- 7.Introduction to HTML

D. Course Organization

The course will take 11 weeks; 9 weeks of teaching, 3 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation Independent studying, exercises. A student must partake and accumulate at least a third of the course exercises, implement a personal homepage in HTML, and pass an examination in order to pass the course.

G. Bibliography

A+ Certification All-in-One Exam Guide, Sixth Edition (A+ Certification All in One Exam) # Publisher: McGraw-Hill Osborne Media; 6 edition (December 21, 2006) # ISBN-10: 0072263113

Microsoft Windows XP Inside Out, Second Edition # Publisher: Microsoft Press; 20 Pap/Cdr edition (November 3, 2004) # ISBN-10: 073562044X

Basics of Information Technology (ICT 101,111), 72h

A. Course Description

This course introduces students to the basics of computer hardware and software through lectures and practical experience. It includes lectures on computer hardware, operating systems, word processing, spreadsheets, presentation programs, databases, computer networks, e-mail, and the Internet. During course, students practice skills with computers and must complete assignments on taught areas.

B. Course Objective

After successful completion of this course, students will have a general knowledge of computer hardware and operating systems, databases, presentation programs, computer networks, e-mail and web browsers and deeper knowledge of word processing and spreadsheets. This will be achieved by teaching, completing practical projects and by solving

problems.

C. Course Content

1.Basics of computer hardware and Operating Systems 2.Basics of Computer Networks, E-Mail and Internet 3.Basics of Presentation programs Databases 4.Deeper knowledge of Word Processing and Spreadsheets

D. Course Organization

The course will take 18 weeks; 15 weeks of teaching, 4 hours per Week, 1 week for study break and 2 weeks of University examinations

E. Method of Instruction Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

A+ Certification All-in-One Exam Guide, Sixth Edition (A+ Certification All in One Exam) # Publisher: McGraw-Hill Osborne Media; 6 edition (December 21, 2006) # ISBN-10: 0072263113

Microsoft Windows XP Inside Out, Second Edition # Publisher: Microsoft Press; 20 Pap/Cdr edition (November 3, 2004) # ISBN-10: 073562044X

Microsoft Office 2003: Introductory Concepts And Techniques # Publisher: Course Technology Ptr (Sd); 2nd Sprl edition (February 15, 2005) # ISBN-10: 0619254858

Network+ Guide to Networks, Fourth Edition # Publisher: Course Technology; 4 edition (April 4, 2005) # ISBN-10: 061921743X

Programming, part 1: Introduction to Object Oriented Programming (OOP) using Java (course code), 54h

A. Course Description

The idea of programmability, introduction to the basics of programming with the Java programming language. The fundamental structures and concepts of programming such as: variables, constants, control structures, while-loops, and data structures, a short introduction to applets and event-driven programming will be dealt with.

B. Course Objective

The main objective is for students to form a correct way of thinking in terms of programming. By the end of the course should know the basics of programming using Java language. The students will be able to create small programs

C. Course Content

1.Introduction to the basics of programming with Java programming language 2.The fundamental structures and concepts of programming such as: a.Variables b.Constants c.Control structures d.While-loops e.Data Structures 3.A short introduction to applets and event-driven programming

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 3 hours per Week and 2 weeks for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

Course exercises and exam, a student must complete a third of the course exercises to take part in the course exam or renewal exam.

G. Bibliography

Java In A Nutshell, 5th Edition # Publisher: O'Reilly Media; 5 edition (March 15, 2005) # ISBN-10: 0596007736 # ISBN-13: 978-0596007737

Introduction to the Ethics of Computing (24h)

A. Course Description

Ethical aspects of computing and computer science, such as piratism, open source movement, and copyright issues.

B. Course Objective

This course helps student to develop his/her own ethical thinking by theory of ethics, case studies and examples presented in the course material.

C. Course Content

Ethical aspects of computing and computer science a.Piratism b.Open source movement c.Copyright issues

D. Course Organization

The course will take 12 weeks; 6 weeks of teaching, 6 weeks of research and writing of essay, 2 hours per Week

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

An essay related to theme of the course is written. An individual learning journal is kept during the course.

Grading: passed/failed. Independent searching for additional information from the Internet, writing instructions for essay and learning journal are provided separately.

G. Bibliography

Ethics and Computing (Paperback) # Publisher: Wiley-IEEE Press; 2 edition (October 12, 2000) # ISBN-10: 0780360192

Web Page Design and Administration (ICT 331), 34h

A. Course Description

Students learn to design a web page utilizing HTML software to present information as text, graphics, and audio/video clips; organize the web page utilizing multiple frames, and create active links to other web sites.

B. Course Objective

At the end of this course a student is expected to be able to make his or her own web pages, and compete for Webmaster job position in the market

C. Course Content

1.Basics of HTML language 2.Basics of Image technology 3.Combining multiple media using HTML language ie combining text, graphics and A/V

D. Course Organization

The course will take 18 weeks; 15 weeks of teaching, 2 hours per Week, 1 week for study break and 2 weeks of University examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

HTML 4 for the World Wide Web: VQS (3rd Edition) # Publisher: Pearson Education; 3 edition (May 7, 1998) # ISBN-10: 0201696967

Web Design: A Beginner's Guide # Publisher: McGraw-Hill Companies (May 2001) # ISBN-10: 0072133902

Development studies (DS100), 45h

A. Course Description

This module introduces students to various concepts and theories of socio-economic development in developing countries as well as factors influencing the process of development in these countries and how the economic system that centred on Western Europe became the determining factors of history in Sub-Saharan Africa.

Other issues covered in this module are: the economic and socio-political consequences of constitutional independence, the post-independence problems of development, awareness of Gender and development, the current crisis in Africa and its implication to Tanzania.

B. Course Objective

To help students understand the concepts and theories of socio – economic development in developing countries as well as factors influencing the process of development in these countries. To help students to understand how the economic system centered on Western Europe became the determining factors of history in sub – Saharan Africa.

C. Course Content

1.Introduction to the meaning of development 2.Overview of African pre–colonial societies 3.Africa's roots of underdevelopment 4.The International Division of Labour

D. Course Organization

The course will take 18 weeks; 17 weeks of teaching, 2,5 hours per Week, 1 week for study break and 1 week of University examinations.

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

1.Shillington, Kevin (1995). History of Africa, esp. chapter 28: Â´Â´Africa since Independence 1 Chapters 29: "Africa since Independence 2

2.Stiglitz, Joseph (2002). Globalization and its discontents. Penguin Books, chapters 1, 2, 4, 6, 8 and 9.

