Doc. 300.1.4

Follow-up Report
(for a CYQAA accredited Institution/Department/ Programme of study)

Date: 30/11/2021

- **Higher Education Institution: European University Cyprus**
- **Town: Nicosia**
- **Type of Evaluation: Programmatic**
- **Accredited on CYQAA Council's Summit Number:** 68th Summit
- **Date of Accreditation: 14/07/2021**

If applicable:

- **School/Faculty: Sciences**
- **Department: Computer Science and Engineering**
- **Programme of Study Name (Duration, ECTS, Cycle)**

  Programme Bachelor
  In Greek:
  "Πληροφοριακά Συστήματα (4 Έτη / 240 ECTS, Πτυχίο)"
  In English:
  "Computer Information Systems (4 Years / 240 ECTS, B.Sc.)"

- **Programme's type: Conventional**
- **Language (s) of instruction: English**

The present document has been prepared within the framework of the authority and competencies of the Cyprus Agency of Quality Assurance and Accreditation in Higher Education (CYQAA), according to the provisions of the "Quality Assurance and Accreditation of Higher Education and the Establishment and Operation of an Agency on Related Matters Laws of 2015 to 2019" [N. 136 (I)/2015 to N. 35(I)/2019] and the European Standards and Guidelines (ESG).

A. Internal Quality Assurance Committee

Name	*Position*	*Rank*
Prof. Loizos Symeou	Vice Rector of Academic Affairs, Chair of Committee on Internal Quality Assurance	European University Cyprus
Prof. Theodoros Xanthos	Professor, Faculty Representative, School of Medicine	European University Cyprus
Dr. Vasiliki Gkretsi	Associate Professor, Faculty Representative, School of Sciences	European University Cyprus
Dr. Georgia Petroudi	Assistant Professor, Faculty Representative, School of Humanities, Social and Education Sciences	European University Cyprus
Dr. Christiana Markou	Assistant Professor, Faculty Representative, School of Law	European University Cyprus
Dr. Christakis Sourouklis	Assistant Professor, Faculty Representative, School of Business Administration	European University Cyprus
Dr. Pieris Chourides	Associate Professor, Quality Assurance Expert	European University Cyprus
Dr. Ioannis Karis	Adjunct Assistant Professor, Quality Assurance Expert	European University Cyprus
Ms Athanasia Ktena	Administrative Head, Office of the Vice Rector of Academic Affairs, Administration Representative	European University Cyprus
Mr Andreas Maliappis	Student Representative, (Undergraduate Student)	European University Cyprus
Mr Michalis Katsouris	Student Representative, (Graduate Student)	European University Cyprus

B. Guidelines on content and structure of the Follow-up Report

- *CYQAA has a consistent follow-up process for considering the action taken by the institution toward the improvement and further development of the CYQAA externally evaluated and accredited institution / department / programme of study. The present Follow-up Report should recount, synoptically, institutional action taken toward the implementation of the remarks indicated in the CYQAA Final Report.*

- *The Follow-up report should provide evidence (via website links) and appendices at the end of the report on how the remarks of the Council of CYQAA have been adhered to.*

- *The remarks indicated in the CYQAA Final Report should be copied from the corresponding report and be followed by the institution's response.*

- *The institution may add any other institutional action taken towards the implementation of ESG aiming at the improvement of the institution / department / programme of study.*

1. Remarks on the CYQAA Final Report

The Council of the Cyprus Agency of Quality Assurance and Accreditation of Higher Education, during its 68th Summit on 14 and 15 of June 2021, on the basis of Article 20 (2)(f)(i) of the Quality Assurance and Accreditation in Higher Education and the Establishment and Operation of an Agency on Related Matters Laws of 2015 to (No 2) of 2020 [N. 136 (I)/2015 to 138(I)/2020], and on the basis of the suggestions of the External Evaluation Committee, the comments of the institution on the report decided that the program is accredited to be delivered in English.

According to the recommendations of the EEC and the decision of the Agency, the Institution is required, within six months and no later than 30th December 2021, to provide evidence and data confirming compliance with the following:

- Provide incentives and support to faculty members that will enable them to increase their level of engagement in research and publications. To this end, the institution should also revise the existing workload of faculty members.

- Enhance transparency of the program through publicizing all information pertaining to the ESG Information Management

- Reconsider the learning outcomes in all courses to provide students the essential knowledge, skills and attitudes necessary for pursuing studies at a graduate level

2. Institution's Response

The Department of Computer Science and Engineering of European University Cyprus wishes to express its sincere gratitude to the CY.Q.A.A. for the re-accreditation of the undergraduate Computer Information Systems (B.Sc.) programme. In the following pages, we address in detail the above three issues requested by CY.Q.A.A.

#1: Provide incentives and support to faculty members that will enable them to increase their level of engagement in research and publications. To this end, the institution should also revise the existing workload of faculty members.

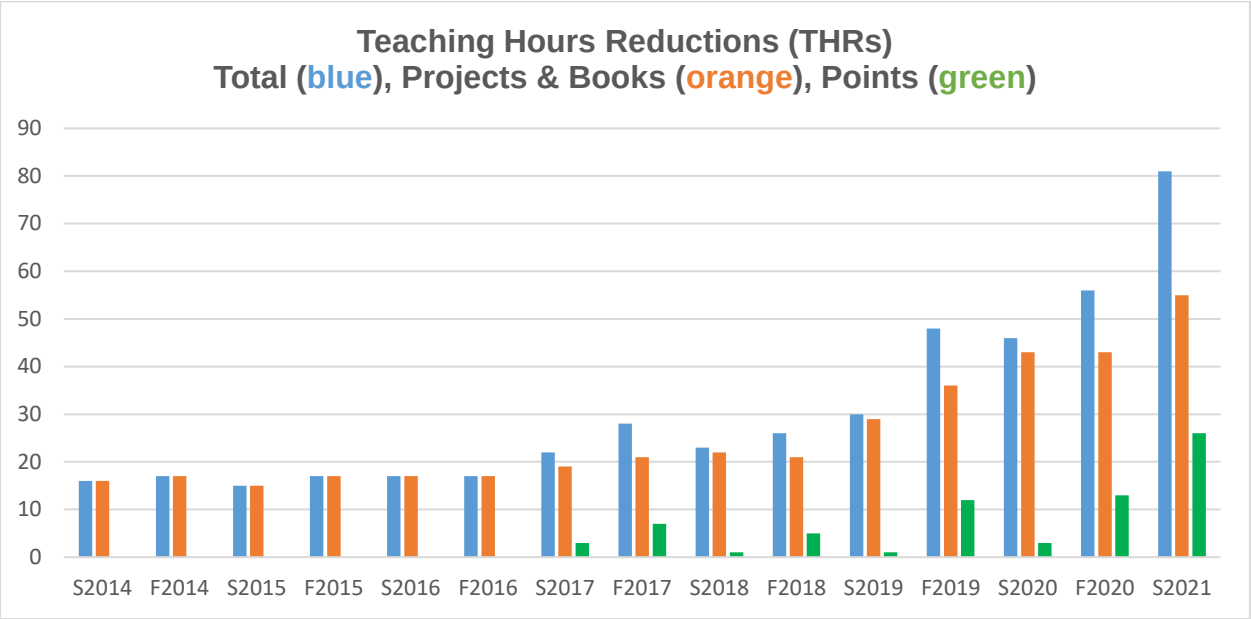
Increasing the quality of the research output is a central pillar in both the University's and the Department's strategy. To this end, the Department promotes research synergies of its faculty, through the school's research centers and through research clusters of common research interests. With respect to the latter, from Spring 2021, the Department started investing further through organizing twice a year, a research meeting/workshop, whereby faculty discuss their research agenda, further promoting research synergies among the Department's members, but also supporting less active faculty and offering assistance.