3.Sunseri, Thaddeus (2002). Vilimani; Labour Migration and Rural Change in Early Colonial Tanzania. James Currey; Oxford. Heinemann; Portsmouth, N.H,. David Philp; Cape Town.

4.Todaro, Michael P. (2000). Economic Development, 7th edn. Chapters 3, 9, 10, 11 and 18.

5.UNDP Report on Development (1992)

6.URT (2002). Poverty and Human Development Report; Research and Analysis Workshop group. Mkuki na Nyota.

7.URT (2003). Â´Â´Women in Decision Making Position in Public Service" President's Office – Gender Unit.

8.East African Community (EAC) www.eac.int

Communication Skills (LANG 102), 45h

A. Course Description

This course will emphasize two major areas; English language proficiency in the areas of speaking, listening, reading and writing and at the end of the course students should be able to communicate effectively both verbally and none verbally.

B. Course Objective

Students should improve their English language proficiency in the areas of:

- Speaking
- Listening
- Reading
- Writing

Students should be able to communicate effectively both verbally and none verbally.

C. Course Content

1.The Communication Process 2.Listening Skills 3.Reading Skills 4.Citing Sources and References 5.The English Grammar 6.Approaching Examination Questions

D. Course Organization

The course will take 18 weeks; 17 weeks of teaching, 2,5 hours per Week, 1 week for study break and 1 week of University examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Berkeley College. A System for Effective Listening and Note taking. 12 October 2000. http://www-s/c.uga.berkeley.edu/CalRen/Listening.html

California Polytechnical College. Academic Skills Center - Notetaking Systems. 12 October 2000. http://www.sas.calpoly.edu/asc/ssl/notetaking.systems.html

Gillett, A. Using English for Academic Purposes, October 2006, http://www.uefap.co.uk

Huseman, R., Lahiff, J & Penrose, Jr. J. M. (1991). Business Communication: Strategic and Skills. 4th Ed. Fort Worth. The Dryden Press.

Lumsden,G & D. Lumsden (1996): Communicating With Credibility and Confidence, Belmont.Wadsworth Publishing Company,

Pegg, Bruce. Notetaking. (4 October 1995). 12 October 2000. http://www2.colgate.edu/diw/notetakin
Shumbusho, G. N. (1997). Basic Academic Writing: A reference Guide. Mzumbe. Research, Information and Publication.

Thorne, S. (1997). Mastering Advanced English Language. London, Palgrave

University of Texas at Austin. Making the Grade 101. (27 February 1998). 20 October 2000. http://www.utexas.edu/student/lsc/makinggrade/inclassnotes.html

SECOND SEMESTER

Programming, part 2 using Java (course code), 60h

A. Course Description

Introduction to the fundamentals of object-oriented programming and event-driven programming with Java. The design and implementation of object-oriented programs. The basics of graphical user interface (GUI) design and implementation.

B. Course Objective

By the end of the course students should know fundamentals of object-oriented programming and event-driven programming with Java and be able to design and implement object oriented programs.

C. Course Content

1.Fundamentals of object-oriented programming 2.Event-driven programming with Java 3.The design and implementation of object-oriented programs 4.The basics of graphical user interface (GUI) design and implementation

D. Course Organization

The course will take 15 weeks; 14 weeks of teaching, 4 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

Course exercises and exam, a student must complete a third of the course exercises to take part in the course or renewal exam

G. Bibliography

Introduction to Java Programming-Comprehensive Version # Publisher: Prentice Hall; 6 edition (July 12, 2006) # ISBN-10: 0132221586

Effective Java Programming Language Guide # Publisher: Prentice Hall PTR; 1st edition (June 5, 2001) # ISBN-10: 0201310058

Programming Project using Java (course code), 54h

A. Course Description

An implementation of a small-scale software project. Practical understanding of a basic software development process: analysis, design, implementation, testing and documentation. Students can suggest their own topics for the project.

B. Course Objective

By the end of the course students should be comfortable with the software development life cycle process .

C. Course Content

1.Software development process

a.Analysis b.Design c.Implementation d.Testing e.Documentation

2.An implementation of a small-scale software project

D. Course Organization

The course will take 18 weeks; 17 weeks of teaching, 3 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

Finished program and documentation

G. Bibliography

Core Java(TM) 2, Volume II–Advanced Features (7th Edition) # Publisher: Prentice Hall Ptr; 7 edition (November 22, 2004) # ISBN-10: 0131118269

Research Fields of Computer Science (24h)

A. Course Description

Familiarization to a set of research fields in computing, such as: artificial intelligence, analysis of algorithms, computational theory, colour research, software engineering, and educational technology.

B. Course Objective

By the end of the course students should be competent in the field of research in computer science.

C. Course Content

Familiarization to a set of research fields in computing:

a.Artificial intelligence b.Analysis of algorithms c.Computational theory d.Colour research e.Software engineering f.Educational technology

D. Course Organization

The course will take 12 weeks; 11 weeks of teaching, 2 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, research, individual assignments, group assign-

ments, class discussions and examinations

F. Course Evaluation

A study related to the themes of the course is written alone or in groups of 2-4 students. An individual learning journal is kept during the course

G. Bibliography

Research in Information Systems: A handbook for research supervisors and their students # Publisher: Butterworth-Heinemann (January 26, 2005) # ISBN-10: 0750666552

Introduction to Computer Networks (ICT 333), 36h

A. Course Description

In this course students learn about network terminology and technology such as LAN, WAN. Specific topics include TCP/IP network addressing design, LAN design, configuration, and topology, peer-to-peer and client server models, WAN/MAN services and Internet services

B. Course Objectives

The Course is designed to provide students with the basics of Networks

C. Course Content

1.Network Technologies: Ethernet, Token Ring etc 2.Network Topologies such as BUS, STAR, RING, MESH etc 3.Network types: LAN, MAN, WAN 4.Network Architecture such as peer-to-peer, client server

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 2 hours per Week and 2 weeks for University examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Network+ Guide to Networks, Fourth Edition # Publisher: Course Technology; 4 edition (April 4, 2005) # ISBN-10: 061921743X

System Support and Administration (ICT 316) , 34h

A. Course Description

Students are presented with the basic skills and knowledge necessary to support PCs as stand-alone units or as a networked system. Topics include common software, hardware, network, and printing issues and problems.

The course will also cover fundamental principles in system administration, including system planning, acquisition, implementation, control, data security, and disaster recovery/business continuation planning.

B. Course Objective

At the end of this course a student is expected to be competent in the aspects of computer hardware and computer system administration in general.

C. Course Content 1.common software and hardware 2.Networking administration 3.Printing administration 4.System planning, acquisition and implementation 5.Data Security 6.Disaster recovery

D. Course Organization

The course will take 18 weeks; 15 weeks of teaching, 2 hours per Week, 1 week for study

break and 2 weeks of University examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

A+ Certification All-in-One Exam Guide, Sixth Edition (A+ Certification All in One Exam) # Publisher: McGraw-Hill Osborne Media; 6 edition (December 21, 2006) # ISBN-10: 0072263113

Microsoft Windows XP Inside Out, Second Edition # Publisher: Microsoft Press; 20 Pap/Cdr edition (November 3, 2004) # ISBN-10: 073562044X

Microsoft Office 2003: Introductory Concepts And Techniques # Publisher: Course Technology Ptr (Sd); 2nd Sprl edition (February 15, 2005) # ISBN-10: 0619254858

Mathematics for Computer Science (course code), 36h

A. Course Description

Course covers: Functions, relations, and sets, Basic logic, Proof techniques, Basics of counting, Graphs and trees, Discrete probability, Matrices, Interpolation and numerical derivative, and curve fitting with Least Square Method.

The mathematics should be presented to the students through examples from the computer science and engineering domains so that students can relate the mathematical techniques with their own field.

Also students will explore some of the computer technology used to solve mathematical

problems and will explore simple technologies. Maple computer software and MS Excel will be used to implement these techniques.

B. Course Objectives

The Course is designed to provide students with the basics of mathematics and how a computer can be used to prove the concepts of Mathematics.

C. Course Content

1.Functions, relations, and sets 2.Basic logic, Proof techniques, Basics of counting, Graphs and trees 3.Discrete probability, Matrices, Interpolation and numerical derivative, and curve fitting with Least Square Method 4.Maple computer software and MS Excel

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 2 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Concrete Mathematics: A Foundation for Computer Science # Publisher: Addison-Wesley Professional; 2 edition (February 28, 1994) # ISBN-10: 0201558025

Communication Skills (course code), 45h

A. Course Description

At the end of this course students should have an advanced understanding of English grammar. Oral and written assignments will develop proficiency with communication styles and skills necessary for their professions.

A solid background in English grammar and vocabulary are pre-requisites for these courses.

B. Course Objectives

The objective of this course is to equip students with an advanced understanding of English grammar. Oral and written assignments will develop proficiency with communication styles and skills necessary for their professions.

C. Course Content

1.English Grammar 2.Vocabulary 3.Oral and Written exercises

D. Course Organization

The course will take 15 weeks; 14 weeks of teaching, 3 hours per Week and 1 week for examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Berkeley College. A System for Effective Listening and Note taking. 12 October 2000. http://www-s/c.uga.berkeley.edu/CalRen/Listening.html

California Polytechnical College. Academic Skills Center - Notetaking Systems. 12 October 2000. http://www.sas.calpoly.edu/asc/ssl/notetaking.systems.html

Gillett, A. Using English for Academic Purposes, October 2006, http://www.uefap.co.uk

Huseman, R., Lahiff, J & Penrose, Jr. J. M. (1991). Business Communication: Strategic and Skills. 4th Ed. Fort Worth. The Dryden Press.

Lumsden,G & D. Lumsden (1996): Communicating With Credibility and Confidence, Belmont.Wadsworth Publishing Company,

Pegg, Bruce. Notetaking. (4 October 1995). 12 October 2000. http://www2.colgate.edu/diw/notetakin
Shumbusho, G. N. (1997). Basic Academic Writing: A reference Guide. Mzumbe. Research, Information and Publication.

Thorne, S. (1997). Mastering Advanced English Language. London, Palgrave University of Texas at Austin. Making the Grade 101. (27 February 1998). 20 October 2000. http://www.utexas.edu/student/lsc/makinggrade/inclassnotes.html

Foundation of Faith and Ethics (course code), ??h

A. Course Description

B. Course Objectives

C. Course Content

D. Course Organization

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

SECOND YEAR

THIRD SEMESTER

Hardware, Computer Architecture and Operating Systems (course code), 39h

A. Course Description

An overview of basic computer architecture, structure and functionality. Mathematical and physical foundations of computers, computer components, machine code, operating systems, parses, systems software and databases.

B. Course Objective

By the end of the course students are expected to be acquainted with basic computer architecture, structure and functionality concepts. Also they will be able utilize concepts of mathematical and physical foundations of computers.

C. Course Content

1.Basic computer architecture, structure and functionality 2.Mathematical and physical foundations of computers 3.Computer components 4.Machine code 5.Operating systems 6.Parses 7.Systems software and databases

D. Course Organization

The course will take 13 weeks; 12 weeks of teaching, 3 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

Course exercises and exam, a student must complete a third of the course exercises to take

part in the course or renewal exam.

G. Bibliography

A+ Certification All-in-One Exam Guide, Sixth Edition (A+ Certification All in One Exam) # Publisher: McGraw-Hill Osborne Media; 6 edition (December 21, 2006) # ISBN-10: 0072263113

Microsoft Windows XP Inside Out, Second Edition # Publisher: Microsoft Press; 20 Pap/Cdr edition (November 3, 2004) # ISBN-10: 073562044X

Discrete Structures (course code), 66h

A. Course Description

Introduction to mathematical concepts and tools useful for a computer scientist, such as logical reasoning, set theory, induction, and basics of probability calculus

B. Course Objective

By the end of the course students are expected to be acquainted with tools and mathematical concepts useful for a computer scientist.

C. Course Content

Mathematical concepts and tools a.Logical reasoning b.Set theory c.Induction d.Basics of probability calculus

D. Course Organization

The course will take 11 weeks; 10 weeks of teaching, 6 hours per Week and 1 week for examinations

E. Method of Instruction

Online Distant learning, direct lectures, individual assignments, class discussions and examinations

F. Course Evaluation

Course exercises and exam, a student must complete a third of the course exercises to take part in the course or renewal exam.