This culture of high-quality research output is supported by a number of EUC's research support policies and mechanisms, including among others a policy on Teaching Hour Reduction (THR), the Sabbatical leave scheme, the "Annual Awards for Excellence in Research", as well as the available budgets for conference participation and membership in scientific and professional societies, and the Ph.D. Scholarships Award Scheme.

In particular, the University recognizes and supports the need for the faculty's engagement in systematic and consistent research activities and career advancement. Consequently, to motivate, support and enhance the faculty's research activities, the University has adopted the THR policy, which is part of the wider University Research Policy (Appendix I). Through the THR policy, faculty members who have a contractual obligation of 12 teaching hours per semester, may, through this provision, have a reduced workload of either 6 or 9 hours per semester.

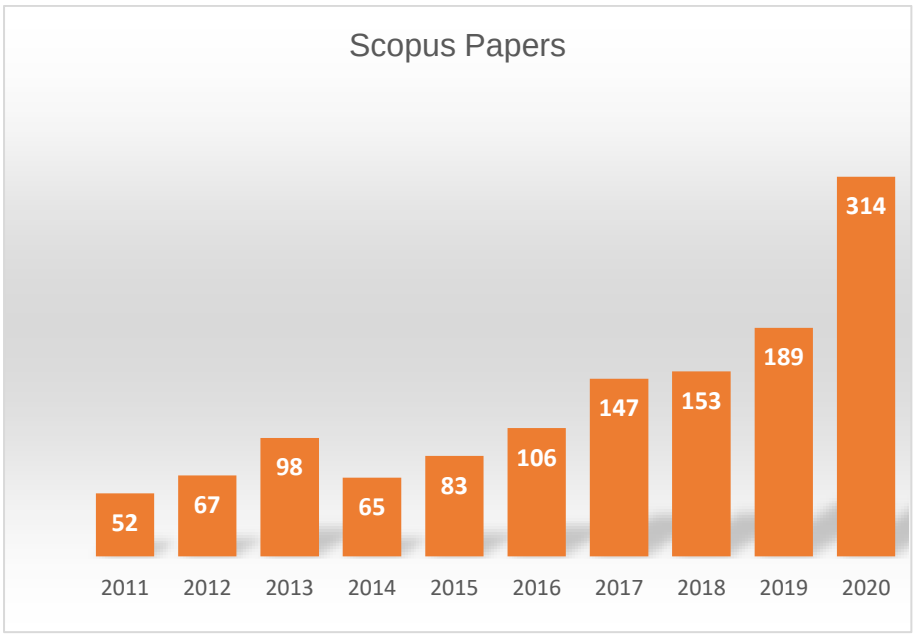
Following the introduction of the THR policy, the research activities of full-time faculty have substantially increased. This is evident from the steady increase in both the number of faculty who are granted a THR, and the parallel increase in research activities.

A number of the Department's faculty has systematically capitalized on the particular policy, while every year additional faculty members are eligible for the THR. The figure below demonstrates the steady increase in the number of allocation of THR per semester (2014 to date).



The THR policy has led into a boost of not only the quantity but also the quality of research output. Specifically, in the last five years, the University's output in Scopus indexed paper journals has **quintupled** as much. That is, for the years 2018, 2019 και 2020, the University's publications in Scopus indexed journals is of the order of 156, 192 and 312, respectively. On the basis of this track record, and provided that the University maintains the benchmark of 150 high quality journal articles in the years 2021 και 2022, it fulfils the criteria for the **Times Higher Education World rankings** in 2023.

The figure below depicts the steady increase in the number of University's output in Scopus indexed paper journals per calendar year (2011 to date).



Moreover, the positive effect of the THR policy is evident from the strong growth in the research activity of the University as measured through competitive external research projects. Such funding has **quadrupled** during the last 5 years.

Apart from the cumulative nature of the THR policy, this high research culture is supported through the recently introduced Sabbatical leave scheme (Appendix II). The Sabbatical leave scheme aims at encouraging faculty members to engage in scholarly research and international networking, and it is granted with full remuneration. Sabbatical leave is granted for planned travel study, formal education, research, writing of papers, monographs and books or other experience of academic value. At the end of the Sabbatical period, the faculty member must submit a detailed report on the research activities performed under that period.

In addition, the “Annual Awards for Excellence in Research” may be seen as a further motivation for faculty to engage in high quality research. Specifically, two faculty members are awarded these Awards, on the basis of the quality and impact of their research. These two awards are:

- The "EUC Research Award-Young Researcher”, is awarded to young researchers that have demonstrated the ability to perform high-quality research. The Award aims to enhance young scientists' research activity who have shown an ability to produce significant and internationally recognized achievements from the early stages of their career.
- The "EUC Research Award-Distinguished Researcher" is granted to excellent scientists with extensive research experience who have demonstrated significant and internationally recognized research results. The Award aims to appraise and promote the work and personality of these distinguished scientists who honour European University Cyprus through their high-quality research and its impact.

To be eligible, full-time faculty members must be nominated by February 28 of each year. The nominations are assessed by a special committee, comprised of both internal and external members.

A series of other incentives is also employed, so as to encourage and support full-time faculty in their research activities, as outlined below:

- Based on their research profile and activities (at the time of hiring), newly hired full-time faculty members may be granted a THR from the very first semester of employment.
- The University has also introduced the Ph.D. Scholarships Award Scheme. The general aim of the scheme is to reward faculty members who have been able to demonstrate an excellent recent research record. The scholarships are awarded to faculty members who fulfil the selection criteria of the scheme and who have a suitable Ph.D. candidate in their field. All full-time faculty members of the University who hold the rank of Assistant Professor or higher are eligible to apply for the award. The Ph.D. scholarships are awarded to the most promising candidates of any nationality. They cover the tuition fees of new Ph.D. students for the whole duration of their studies. Five (5) such scholarships have been announced for the academic year 2021-22.
- Following the Ph.D. scholarships award scheme, the University enhances Ph.D. students with the Policy for the Award of Scholarships for publishing a Scopus paper. This scheme awards scholarships to Ph.D. students who have presented an article to a Scopus Conference or published a paper in a Journal indexed by Scopus. The scholarships are in the form of a tuition fee exemption.
- In addition, an annual budget of 1470 Euro is available for each full-time faculty member, for participation in local and/or international conferences.
- A further, annual budget of the order of 120 Euro is available for each full-time faculty member, for subscription in scientific and professional associations.

In line with the EEC’s recommendation to provide incentives and support to faculty members so that they can increase their level of engagement in research and publications, the Department set up a

research workshop in Spring 2021. The workshop included a presentation, followed by a discussion on best practices amongst peers. It has also agreed, and a budget has been secured for a webinar on academic writing to be delivered by an external, international expert.

#2: Enhance transparency of the program through publicizing all information pertaining to the ESG Information Management

In response to the CY.Q.A.A. follow-up action on enhancing transparency of the program through publicizing all information pertaining to the ESG Information Management we would like to present the various activities that the department is using in compliance with ESG 1.7 – Information Management and 1.8 – Public Information.

ESG 1.7 states that "Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities." To this end the University keeps track of several Key Performance Indicators that capture students' progression, success and drop-out rate. Another indicator of academic performance is the Low GPA Policy. Students' academic progress is monitored based on their GPA (Grade Point Average) on a semester basis. Taking into consideration the ECTS load of each student and their semester GPA, Student Advisors at the Advising Centre of the Department of Enrolment come into communication with students to address issues and assist those with low GPA, by monitoring their academic path and discussing ways to improve performance. The same list of students with low GPA's reaches the Schools' program coordinators, Chairpersons, and Dean for their perusal. The Department closely monitors and supports students with low GPA by following these procedures for supporting students with low GPA as these are described in the EUC Internal Regulation on Low GPA (more information about the processes involved appear in the discussion below; for more details of the procedure please also see the Internal Regulation on "EUC's Procedures for Supporting Students With Low Grade Point Average (GPA)" that appears in Appendix V). This policy outlines a framework providing the process and actions to be taken. Information for low GPA students is provided by the Department of Enrolment (per Department and per program of study) twice per year in the beginning of each semester. The policy ensures: 1) the provision of correct information to all students, namely undergraduate, postgraduate, Conventional and E-Learning students; 2) that students are aware of the role of GPA and the impact of low GPA on the progress of their studies; 3) increased support provided at the Program, Department and School level; 4) proper implementation of procedures by the Student Advising Centre.

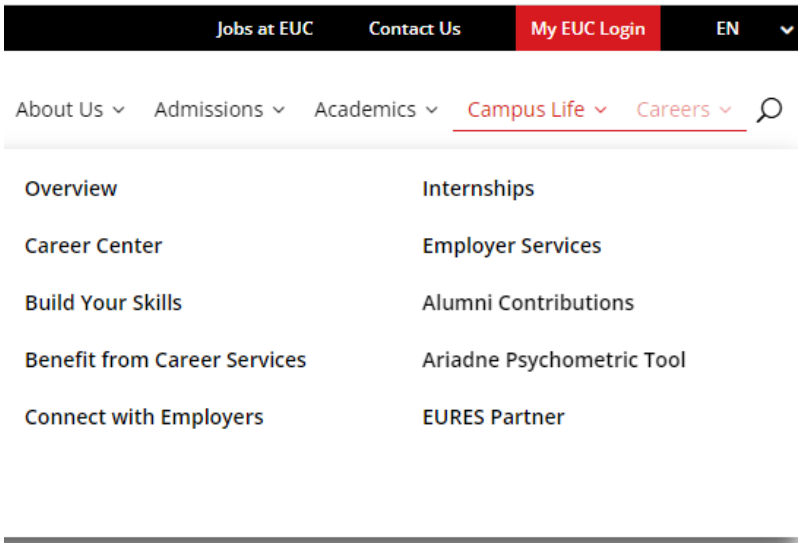
In addition to the Key Performance Indicators stated above, a mechanism is already in place to obtain input from students regarding their courses. Towards the end of each semester, the students are asked to evaluate each of their courses online. Submission is anonymous and the time it takes to fill out the evaluation form is around 10-15 minutes. The survey pertains all aspects of the course and the overall learning experience of the student (hence named the Survey on 'Student Feedback on their Learning Experience' (SFLE), such as the course structure and content, the faculty performance, the facilities involved, the administrative support, etc. (please see the Fall 2020 version of the Survey in Appendix VI and its associated Framework in Appendix VII). The information received are aggregated in a different way based on the type of question. Questions that have a specific scale of grading (e.g., from 0-5) are averaged. All answers to questions that require text input are simply appended as one large paragraph. These results are then forwarded to faculty to review and act accordingly. The Chairperson of the Department also reviews the aggregated

information per course and makes recommendations where needed. A detailed description of the procedures involved is provided Appendix VIII.

The main goal of ESG 1.8 is to "… publish information about their activities, including programmes, which is clear, accurate, objective, up-to date and readily accessible." To this end, European University Cyprus has established various activities and mechanisms to disseminate information about the program in a clear, concise, and timely-manner. Following is a list of practices utilized to achieve this.

EUC Website: News and events are being posted at the European University main page (euc.ac.cy) under the tabs of Careers and Campus life. News specific to the Computer Information Systems Program are also added to the Program's website at (https://euc.ac.cy/en/programs/bachelor-computer-information-systems/)

Career Center: The Careers Center provides support through Career days, internship placements, faculty mentoring, on-campus company visits and alumni networks. It maintains strong links with industry leaders and dynamic partnerships with employers to secure high graduate employment rates. The following figure shows a screen capture of the various topics covered under the Careers tab.

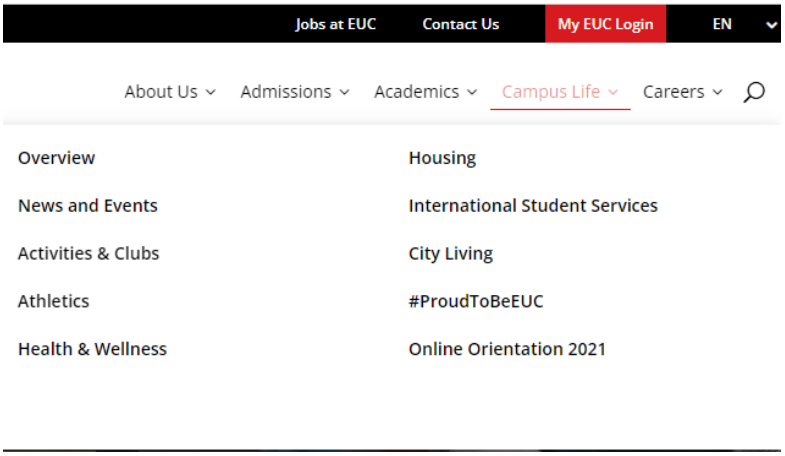


The Career Center encourages and inspires graduates to search for employment opportunities all across Europe, as part of its firm belief is that the employment market extends well beyond Cyprus. The Career Center also joined the EURES Network in October 2019. EURES is a cooperation network designed to facilitate the free movement of workers within the EU 28 countries plus Switzerland, Iceland, Liechtenstein and Norway. The network is composed of the European Coordination Office (ECO), the National Coordination Offices (NCOs), EURES Partners and the Associated EURES Partners.

This semester a team from EURES network has contacted the Careers Center and expressed interest to recruit our students to work in Germany based on an initiative from the Berlin Chamber of Commerce. They visited EUC in October 2021 and a presentation was made to the students regarding IT related opportunities in Germany.

Another company, Wargaming, has also recently requested from the Career Center to meet with our students, present its activities, and discuss with students about various employment opportunities. A preliminary meeting took place in November and the presentation is set to take place on the 8th of December 2021.

Campus Life: The Campus Life information page, shown in the figure below, gives the opportunity to students to experience a learning environment and a full student life that goes well beyond the classroom. The campus community and the general public enjoy daily activities including exhibitions, conferences, job fairs, distinguished speakers, social and cultural events. Extra-curricular activities and student clubs contribute greatly to an active student life and campus culture, offering plenty of opportunity for making lasting memories and friendships. Further, students that enter university athletic teams participate in national and international leagues, and train in some of the best athletic facilities in the country.



Erasmus+: Information regarding Erasmus+ is given to the students through the EUC Erasmus+ website (https://erasmus.euc.ac.cy/). Eramus+ invests in the education and training of people of all ages and backgrounds, to boost personal development, skills, and job prospects. European University Cyprus participates in the program since its beginning, and is a holder of the Erasmus Charter for Higher Education 2021-2027. EUC's modernization and internationalization strategy is described in the Erasmus Policy Statement (see Appendix III). It should be noted that due to Covid-19 (Fall 2020-Spring 2021), no exchange of students and faculty took place.