G. Bibliography

Discrete Mathematics with Applications # Publisher: Brooks Cole; 3 edition (December 22, 2003) # ISBN-10: 0534359450

Database Management Systems (course code), 72h

A. Course Description

Course covers: Information models and systems, Database systems, Data modelling, Relational databases, Database query languages and Relational database design and implementing

B. Course Objective

By the end of the course students should be able to design and administer databases

C. Course Content

1.Information models and systems 2.Database systems 3.Data modelling 4.Relational databases and design 5.Database query languages

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 4 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Database Systems: Design, Implementation, and Management, Seventh Edition # Publisher: Course Technology; 7 edition (January 27, 2006) # ISBN-10: 1418835935

Database Management Systems # Publisher: McGraw-Hill Science/Engineering/Math; 3 edition (August 14, 2002) # ISBN-10: 0072465638

Data Structures and Algorithms (course code), 72h

A. Course Description

Course introduces the students the algorithmic problem solving. Course covers fundamental data structures (list and its variants, trees and graphs) and algorithms related to them.

Basic algorithm analysis is also introduced.

B. Course Objective

By the end of the course students should be able to design algorithms and apply concept of data structures in problem solving.

C. Course Content

1.algorithmic problem solving 2.Data structures a.list and its variants b.trees and graphs 3.Basic algorithm analysis

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 4 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Algorithms # Publisher: McGraw-Hill Science/Engineering/Math; 1 edition (September 13, 2006) # ISBN-10: 0073523402

Data Structures and Algorithms in Java # Publisher: John Wiley & Sons; 4 edition (August 24, 2005) # ISBN-10: 0471738840

Cyber Law (course code), 30h

A. Course Description

To equip students with the necessary legal knowledge to deal with issues arising from cyber commercial and industrial matters; to provide guidance and advice as legal consultants to cyber industrial and commercial undertakings and to be aware of the key issues relating to the future development of cyber law in Tanzania.

B. Course Objective

By the end of the course students should be equipped with necessary legal knowledge deal with issues arising from cyber commercial and industrial matters.

C. Course Content

1.Information Security and Privacy 2.Computer Crime 3.Contractual and Non-Contractual Liability in Information Society 4.The Electronic Transactions Ordinance 5.Intellectual Property 6.Defamation, Obscenity and the Internet.

D. Course Organization

The course will take 15 weeks; 14 weeks of teaching, 2 hours per Week and 1 week for examinations

E. Method of Instruction

Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Cyberlaw: Your Rights in Cyberspace # Publisher: South-Western College/West; 1 edition (July 24, 2001) # ISBN-10: 0324074735

Bachelor's Project and Thesis part1, 36h

A. Course Description

In the beginning of the third semester (second year) program, there should be a brainstorming session to identify problems to be solved and start solving them as a long term project. The project runs during the last two academic years (2 years) during which the problem is identified, solved and reported.

This project involves stakeholders (business owners) that have a problem to be solved, Supervisors (teachers) and Problem solvers (students).

During the third semester (second year), students identify the problem that they are going to solve and do background research and reading.

B. Course Objective

At the end of the course, students are required to identify the problem that will be solved. They are also required to start solving their identified long-term project problem.

C. Course Content

1.Project problem brainstorming 2.Problem listing 3.Problem analysis 4.Project proposal approval

D. Course Organization

The course will take 18 weeks; 18 weeks of project work and supervising, 2 hours per Week

E. Method of Instruction Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works

F. Course Evaluation

If the proposal is not approved, the result is FAIL else PASS. And if is FAIL 10% of the total Thesis points are deducted.

G. Bibliography

How to Write a Thesis # Publisher: ARCO; 5 Rev Sub edition (April 2003) # ISBN-10: 0768910811

FOURTH SEMESTER

Network Design and Administration (course code), 72h

A. Course Description

The course covers network and performance monitoring tools provided by the Windows XP and configuring and installing variety of network nodes such as switches, routers, firewall etc. It introduces administration of the Windows 2003 server Operating System (OS), Includes installing and configuring server operating system, planning security, installing applications, backing up file systems, using utilities, managing users, setting network printers and troubleshooting.

The course covers also Active Directory Services (ADS) on the Windows 2003 network operating system. Includes network administration tasks and tools, management of user and group accounts, organization of shared folders, management of ADS, policy, security, and installation and management of Trees and Forests

It also includes overview of network services, how to plan a network infrastructure, network data flow, Dynamic Host Configuration Protocol (DHCP), and Domain Name Services (DNS).

The course also aims at providing hands on experience on Linux server setup, configuration and maintenance.

B. Course Objective

This course aims at acquitting a student with advanced knowledge on network devices and server operation systems management.

C. Course Content

1.Windows XP Network monitoring tools 2.Common network nodes such as switches, routers, firewall etc 3.Windows 2003 server OS 4.Windows 2003 Server a.Active Directory b.User accounts c.Shared folders d.Shared printers e.Policy and security 5.DHCP and DNS 6.Linux Server

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 4 hours per Week and 2 weeks for examinations

E. Method of Instruction

Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Microsoft Windows XP Inside Out, Second Edition # Publisher: Microsoft Press; 20 Pap/Cdr edition (November 3, 2004) # ISBN-10: 073562044X

Network+ Guide to Networks, Fourth Edition # Publisher: Course Technology; 4 edition (April 4, 2005) # ISBN-10: 061921743X

The Ultimate Windows Server 2003 System Administrator's Guide # Publisher: Addison-Wesley Professional; 2Rev Ed edition (April 8, 2003) # ISBN-10: 0201791064

Application Projects Part 1, 54h

A. Course Description

Projects are performed in groups and should introduce students how they can apply the knowledge of CS and Engineering to real world problem solving. Every student needs to take part into one project of Multimedia production. In the beginning of the project, there should be a brainstorming session to identify tasks to be done. The project is carried out by Stakeholders (business owners), Supervisors/tutors (teachers), and Problem solvers (students).

Application domain: Multimedia production.

B. Course Objective

This course aims at giving a further practical experience approach toward a project development circle and Multimedia. Also via this project students are learning about problem solving and problem based learning.

C. Course Content

1.Scenario and plan development 2.Activity and user analysis 3.Presentations 4.Group work 5.Implementation 6.Tests with users and evaluation

D. Course Organization

The course will take 18 weeks; 18 weeks of teaching/group work, 3 hours per week.

E. Method of Instruction

Mix of lecture, tutorial, research, laboratory, class discussions, class presentations and group works.

F. Course Evaluation

Course work, class presentations will account for 50% of the final grade. The final Multimedia production will account for 50% of the final grade.