Activities through Clubs: At EUC, the students are encouraged to get involved in activities carried out by the IEEE organization and the Robotics club.

The IEEE EUC Student club is part of and promotes membership to the Institute of Electronic and Electrical Engineers the biggest international academic and professional organization in the areas of Computer Science and Engineering. The club aims to introduce students to the latest in the forefront of technology and promote their active involvement with the subject, by participation to student competitions, lectures, seminar and field trips. Student subscription to IEEE is covered by the University. This semester we had a total of 20 new registrations bringing the total number of members to 54 students.

The Robotics Club helps student members to acquire the programming skills and knowledge of the hardware required to build and program robots capable of executing tasks autonomously. The Club also organizes on-campus competitions between members' robot creations, as well as taking part in international contests. Students from the robotics club participated in national competitions winning multiple awards and also participated in worldwide competitions in locations such as Doha, Qatar, New Delhi, India and Tallinn, Estonia.

Department Events: Typically, every semester we organize a couple of events where we take the opportunity to socialize with our students. This event may also include a presentation from a key note speaker from industry or another university. Due to Covid-19 we decided to postpone these events from October 2021 to Spring 2022. Instead, the coordinator of each program visited freshman students briefly during class period and talked to them in person. Two formal department events are already allocated in the budget for Spring 2022.

Marketing - Continuous updating of our website: We have met with the Marketing Department of EUC in September 2021 and discussed ways of updating the Computer Information Systems Program website. Among others relating to the structure and means of presentation of material, we agreed on the production of a series of short videos. These videos will be incorporated in the advertising campaign, as well. The intention is to show the student journey at the university and also how the various activities translate to finding good jobs in the industry.

Other means of communication: In addition to the aforementioned means of communication, we also maintain a Departmental website (https://cse.euc.ac.cy/) and a Department Facebook page (https://www.facebook.com/cse.euc.ac.cy/) for announcements that are of interest to students in all three programs of the Department (i.e., Computer Engineering, Electrical Engineering, Computer Information Systems, and Computer Science). In addition, students are directed to read news regarding research projects, conferences, presentations, and other activities that are posted on the websites of the respective research groups of the Department listed below.

Research Groups of the Department:

Center of Excellence: Center for Risk and Decision Sciences	CER!DES Excellence in Innovation and Technology
• **Telecommunications Research Lab**	
• **Research Laboratory in ICT-Enhanced Education**	ictee
• **Cyber.EUC – Cyber Security**	European University Cyprus | CYBER.EUC Research Center
Aristarchus Research Center	ARC Aristarchus Research Center

#3: Reconsider the learning outcomes in all courses to provide students the essential knowledge, skills and attitudes necessary for pursuing studies at a graduate level

For the final follow-up request of the CY.Q.A.A., we took into consideration the proposal and reevaluated the learning outcomes ensuring that they all provide both the basis for a career in industry as well as allowing the students to continue their studies at a graduate level. The degree was redesigned based on the ACM/AIS guidelines to be able to tackle all the issues that a graduate of an Information Systems degree will encounter. As seen in the excerpt below, the ACM/AIS guidelines (Appendix IV) aim to both prepare students for the workforce but also to allow them to continue their studies in Information Systems.

> "The model curriculum should be designed to help Information Systems programs to produce competent and confident entry-level graduates well suited to workplace responsibilities or further studies of Information Systems."

Furthermore, the courses that are shared with both the business degree and the computer science degree already have learning outcomes that are based on pursuing an academic career. In the table below one can see that the General Education Requirements, Business Core Requirements and Computer Science requirements are part of the curriculum of the respective degrees in the university. This shows that the learning outcomes of these courses are based on students that will probably continue their studies in academia.

For the courses that are specific to the program, the learning outcomes follow the ACM/AIS guidelines and can also allow students to follow a more academic path since the theoretical aspects of each subject are also discussed. In each course provided in the program, students are taught the concepts and then they learn how to apply those concepts. We find that the learning outcomes allow the students to both learn the theory so that they can enhance it if they want to continue as academics but also how to apply it in a business setting if they want to continue in the industry. As an example, we can analyze the learning outcomes of the first Information Systems course that students undertake, namely CIS100 - Fundamentals of Information Systems. Below you will find the learning outcomes as defined in the course outline.

- Recognize the roles of information systems in supporting the structures and processes; the management; and the strategic success of organizations
- Explain the major components of the information technology infrastructure of an organization: hardware and software; data resources; telecommunications and networks; and the Internet
- Solve managerial problems with the use of IT tools
- Differentiate knowledge management and describe how knowledge management supports organizational decision-making and affects strategic success
- Evaluate key issues of Information Systems, including security and control and global systems issues

We can see here that the students need to learn the role of Information Systems in an organization, they need to identify the major components of the IS infrastructure, understand knowledge management and evaluate issues relating to Information Systems. All these learning outcomes are important when moving into the industry as an Information Systems professional but are just as important if one wants to pursue a more academic direction. By completing all these learning outcomes, the student is prepared to identify, evaluate, and enhance the existing processes, and even help in resolving issues relating to Information System. This is apparent throughout the program and a student that follows the Bachelor in Computer Information Systems is more than capable of pursuing further academic studies with a solid background.

DEGREE REQUIREMENTS		**ECTS**
General Education Requirements		**30**
COM215	Public Speaking and Human Communication	6
CSE210	Writing for Computer Science and Engineering	6
ENL103	Academic Writing	6
AEF105	Business Statistics	6
BUS210	Numerical Methods and Applications for Business	6
Business Core Requirements		**42**
BUS100	Introduction to Business	6

MAR100	Introduction to Marketing	6
MGT100	Introduction to Management	6
AEF125	Introduction to Managerial Accounting	6
CIS210	Operations Management	6
BUS220	Innovation and Entrepreneurship	6
BUS400	Strategic Management	6
Information Systems Requirements		**42**
CIS100	Fundamentals of Information Systems	6
CIS205	Networks and Information Security	6
CIS300	Enterprise Architecture	6
CIS400	Information Systems Project Management	6
CIS410	Information Systems Strategy and Management	6
CSE230	Systems Analysis and Design	6
CSE310	Database Management Systems	6
Computer Science Core Requirements		**108**
CSE100	Programming Principles I – Robotics Lab	6
CSE110	Programming Lab using Robotics	6
CSE120	Programming Principles II – Robotics Lab	6
CSE200	Data Structures & Algorithms	6
CSE125	Computer Networking and Web Technologies	6
CSE213	Web Programming	6
CIS200	Search Engine Optimization and Internet Marketing	6
CSE335	Smartphone Programming	6
CSE350	E-commerce and the Internet	6
CIS405	Data Mining and Web Mining	6
CSE425	Cybercrime Concepts and Legal Considerations	6

CIS305	Knowledge Management	6
CIS430	Senior Project	12
CSE340	Human Computer Interaction	6
CIS415	Decision Science	6
CIS420	E-commerce Marketing Strategy	6
CIS310	Visual Programming	6
Free Electives		**18**
Total Requirements		**240**

C. Other institutional action taken towards the implementation of ESG aiming at the improvement of the institution / department / programme of study.

N/A

D. Signatures of the Internal Quality Assurance Committee

Name	*Signature*
Prof. Loizos Symeou, Vice-Rector for Academic Affairs, Chair of Committee on Internal Quality Assurance	
Dr. Theodoros Xanthos, Professor, Faculty Representative, School of Medicine	
Dr. Vasiliki Gkretsi, Associate Professor, Faculty Representative, School of Sciences	
Dr. Georgia Petroudi, Assistant Professor, Faculty Representative, School of Humanities, Social and Education Sciences	
Dr. Christiana Markou, Assistant Professor Faculty Representative, School of Law	
Dr. Christakis Sourouklis, Assistant Professor, Faculty Representative, School of Business Administration	
Dr. Pieris Chourides, Associate Professor, Quality Assurance Expert	
Dr. Ioannis Karis, Adjunct Assistant Professor, Quality Assurance Expert	
Ms Athanasia Ktena, Administrative Head, Office of the Vice Rector of Academic Affairs, Administration Representative	Athanasia Ktena
Mr Andreas Maliappis, Undergraduate Student	
Mr Michalis Katsouris, Graduate Student	

Date: 30/11/2021

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APPENDIX I

INTERNAL REGULATION ON

RESEARCH POLICY

54th Senate Decision: 21 December 2017
60th Senate Decision: 2 October 2018
70th Senate Decision: 13 December 2019
80th Senate Decision: 28 January 2021
86th Senate Decision: 14 October 2021

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Introduction

Within the framework of further contribution to the research community, the mission of the European University Cyprus (from now on referred to as the University or EUC) is to develop a pioneering and innovative research infrastructure with the objective of generating new knowledge. The university focuses on both fundamental and applied research and wherever possible the commercial application or exploitation of the research results.

The policy is guided by the following broad objectives:

1) The establishment of an interdisciplinary approach for researchers with attractive conditions for accessible movement among institutions, disciplines, sectors and countries, without financial and administrative obstacles.

2) The creation of state of the art research infrastructures, including research centres, foundations, units and/or laboratories, which are integrated and networked and accessible to research teams from across the EUC.

3) Introduction of a simple and harmonized regime for intellectual property rights in order to enhance the efficiency of knowledge transfer, in particular between public research and industry.

4) Optimization of research programs and priorities, for example by developing joint principles for the administration of European, national and regional funding programs.

5) The strengthening of international cooperation enabling faculty and other scholars in the world to participate in various research areas, with special emphasis on developing multilateral initiatives to address global challenges.

6) The transfer of research-based knowledge to EUC students

Research is conducted by faculty members, research associates/research personnel and PhD students either on their own or within the framework of external (national, European, international) and internal funding programs that are launched by the University.

The Research Policy provides a code of conduct for research and is intended for all staff, including people with honorary positions, faculty members, special teaching personnel, scientific collaborators, special scientists, research associates, and students carrying out research at or on behalf of the University.

All groups mentioned above must familiarize themselves with the Research Policy to ensure that its provisions are observed.

1. EUC Research Ethics Policy

1.1 Scope and Purpose

1. The aim of the EUC Research Ethics policy is to promote and encourage a high quality research and enterprise culture, with the highest possible standards of integrity and practice. The policy applies to all academic, contract research and administrative staff, all research students, as well as undergraduate and masters students who are undertaking research. In short, the policy applies to all disciplines and research activities within the University, or sub-contracted on its behalf.

2. All staff and students are expected to act ethically when engaged in University business. Any research involving animals, human participants, human tissue or the collection of data on individuals requires ethical consideration. While particular attention must be paid to the interests of potentially vulnerable groups, such as children, the University recognises that it has a duty of care towards all members of the wider community affected by its activities. The University also recognises that it has a duty of care to its own staff, and that this includes the avoidance of harm to those undertaking research.

3. The University will establish a framework for research ethics governance in which its Research Ethics Committee will have a central approval, monitoring and training role. The University will establish a Research Ethics Committee with representatives from all the Schools. The Research Ethics Committee will put in place the procedures needed to obtain approval.

   It is, however, recognised that it may not always be appropriate or practicable for ethical approval to be sought from the Research Ethics Committee especially when it comes to short or undergraduate projects. Normally undergraduate or taught projects will not require clearance from the Research Ethics Committee and the matter can be dealt with at School and/or Department level. However, when active intervention is involved whether physically invasive or psychologically intrusive the Research Ethics Committee will need to be consulted. In particular, university staff has an obligation to ensure that not only their own research but any undergraduate or masters student research conducted under their supervision is ethically sound. Where research projects are subject to external approval, the School or Department responsible must ensure that this approval is sought and given. Where approval for a project has been given by a Research Ethics Committee at another university, as may be the case with a collaborative project, the EUC Research Ethics Committee must be provided with proof of this.

4. For some research projects it may be necessary to obtain the approval of the Cyprus National Bioethics Committee. Researchers should consult directly with the Cyprus National Bioethics Committee. Contact details and more

information on the approval process can be found on http://www.bioethics.gov.cy .

1.2 General Principles

1. The EUC Research Ethics Policy is based on widely accepted principles and practices governing research involving human participants. The key elements are:
   - Minimal risk of harm to participants and researchers;
   - Potential for benefit to the society;
   - Maintenance of the dignity of participants:
   - Minimal risk of harm to the environment;
   - Voluntary informed consent by participants, or special safeguards where this is not possible;
   - Transparency in declaring funding sources;
   - Confidentiality of information supplied by research participants and anonymity of respondents;
   - Acknowledgement of assistance;
   - Appropriate publication and dissemination of research results;
   - Independence and impartiality of researchers.

1.3 The Definition of Human-Related Research

1. All human-related research which includes one or more of the following require ethical assessment and approval at the appropriate level:
   - Direct involvement through physically invasive procedures, such as the taking of blood samples
   - Direct involvement through non-invasive procedures, such as laboratory-based experiments, interviews, questionnaires, surveys, observation
   - Indirect involvement through access to personal information and/or tissue
   - Involvement requiring consent on behalf of others, such as by parents for a child participant

1.4 Vulnerable Participants

1. Some participants may be particularly vulnerable to harm and may require special safeguards for their welfare. In general, it may be inappropriate for undergraduates to undertake research projects involving such participants.
2. Particularly vulnerable participants might be:
   - Infants and children under the age of eighteen
   - People with physiological and/or psychological impairments and/or learning difficulties.

- People in poverty
- Relatives of sick, or recently–deceased, people

1.5 The Legal Framework, the Role of Professional Associations and Research Councils

1. All research undertaken under the auspices of EUC must meet statutory requirements. Of particular relevance is the Bioethics Law (N.150 (I)/2001 and 53 (I)/2010), the Data Protection Law (2001), the Patients Protection Law (2005), and all those laws that create the legal framework for the Cyprus National Bioethics Committee.
2. Researchers in particular disciplines should comply with any research ethics guidelines set out by their professional associations.
3. Research Councils, charitable trusts and other research funding bodies in most cases require an undertaking from grant applicants that research proposals involving human participants have been approved by the University Research Ethics Committee or another appropriate body. Some also require audited compliance with their guidelines.

2. Good Research Practices / Code of Ethical Conduct in Research

2.1 Code of ethical conduct in research

Scholarly inquiry and the dissemination of knowledge are central functions of the University. They can be carried out only if faculty and research personnel abide by certain rules of conduct and accept responsibilities stemming from their research. And they can only be carried out if faculty and research personnel are guaranteed certain freedoms. The University expects that faculty and research personnel will be bound by the following research practices:

All faculty and research personnel are free to choose any research matter, to receive support from any legitimate source, and to create, analyse and derive their own findings and conclusions.