G. Bibliography

Multimedia Design and Production for Students and Teachers # Publisher: Allyn & Bacon; 1st edition (April 25, 2003) # ISBN-10: 0205343872

Multimedia Production, Planning and Delivery # Publisher: Prentice Hall; Bk&CD Rom edition (February 18, 1997) # ISBN-10: 1575766256

Multimedia, 108h

Image technology (course code), 54h

A. Course Description

The course covers Basic concepts of digital image, Enhancement and restoration, Geometric operations, Image analysis, Compression, Image synthesis. Also students will learn how to use image input/output devices and commercial image processing software and its filters and they can apply them in designing image processing systems.

B. Course Objective

After completing the course the students will know the image processing methods and will be able to apply the commercial image processing software efficiently. They will know the image input/output devices and can apply them in designing image processing systems.

C. Course Content

1.Basic concepts of digital image 2.Input/output devices 3.Image processing methods 4.Commercial image processing software like Adobe Photoshop

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 3 hours per Week and 2 weeks for examinations

E. Method of Instruction Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Integrated Image and Graphics Technologies (The International Series in Engineering

and Computer Science) # Publisher: Springer; 1 edition (February 29, 2004) # ISBN-10: 1402077742

Adobe Photoshop CS2 Classroom in a Book # Publisher: Adobe Press; Pap/Cdr edition (May 24, 2005) # ISBN-10: 0321321847

Multimedia production (course code), 54h

A. Course Description

The course covers Basic concepts in multimedia, Equipment in multimedia production, Multimedia authoring tools, Multimedia programming, Application types and Multimedia development process. Students will learn also editing software required in multimedia productions, Basics of digital media assets management and editing.

B. Course Objective

On completion of this unit the student will know the terms, most common tools and production process of multimedia applications.

Students will be able to produce basic multimedia applications with Multimedia editing software. In addition to that the student will get basic knowledge to use Multimedia equipments

C. Course Content

5.Basic concepts in multimedia 6.Equipment in multimedia production 7.Multimedia authoring tools 8.Multimedia programming 9.Application types 10.Multimedia development process 11.Multimedia editing software 12.Basics of digital media assets management

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 3 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Multimedia Design and Production for Students and Teachers # Publisher: Allyn & Bacon; 1st edition (April 25, 2003) # ISBN-10: 0205343872

Multimedia Production, Planning and Delivery # Publisher: Prentice Hall; Bk&CD Rom edition (February 18, 1997) # ISBN-10: 1575766256

Software Engineering (course code), 45h

A. Course Description

Course covers Software life cycle: Specification, design, production, testing, maintenance, documentation, system integration and testing. Object-oriented design methods with Unified Modelling Language (UML).

Quality assurance scheme: Examples of analysis and implementation tools. Course covers also basics of Project management.

B. Course Objective

Students will get knowledge of Software engineering. Students will be familiar with Software development process and tools. After the course they are able to act as Software developer or as Software development Project Manager.

C. Course Content

1.Software life cycle a.Specification b.Design c.Production d.Testing e.Maintenance f.Documentation g.System integration and testing 2.Unified Modelling Language (UML) 3.Quality assurance scheme a.Analysis and implementation tools 4.Basics of Project management.

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 2,5 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Software Engineering: (Update) (8th Edition) (International Computer Science) # Publisher: Addison Wesley; 8 edition (May 25, 2006) # ISBN-10: 0321313798

Bachelor's Project and Thesis part2, 36h

A. Course Description

During the fourth Semester, students are starting to solve their Bachelor's project problems by applying their knowledge from the studied courses and begin continue their writing process that leads to their Bachelor's Theses.

B. Course Objective

At the end of the course, students have to show good progress in their problem solving.

C. Course Content

1.Project problem solving 2.Thesis Report writing

D. Course Organization

The course will take 18 weeks; 18 weeks of project work and supervising, 2 hours per Week

E. Method of Instruction Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works

F. Course Evaluation

If the proposal is not approved, the result is FAIL else PASS. And if is FAIL 10% of the total Thesis points are deducted.

G. Bibliography

How to Write a Thesis # Publisher: ARCO; 5 Rev Sub edition (April 2003) # ISBN-10: 0768910811

THIRD YEAR

FIFTH SEMESTER

Business and E-Commerce, 108h

Advanced Website Development for business (course code), 54h

A. Course Description

Course covers Internet Access Requirements, Web Hosting Requirements, Web Site Goals, Content Development, Site Map Development, Web Site Design Principles, Web Site Design Tools, Web Page Programming Tools, Navigation Aids, Web Site Search Tools, Databases, Forms, Security Issues and Threats, Security Procedures, Encryption, Digital Certificates, SSL and SET Technologies, Authentication and Identification, Security Providers.

B. Course Objective

Students will get the knowledge of advanced website development and how to implement the knowledge in business and E-commerce.

C. Course Content

1.Internet Access Requirements 2.Web Hosting Requirements 3.Web Site Goals 4.Content Development and Site Map Development 5.Web Site Design Principles 6.Web Site Design Tools and Web Page Programming Tools 7.Navigation Aids and Web Site Search Tools 8.Databases and Forms 9.Security Issues and Threats, Security Procedures, Encryption, Digital Certificates, SSL and SET Technologies, Authentication and Identification, Security Providers.

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 3 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

The Web Page Design Cookbook: All the Ingredients You Need to Create 5-Star Web Pages # Publisher: Wiley; Bk&CD-Rom edition (November 1995) # ISBN-10: 0471130397

E-commerce (course code), 54h

A. Course Description

Course covers a meaningful subset of the topics introduces below:

E-Commerce Basics: E-Commerce Definition, Internet History and E-Commerce Development, Business-to-Business E-Commerce, Business-to-Consumer E-Commerce, E-Commerce Stages and Processes, E-Commerce Challenges, and E-Commerce Opportunities. E-Commerce Options: Entry-Level Options, Storefront and Template Services, E-Commerce Software Packages, E-Commerce Developers, and E-Business Solutions, Marketing Issues: Data Collection, Domain Names, Advertising Options, and Web Site Monitoring. E-Commerce Components: Shopping Carts, Checkout Procedures, Shipping Options Payment Processing: Electronic Payment Issues, E-Cash, Credit Card Issues, Merchant Accounts, Online Payment Services, Transaction Processing, Taxation Issues. Security Issues: Privacy Policies, Legal Issues

B. Course Objective

Students will get the knowledge of advanced E-commerce techniques and how to utilize those techniques in business. They will have skills to work as an consultant.