Research methods, techniques, and practices should not violate any established professional ethics, or infringe on health, safety, privacy and other personal rights of human beings and/or animals.

The above principles define the university's role with respect to research carried out on its premises. They are set forth to reinforce, and not diminish each faculty and research personnel's personal responsibilities toward their research, and to assure that each faculty and research personnel's source of funding and research applications are consistent with moral and societal conscience.

2.2 Openness in research

The University recognizes and supports the need for faculty and research personnel to protect their own rights, be they academic or intellectual property rights. Even so, the University encourages all faculty and research personnel to be as open as possible when discussing their research with other researchers and the public. This aims at the dissemination of research performed in the University to enhance the international research community's knowledge and understanding.

2.3 Integrity

Faculty and research personnel must be honest about their research and in their review of research coming from other researchers. This applies to all types of research work, including, but not limited to, analysing data, applying for funding, and publishing findings. The contributions of all involved parties should be acknowledged in all published forms of findings.

Faculty and research personnel are liable to the society, their professions, the University, their students and any funding agency that may fund their research. For this reason, faculty and research personnel are expected to understand that any form of plagiarism, deception, fabrication or falsification of research results are regarded as grave disciplinary offences managed by procedures described in detail in Section 2.4.

Any real or potential conflict of interest should be reported by faculty and research personnel to any affected party in a timely manner in all matters concerning research and peer review. According to the United States National Institute of Health "Conflict of interest occurs when individuals involved with the conduct, reporting, oversight, or review of research also have financial or other interests, from which they can benefit, depending on the results of the research." (http://www.nih.gov).

2.4 Misconduct in research

Misconduct in research may involve Fabrication, Falsification, or Plagiarism in proposing, performing, or reviewing research, or in reporting research results. To prove that there has been misconduct in research, the following conditions must be met: The performance of said research has significantly deviated from accepted practices used in the field that the research was performed, and there was intention in the misconduct by the researcher(s).

Any allegations about misconduct in research will be investigated by the University thoroughly, through a special committee formed as described in the University Charter, Annex 11, Article VII.

3. Intellectual Property Policy

3.1 Introduction

The EUC is dedicated to teaching, research, and the extension of knowledge to the public. Faculty, research personnel, and students at the University, hereafter referred to as "University Employees," recognize as two of their major objectives the production of new knowledge and the dissemination of both old and new knowledge. Because of these objectives, the need is created to encourage the production of creative and scholarly works and to develop new and useful materials, devices, processes, and other inventions, some of which may have potential for commercialization.

The University acknowledges the need for an Intellectual Property Rights (IPR) policy, which will promote the University's reputation as socially relevant, leading research and teaching organisation and will directly contribute to the financial position of the EUC if its commercial value is realised.

The policy is based on the principles that will govern the ownership rights emanating from research of and/or materials produced by the EUC's members of staff and students, and to establish objectively fair and equitable criteria for the transfer of knowledge. The EUC thus aims to provide support services to promote the creation of Intellectual Property (IP) whilst seeking to maximise the commercial exploitation of the resulting IPR.

Intellectual Property includes, but is not limited to, patents, registered designs, registered trademarks and applications and the right to apply for any of the foregoing, copyright, design rights, topography rights, database rights, brands, trademarks, utility model rights, rights in the nature of copyright, knowhow, rights in proprietary and confidential information and any other rights in inventions.

The EUC acknowledges that registration and commercial exploitation of Intellectual Property is often a long and costly process that is justified once it is ascertained that there exists a business case for such registration and exploitation. It is known that in practice, only a small number of works can be commercially exploited in a viable manner, depending on the nature and marketability of the work in question.

3.2 Definitions

For the purposes of this Policy:

Creator - "Creator" shall mean, employees of EUC, a student, non-employees contracted to EUC for contracts and services, or a member of a Visiting Teaching Staff involved in the production of Disclosable Work.

Disclosable Work – "Disclosable Work" shall mean such work that is novel, original, and/or important and is likely to bring impact and enhance the Creator's reputation. This work is characterised by the IP rights it generates.

Intellectual Property Policy – "IP Policy" is the name of the policy described here that outlines the regulations of the EUC in regard to disclosure and exploitation of Intellectual Property Rights (IPR).

Organisation – “Organisation” for the purpose of this document is the European University Cyprus (EUC).

Intellectual Property Adjudication Committee – is the name of the committee established to resolve disputes over interpretation or claims arising out of or relating to this policy, or dispute as to ownership rights of Intellectual Property under this policy.

Office of the Vice Rector for Research and External Affairs – is the office within the EUC responsible for the development of and enacting this IP Policy and is the interface between the EUC and the Technology Transfer Facility.

Technology Transfer Facility – “TTF” for the purpose of this policy, is the relevant body responsible for Technology Transfer support in Cyprus.

3.3 Intellectual Property Regulations

3.3.1 Responsibility

1. The IP Policy acknowledges that all members of staff and students have responsibilities with regard to IPR arising from and/or used by them in the course of their teaching/employment.
2. The IP Policy also recognises that all members of staff and students require support and assistance to help them to meet their responsibilities and this will be provided by the Office of the Vice Rector for Research and External Affairs and, subsequently, by the Technology Transfer Facility.

3.3.2 Identification of IP (including duty of confidentiality)

1. It is expected that identification will take place when employees, students, or members of staff are involved in creating and developing IP. Much of the IP which will be created by the EUC’s employees may be anticipated prior to its creation depending on the nature of the project in question and outputs and results that are expected to be generated. Examples of such outputs which are likely to have potential IP rights arising include (but are not limited to):
   - Inventions (whether or not patentable);
   - Methodologies;
   - Software;
   - Databases;
   - Educational/training materials and tools;
   - Modelling tools;
   - Solutions to technical problems; and
   - Design/artistic products.

2. A Summary of the main classes of IPR is listed below:

Patent

A registered patent provides a time-defined (up to 20 years) geographically defined monopoly right to exploit a new commercially valuable invention or process. The basis of the permission to exploit is that the invention's working is disclosed, although patenting is not possible if there has been ANY prior disclosure of the invention. Patents are governed by Cyprus Law or EU Law such as the New Patent Law of Cyprus (Law No. 16(I)/1998).

Copyright

This time-limited right (which varies between 25 and 70 years according to the material) arises automatically on the physical creation (not the idea) of software, original literary, dramatic, artistic or musical work, and in recorded (e.g. film) or published (e.g. layout) derivations. Use of the © mark and owner's name and date is the internationally recognised way of alerting the public to the copyright ownership but the protection (the right to preventing unauthorised copying) exists regardless. Copyright is governed by the Copyright Law, 59/76.

Copyright may be assigned to a third party, but until that point or until a licence is agreed it remains the property of the Creator, unless s/he creates the work 'in the course of his/her employment', in which case it is the property of the employer.

Moral rights

All European countries recognise an author's moral rights. In Cyprus, there are two moral rights: the right of paternity and the right of integrity. These rights relate to the reputation or standing of the creator in the eyes of fellow human beings. To infringe a moral right involves denigrating or harming the author's reputation. The right of integrity means the creator has the right to object to derogatory treatment of his/her work. Basically, this means changing it in a way that affects the nature of the work without permission. Moral rights can be waived (i.e. the author chooses not to exercise the rights) or they can be bequeathed. They cannot be assigned.

Performing rights

Creators of copyright works have the right to protect the physical form in which those works are created – words on the page, pigment on a canvas, or the clay or metal of a sculpture. Performers such as teachers, actors, musicians and dancers also enjoy protection of their performance, especially when recorded on film, video, tape, CD, or in other form.

Performing rights may affect the multimedia elements of online courseware, as well as the Creator's copyright in the material itself.

Database Right

This time-limited (15 years) right arises without registration to protect the compilers of non-original information from losing the benefit of their work through unauthorised copying or re-use.

Industrial Designs

There is automatic time-limited (15 years) protection (the right to prevent unauthorised copying) for unregistered designs, provided authorship can be proved, under the Legal Protection of Industrial Designs and Models Law 4(I)/2002 This design right covers “the appearance of the whole or a part of a product resulting from the features of, in particular, the lines, contours, colours, shape, texture and/or materials of the product itself and/or its ornamentation" on condition of novelty of the design.

On registration under Legal Protection of Industrial Designs and Models Law, the designer of the new pattern or shape which has aesthetic appeal (can be 2 or 3 dimensional) acquires a monopoly right of commercialisation for a maximum of 25 years from the filing of the application, divided into 5 periods of 5 years.

An unregistered community design (UCD) gives its owner the right to prevent unauthorised copying of their design throughout the European Union. It is not a monopoly right and lasts for 3 years from the date on which the design was first made available to the public within the Community.

Domain Names

Registering a domain name for Internet use gives a right to use the domain name typically for a period of two years, registered with bodies like ICANN internationally and the University of Cyprus in Cyprus. Owners of trademarks can have established rights to domain names.

Trade Marks

Registering a trade mark under the Cyprus Trade Marks Law, Chapter 268, gives a monopoly right for the use of graphically distinct trading identification signs. Unregistered trade marks have some protection through court actions against "passing off" (piracy), provided that their use has not lapsed for a period of 5 years. Cyprus legislation is fully harmonised with EU Standards applicable in trade mark protection.

3. EUC’s members of staff and students undertake to keep confidential and not disclose any confidential information, data, materials, knowhow, trade secrets or any other IP, to any unauthorised third party and shall also undertake to keep such information secure and strictly confidential both during the course of research activity, be it of an Academic or Collaborative/Contract nature, and also on and following completion thereof.

4. Any breach of this confidentiality and non-disclosure obligation constitutes a serious breach and may lead to disciplinary action and does not prejudice the rights of the EUC to file any action for damages or any other rights available at law.

3.3.3 Coverage of the Regulations

1. Whom does this IP Policy apply to?
    - Employees:

      By persons employed by the EUC in the course of their employment.
    - Students:

      By student members in the course of or incidentally to their studies at EUC.
    - Non-employees contracted to the EUC:

      By persons engaged by EUC under contracts for services during the course of or incidentally to that engagement.
2. Sabbatical, Seconded, Visiting Academics and others:

   By other persons engaged in study or research in the University who, as a condition of their being granted access to the EUC's premises or facilities, have agreed in writing that this Part shall apply to them.
3. Participation of the EUC members of staff/employees and or students in Collaborative and/or Contracted Research.

   The preparation and negotiation of any IP agreements or contracts involving the allocation of rights in and to IP will be undertaken by a competent person authorised for this purpose by the EUC.

   Issues that will be addressed in such agreements include, but will not always be limited to:

   - ownership of Foreground IP;
   - licences to Foreground IP for uses outside the project;
   - ownership of Background IP;
   - licences to use Background IP in the project or activity in question and in relation to the use of the Foreground IP arising from such project or activity;
   - allocation of rights to use or commercialise IP arising from any such project or activity and the sharing of revenues; and
   - publications arising from the relevant project or activity and the rights arising from such projects or activities.

The terms of such agreements may be subject to negotiation.

3.3.4 Exceptions to the Regulations

1. Unless specifically commissioned, typically the EUC will NOT claim ownership of copyright in certain types of Disclosable Work described in this policy as “Creator Copyright Works”:
    - artistic works;
    - text and artwork for publication in books;
    - articles written for publication in journals;
    - papers to be presented at conferences;
    - theses and dissertations;
    - oral presentations at conferences;
    - posters for presentation at conferences; and
    - musical scores.

2. Where IP has been generated under the exception clause of this regulation, the EUC may assign the copyright to the Creator.
3. Students – undergraduate and/or postgraduate.

3.3.5 Disclosure of IP

1. All persons bound by these Regulations are required to make reasonably prompt written disclosure to the EUC’s Office of the Vice Rector for Research and External Affairs at the outset of the work or as soon as they become aware of it (by completion of the Invention Disclosure Form, the information required for which is provided in Appendix B):
    - any IP of potential commercial value arising from their work;
    - the ownership by a third party of any IP referred to or used for their work;
    - any use to be made of existing EUC IP during their work;
    - any IP which they themselves own which is proposed to be used by the EUC.
2. Creators shall keep all Disclosable Work confidential and avoid disclosing this prematurely and without consent;
3. Only disclose any Disclosable Work and the IP relating to it in accordance with the EUC’s policy and instructions;
4. Seek EUC’s consent to any publication of information relating to any Disclosable Work;
5. Creators must NOT:
    i. apply for patents or other protection in relation to the Disclosable Work; and
    ii. use any Disclosable Work for their own personal and/or business purposes and/or on their own account.

3.3.6 Ownership of IP

1. Ownership of IP created by an individual who is an employee is generally determined by considering:
    - Who created the IP?

- Was the IP created in the course of the Creator's employment?
- Are there any contractual conditions that affect ownership?

2. Assignment of ownership rights

   Generally, the Creator of IP is its legal owner. From the EUC's point of view, the most important exception to this is the general rule that IP is owned by a person's employer where the IP is created as part of, or through the auspices of, the person's employment.

3. The EUC claims ownership of all the Intellectual Property specified in section 2.2, which is devised, made or created by those specified in section 3 and under the exceptions to the regulations in Section 4. It also includes but is not limited to the following:

   i. Any work generated by computer hardware/software owned/operated by the EUC.
   ii. Any work generated that is patentable or non-patentable.
   iii. Any work generated with the aid of the EUC's resources and facilities including but not limited to films, videos, field and laboratory notebooks, multimedia works, photographs, typographic arrangements.
   iv. Any work that is registered and any unregistered designs, plant varieties and topographies.
   v. Any University commissioned work generated. Commissioned work is defined as work which the EUC has specifically employed or requested the person concerned to produce, whether in return of special payment or not and whether solely for the University or as part of a consortium.
   vi. Know-how and information related to the above
   vii. Any work generated as a result of the teaching process including but not limited to teaching materials, methodologies and course outlines.
   viii. Material produced for the purposes of the design, content and delivery of an EUC course or other teaching on behalf of the school, whether used at the school's premises or used in relation to a distance learning and/or e-learning project. This type of material includes slides, examination papers, questions, case studies, and assignments ("course materials").
   ix. Material for projects specifically commissioned by the EUC
   x. All administrative materials and official EUC documents, e.g. software, finance records, administration reports, results and data.
   xi. Study guides created by an Instructor for the University

3.3.7 Modus Operandi for Commercial Exploitation of the IPR

1. The EUC is entitled to commercially exploit any result obtained under its aegis (unless this entitlement is relinquished). The Office of the Vice Rector for Research and External Affairs has the responsibility for administration of Disclosures and will work with the TTF of Cyprus, which has responsibility for commercialisation of Disclosures. As guidance to the commercialisation process, the EUC/TTF will follow a standard process, graphically presented in Appendix A.
2. The Creator/s shall notify the Office of the Vice Rector for Research and External

Affairs of all IP which might be commercially exploitable and of any associated materials, including research results, as early as possible in the research project. This notification shall be effected by means of an Invention Disclosure Form (contents as noted in Appendix B). In case of doubt as to whether research is commercially exploitable or otherwise, the Creator/s undertake/s to seek the advice of Cyprus Central TTF.