C. Course Content

1.E-Commerce Basics 2.E-Commerce Options 3.Marketing Issues 4.Payment Processing 5.Security Issues

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 3 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

E-Commerce: Business, Technology, Society # Publisher: Prentice Hall; 3 edition (March 22, 2006) # ISBN-10: 0131735160

Robotics Artificial Intelligence (course code), 18h

A. Course Description

Course introduces students to various topics related to artificial intelligence. Artificial Intelligence involves an application-oriented study of the principles and methods that support the development of artificial intelligent systems. What is AI? What is intelligence? What can be automated?

What sorts of AI applications are there? What are intelligent agents? What common features do they have? Different User Interfaces?

B. Course Objective

Students will be familiar with different aspects of artificial intelligence.

C. Course Content

1.Various topics related to artificial intelligence 2.Intelligent agents 3.Human-computer interaction 4.Perceptual and cognitive capabilities of users and how these influence use of interfaces 5.User Interfaces

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 1 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Russel S., Norvig P.: Artificial Intelligence, A Modern Approach, Second Edition, Prentice Hall, 2003. Pages: 1-307, 320-340, 375-449

Edutainment Robotics (course code), 18h

A. Course Description

Course covers the basic concepts of robotics and how robotics can be used in teaching and learning. In this course students will learn also how to use, control and program I-BLOCK lego robots.

B. Course Objective

Students will be familiar with the basics of Robotics and they will have hand on experience of I-BLOCK lego robots.

C. Course Content

1.Basic concepts of robotics Intelligent agents 2.Using robotics in teaching and learning 3.I-BLOCK lego robots

D. Course Organization

The course will take 18 weeks; 16 weeks of teaching, 1 hours per Week and 2 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Robot Building for Beginners # Publisher: Apress; 1 edition (January 18, 2002) # ISBN-10: 1893115445

Introduction to Robotics: Mechanics and Control # Publisher: Prentice Hall; 3 edition (October 12, 2003) # ISBN-10: 0201543613

Application Projects Part 2, 54h

A. Course Description

Projects are performed in groups and should introduce students how they can apply the knowledge of CS and Engineering to real world problem solving. Every student needs to take part into one project of Business and E-Commerce Website production. In the

beginning of the project, there should be a brainstorming session to identify tasks to be done. The project is carried out by Stakeholders (business owners), Supervisors/tutors (teachers), and Problem solvers (students).

Application domain: E-Commerce Website production.

B. Course Objective

This course aims at giving a further practical experience approach toward a project development circle and Business and E-Commerce. Also via this project students are learning about problem solving and problem based learning.

C. Course Content

1.Scenario and plan development 2.Activity and user analysis 3.Presentations 4.Group work 5.Implementation 6.Tests with users and evaluation

D. Course Organization

The course will take 18 weeks; 18 weeks of teaching/group work, 3 hours per Week.

E. Method of Instruction

Mix of lecture, tutorial, research, laboratory, class discussions, class presentations and group works.

F. Course Evaluation

Course work, class presentations will account for 50% of the final grade. The final Multimedia production will account for 50% of the final grade.

G. Bibliography

E-Commerce: Business, Technology, Society # Publisher: Prentice Hall; 3 edition (March 22, 2006) # ISBN-10: 0131735160

The Web Page Design Cookbook: All the Ingredients You Need to Create 5-Star Web Pages # Publisher: Wiley; Bk&CD-Rom edition (November 1995) # ISBN-10: 0471130397

Bachelor's Project and Thesis, 36h

A. Course Description

During the fifth Semester, students are continuing to solve their Bachelor's project problems by applying their knowledge from the studied courses and continue writing process that leads to their Bachelor's Theses.

B. Course Objective

At the end of the course, students have to show good progress in their problem solving.

C. Course Content

1.Project problem solving 2.Thesis Report writing

D. Course Organization

The course will take 18 weeks; 18 weeks of project work and supervising, 2 hours per Week

E. Method of Instruction

Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works

F. Course Evaluation

If the proposal is not approved, the result is FAIL else PASS. And if is FAIL 10% of the total Thesis points are deducted.

G. Bibliography

How to Write a Thesis # Publisher: ARCO; 5 Rev Sub edition (April 2003) # ISBN-10: 0768910811

Elective Courses, 54h

Course Organization

One Elective Courses with a total of 54 Credit Hours should be taken The course will take 18 weeks; 16 weeks teaching, 3 hours per Week and two weeks for Examinations.

One Elective Courses with a total of 45 Credit Hours should be taken from any of the following Disciplines:

Business Administration

Principles of Accounting I (ACCT 101)

Introduces students to business activities, basic concepts fundamentals of accounting, the accounting cycle and preparation of financial statements.

Principles of Management (MGMT 101)

Introduces students to the evolution of management and the basic managerial functions such as planning, organizing, staffing, directing, controlling, coordinating, reviewing and budgeting.

Financial Management (MGMT 302)

Enables students to understand and apply principles of financial management. Coverage includes: an overview of managerial finance, concepts of evaluation, financial ratio analysis, financial forecasting and planning, management of liquidity, cost of capital, capital structure, capital budgeting, dividend policy and public finance.

Law

Business Law (LAW 110)

In this course, students study business law and company law as it is applicable in common

law legal systems, particularly, law of partnership, company law, cooperative law, and public enterprise law.

Law of Contract I (LAW 102)

The course addresses the law of contracts as administered by courts in East Africa. Major topics covered include the formation of contracts, nature of the contractual relation and its social function, form and consideration, remedies for breach, defenses, discharge of contractual obligations, assignment, principles of agency, quasi-contracts, a comparative study of the Africa customary law of debts, and other contractual obligations. Form, contents and initiating factors, illegal contracts, plaintiff's ignorance of illegality, written laws to protect certain classes of people, and illegal and executory contracts are also explored.

SIXTH SEMESTER

Electric Circuits (course code), 22h

A. Course Description

Introduction to theory, analysis and design of electric circuits. Voltage, current, power, energy, resistance, capacitance, inductance. Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem, steady state and transient analysis, AC, DC, phasors, transistors, operational amplifiers, transfer functions.

B. Course Objective

Students will learn basics of electric circuits and electric network analyses.

C. Course Content

1.Introduction to theory, analysis and design of electric circuits Using robotics in teaching and learning 2.Voltage, current, power, energy, resistance, capacitance, inductance 3.Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem 4.Steady state and transient analysis 5.AC, DC, phasors, transistors, operational amplifiers, transfer functions

D. Course Organization

The course will take 11 weeks; 10 weeks of teaching, 2 hours per Week and 1 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation

Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

Fundamentals of Electric Circuits, Second Edition # Publisher: McGraw-Hill Science/Engineering/Ma
2 edition (May 26, 2004) # ISBN-10: 0073048356

IT Security (course code), 44h

A. Course Description

Course covers these topics:

The basic concepts of general security: confidentially, integrity, authentication, access control, availability

The concepts of workstation security: backups, local policies, Windows XP firewall, Windows updates, antivirus, antispyware and antispam. The concepts of Network security: Wireless, LAN, WAN.

Network security tools and policies: VPN, Firewalls, Secure Network Devices, Intrusion detection. Types and Sources of network threats: bad configuration, viruses, denial-of-Service, unauthorized access. Hacking: auditing and testing, password crackers, sniffers.

B. Course Objective

Students will learn basics of general security and IT security and how to protect computers and networks.

C. Course Content

1.The basic concepts of general security 2.The concepts of workstation security 3.The concepts of Network security 4.Network security tools and policies 5.Types and Sources of network threats 6.Hacking

D. Course Organization

The course will take 11 weeks; 10 weeks of teaching, 4 hours per Week and 1 weeks for examinations

E. Method of Instruction

Direct lectures, tutorial, laboratory, individual assignments, class discussions, group works, tests and examinations

F. Course Evaluation Course work, assignments, class presentations and the mid-semester tests will account for 50% of the final grade. The final examination will account for 50% of the final grade.

G. Bibliography

IT Security: Risking the Corporation # Publisher: Prentice Hall PTR; 1st edition (February 24, 2003) # ISBN-10: 013101112X

Internship – 21Hrs /Wx8Weeks=168Hrs

Bachelor's Project and Thesis, 77h

A. Course Description

During the sixth Semester, students are finalizing their Bachelor's Theses.

B. Course Objective

At the end of the course, students have to present their Theses.

C. Course Content

1.Project problem solving 2.Thesis Report writing

D. Course Organization

The course will take 17 weeks; 17 weeks of project work and supervising, 5 hours per Week, 1 week study break

E. Method of Instruction

Current mix of lecture, tutorial, laboratory, individual assignments, class discussions, group works

F. Course Evaluation

G. Bibliography

How to Write a Thesis # Publisher: ARCO; 5 Rev Sub edition (April 2003) # ISBN-10: 0768910811

Interview Guides

Administration

Supervisor: Mikko Vesisenaho (PhD)
Telephone: +358 400 429 493
Email: mvaho@cs.joensuu.fi

Thesis Topic

Evaluation of the implementation of the BSc IT curriculum at Tumaini University

Thesis Statement

The study aims to examine and evaluate the implementation of the BSc IT curriculum at Tumaini University in Iringa, Tanzania taking in to consideration of the six major constructs on which the curriculum design process aimed to achieve namely practical orientation, contextualization, International recognition, multidisciplinary, research orientation, project based, problem orientation and the extent to which the curriculum implementation address the needs of the computing skills in the surrounding community.

Research Questions

1. How is the curriculum implementation providing the knowledge required in order to build capacity and provide sustainable development and continuity of the ICT education in the developing countries like Tanzania?
2. What is the appropriate curriculum framework which can promote inbound and outbound competency in learning and transferring of the ICT knowledge?
3. 3.How the is implementation strategy affecting the internationalization of learning process through the framework, in order to emphasize the standards, continuing education and research?

Interview questions

The above research questions are further refined to produce the detailed interview questions, from which data will be collected analyzed and be used as the basis of answering the research questions.

General

Is there any noticeable age difference or age groups in the intake? What do you think of the age composition in the intake?

How is the gender balance in the intake? How the enrolment process did consider this balance? How does this affect the implementation of the curriculum?

What was the prior occupation of the applicants? How was this taken into consideration during the enrolment process? How does this contribute to the learning process in the BSc IT program?

What was the number of applicants? How many succeeded to join the program? From the commencement of the program how do you observe the trend of students? Had any student suspended their studies? If yes for what reasons?

How do you rate the affordability of the learning cost to the students (Tuition fees and living costs)? Had there been any difficulties for students meeting the respective costs?

Knowledge and development

How do you explain the process of Information technology curriculum development at your institution? If there were stages involved what is the relevance of such stages?

What do you think of the standard curriculum models (CC2001 and IT2005)?

What do you think of the model adopted for your curriculum? How does the model reflect and support your curriculum and the learning objectives of your BSc IT program?

What do u think is the contribution of the information technology towards development in your community and or work place? What do you think of the IT skills required at your work place? How do you find the reflection of these skills in the BSc IT program?

What are the consideration that u think had been taken into account during the development of the existing curriculum? How do these relate to the courses being taught?

How was the balancing taken in to consideration between the internationalization and local context concepts in the curriculum design?

Implementation, Delivery techniques

Which strategies were adopted to ensure that the objectives of the curriculum are met? How these strategies do affect the implementation of the curriculum?

What do you think of the applicability of your learning outcomes at the international level? What are the courses that you think are applicable globally?

Students

Supervisor: Mikko Vesisenaho (PhD)
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1. How is the curriculum implementation providing the knowledge required in order to build capacity and provide sustainable development and continuity of the ICT education in the developing countries like Tanzania?
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3. 3.How the is implementation strategy affecting the internationalization of learning process through the framework, in order to emphasize the standards, continuing education and research?

Interview questions

The above research questions are further refined to produce the detailed interview questions, from which data will be collected analyzed and be used as the basis of answering the research questions.

General

What was the prior occupation of the applicants? How was this taken into consideration during the enrolment process?

How does this contribute to the learning process in the BSc IT program?

How do you rate the affordability of the learning cost to the students (Tuition fees and living costs)?

Had there been any difficulties for students meeting the respective costs?

Knowledge and development

How do you understand and describe the information technology?

What do u think is the contribution of the information technology towards development in your community and or work place?

What do you think of the IT skills required at your work place? How do you find the reflection of these skills in the BSc IT program?

Do u think there is any relationship between community development and information and communications technology (ICT) development? If yes what is the nature. If not why?

Implementation, Delivery techniques

Do you think that there are some of the modules in the curriculum which are irrelevant to the global market? Why do u think so?

What do you think of the relationship between these modules and the local needs of your community?

What do you think of the applicability of your learning outcomes at the international level?

What are the courses that you think are applicable globally?

How do you comment on the practical sessions? How do u comment on time and resources allocated? If not sufficient why?

Can you mention any of the changes have been implied to the curriculum as the result of choosing the current implementation strategy?

What factors were taken in to consideration? How does this affect the original idea of the curriculum?

Lecturers

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Thesis Topic

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Research Questions

1. How is the curriculum implementation providing the knowledge required in order to build capacity and provide sustainable development and continuity of the ICT education in the developing countries like Tanzania?
2. What is the appropriate curriculum framework which can promote inbound and outbound competency in learning and transferring of the ICT knowledge?
3. 3.How the is implementation strategy affecting the internationalization of learning process through the framework, in order to emphasize the standards, continuing education and research?

Interview questions

The above research questions are further refined to produce the detailed interview questions, from which data will be collected analyzed and be used as the basis of answering the research questions.

General

Is there any noticeable age difference or age groups in the intake? What do you think of the age composition in the intake?

How is the gender balance in the intake? How the enrolment process did consider this balance?

How does this affect the implementation of the curriculum?

From the commencement of the program how do you observe the trend of students?

Had any student suspended their studies? If yes for what reasons?

Knowledge and development

How do you understand and describe the information technology?

How do you explain the process of Information technology curriculum development at your institution? If there were stages involved what is the relevance of such stages?

What do you think of the standard curriculum models (CC2001 and IT2005)?

What do you think of the model adopted for your curriculum?

How does the model reflect and support your curriculum and the learning objectives of your BSc IT program?

What do u think is the contribution of the information technology towards development in your community and or work place?

What do you think of the IT skills required at your work place? How do you find the reflection of these skills in the BSc IT program?

Do u think there is any relationship between community development and information and communications technology (ICT) development? If yes what is the nature.

What are the consideration that u think had been taken into account during the development of the existing curriculum? How do these relate to the courses being taught?

How was the balancing taken in to consideration between the internationalization and local context concepts in the curriculum design?

Implementation, Delivery techniques

Which strategies were adopted to ensure that the objectives of the curriculum are met?

How these strategies do affect the implementation of the curriculum?

What do you think of the applicability of your learning outcomes at the international level?

What are the courses that you think are applicable globally?

Course Matrix of BSc IT program

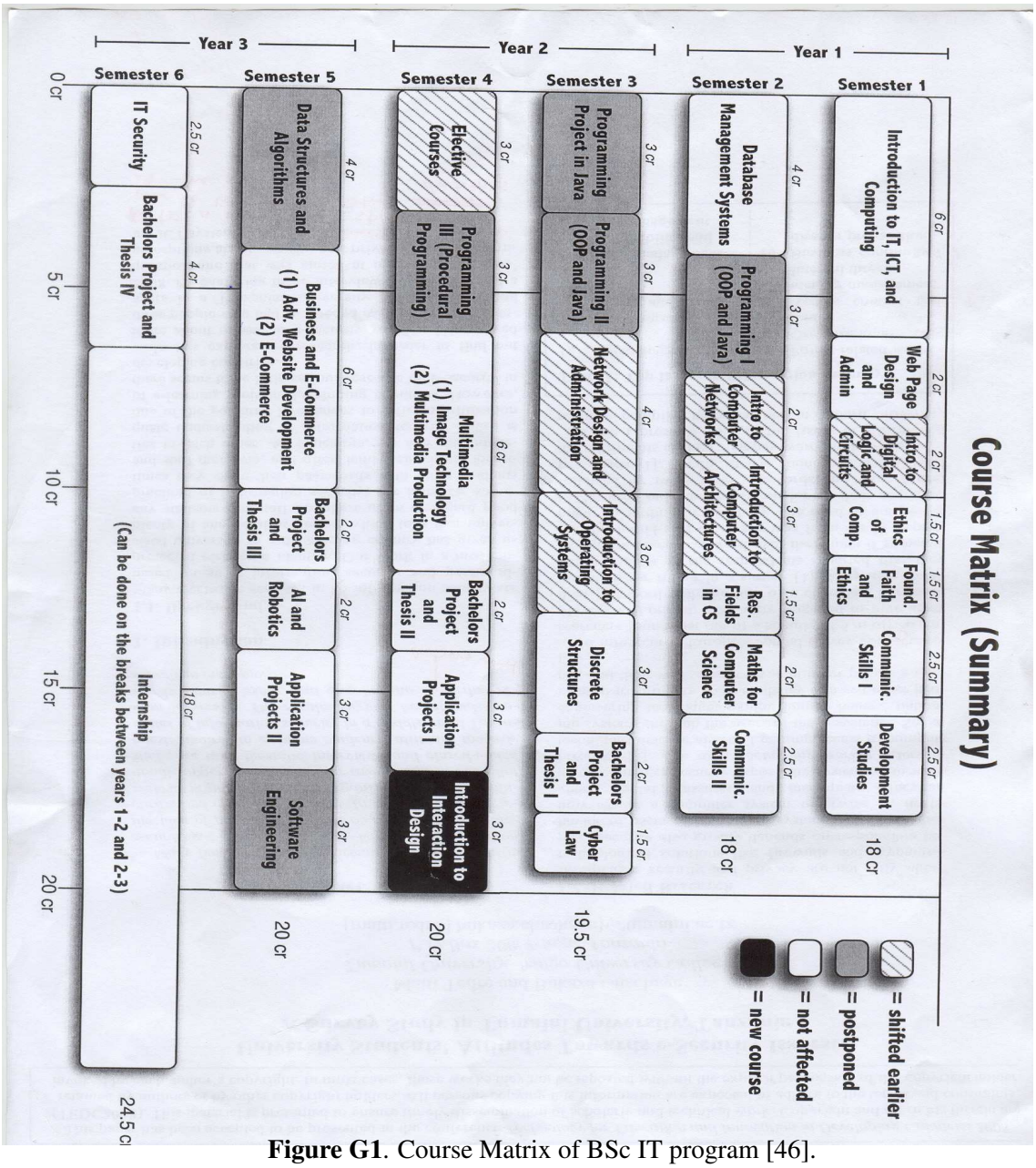

Figure G1. Course Matrix of BSc IT program [46].