3. The Office of the Vice Rector for Research and External Affairs shall immediately acknowledge receipt of the Disclosure Form. In consultation with the TTF and the Creator/s, shall decide whether the EUC and the TTF has an interest to protect and exploit the relevant IPR.
4. The TTF shall communicate the decision in writing to the Office of the Vice Rector and the Creator/s by not later than three months from the date of receipt of the Invention Disclosure Form. If the EUC and TTF decide to protect and exploit the IPR, it is understood that:
    - the Creator/s shall collaborate with the EUC and the TTF, to develop an action plan for the protection and commercial exploitation of the IP;
    - the TTF in collaboration with the Creator/s shall ensure that third party rights are not infringed in any way through the process; and
    - the EUC/TTF shall seek to protect the right of the Creator/s to use the said IP for strictly non-commercial purposes.
5. Should the EUC and TTF decide that there is no interest in protecting and exploiting the relevant IPR, or should it fail to inform the Creator/s about its decision within the stipulated time, the EUC may assign all its rights, title and interest in such IP to the Creator/s concerned, whilst the EUC retains the right to use the said IP in whichever manifestation for strictly non-commercial purposes.

6. The Creator/s SHALL NOT enter into any sponsorships or commercial agreements with third parties related to their research at EUC without prior written authorisation by the Office of the Vice Rector for Research and External Affairs. This said, it is understood that consent shall generally be granted to Creator/s for such requests as long as the IPRs of the EUC are safeguarded; otherwise the claims on IPR expected by the third party must be agreed upon explicitly upfront.

3.3.8 IPR protection

1. Some forms of IP require active steps to be taken to obtain protection (e.g.: patents, registered trademarks and registered designs). Other forms of IP rights are protected on creation (e.g. Copyright, EU Database Rights) but still require appropriate management in order to maximise the protection available. Best practices in patent protection require that all materials made publicly available by any employees, members of staff and/or students should include a copyright notice.
2. Any decisions relating to the registration of any IP rights such as making an application for a patent or a registered trade mark or a registered design (including any decisions to continue or discontinue any such application) should be made in consultation with the Office of the Vice Rector for Research and External Affairs and

the TTF. The IP registration process can be very expensive and IP protection costs should not be incurred without appropriate consideration of how such costs will be recovered.

3.3.9 Revenue Sharing Mechanism

The EUC's employees and students can benefit from the Revenue Sharing Scheme if their work generates income for the EUC. The scheme is presented in Appendix C. Note that such revenue to be shared is typically calculated after deduction of all costs incurred by the EUC and TTF in developing, protecting, exploiting, and marketing the Disclosable Work and the Intellectual Property it contains.

3.3.10 Leaving the EUC

Cessation of employment, under normal circumstances, will not affect an individual's right to receive a share of revenue. Exceptions to this rule include: cessation of employment due to disciplinary actions.

3.3.11 Applications to use the EUC's IP

1. The EUC may be willing to consider requests from its staff and/or students for a licence to use specific IP, owned by EUC for their use although the terms and decision to grant any such licences is a decision wholly made by the EUC.
2. Applications for such licence should be made in writing to the Office of the Vice Rector for Research and External Affairs.

3.3.12 Breach of the Regulations

1. Breach of the regulations listed in this Policy may be a disciplinary matter for the EUC's staff and students under the normal procedures.
2. The EUC shall consider all avenues available to it, including legal action if necessary, in respect to persons bound by these regulations who acted in breach of them.

3.3.13 Discretion to assign/licence back

1. If the EUC does not wish to pursue the commercialisation of any Intellectual Property or does not wish to maintain an interest in the IPR, it has the right to assign such IPR rights to the Creator/s of the IPR by entering into an agreement to enable the IP to be used by the Creators. This will generally only be granted where there is clear evidence that the IP provides no other benefit to the EUC and is not related to other IP, which the EUC has an interest in.
   However, the EUC shall not assign its IP if they consider that the commercialisation of the IP could potentially bring harm to the name of the EUC. Decisions regarding potential harm will be taken by the Research Ethics Committee of EUC.
2. Requests for any transfer of rights from the EUC to another party with rights should be made in the first instance to the Vice Rector for Research and External Affairs.

3.3.14 Amendments to the Regulations

These Regulations may be amended by the Senate of the EUC on the recommendation of the Vice Rector for Research and External Affairs.

3.3.15 Death

In the event of a researcher's death, the entitlement shall continue for the benefit of his or her estate.

3.3.16 Disputes

1. Any question of interpretation or claim arising out of or relating to this policy, or dispute as to ownership rights of intellectual property under this policy, will be settled by submitting to the EUC's Intellectual Property Adjudication Committee a letter setting forth the grievance or issue to be resolved. The committee will review the matter and then advise the parties of its decision within 60 days of submission of the letter.
2. The Intellectual Property Adjudication Committee will consist of a chair who is a member of the tenured faculty, at the rank of either a Professor or an Associate Professor, one member of the faculty from each School, at the rank of either Assistant Professor or Associate Professor or Professor, an individual from the EUC with knowledge of Intellectual Property and experience in commercialisation of Intellectual Property, and two other members representing, respectively, the EUC administration, and the student body. The chair will be appointed by the Vice Rector for Research and External Affairs, with the advice and consent of the Senate Research Committee, and the remaining members of the committee will be appointed: the faculty members, each by their School's Council, the administration representative by the University Council or its designee, and the student representative by the Student Union.
   The committee will use the guidelines set forth in this policy to decide upon a fair resolution of any dispute.
3. Any disputes regarding the revenue distribution from the exploitation of Disclosable Works will be dealt with in accordance with the EUC's normal member of staff or student dispute procedures as outlined in the contractual terms of conditions.
4. The Parties shall attempt to settle any claim, dispute or controversy arising in connection with this Policy, including without limitation any controversy regarding the interpretation of this Policy, through consultation and negotiation in good faith and spirit of mutual cooperation. Where such claims or disputes cannot be settled amicably, they may be taken to court.
5. This Agreement shall be governed by, and construed in accordance with the laws of Cyprus.

4. Offices, Committees and Centres for Research

4.1 Vice Rector for Research and External Affairs

The Vice Rector for Research and External Affairs (from now on referred to as the Vice Rector) is the person responsible for representing the University on research

matters and enhancing activities related to research within the University. Moreover the Vice Rector facilitates and supports, when asked by faculty or research members, all research activities, including the implementation of research projects, the organization of scientific conferences and the establishment of research units/labs. In addition, the Vice Rector is responsible for the smooth implementation of the University's Research Policy.

4.2 Senate Research Committee

The administration of the research activity is facilitated by the Senate Research Committee of the University. The Committee composition is prescribed in the University Charter and the Committee is accountable to the Senate of the University.

4.3 Research Foundations and Centres

Research is carried out in university departments, research foundations, and centres. The Senate suggests to the University Council the formation of new foundations and research centres or the discontinuation of existing ones, if necessary.

The University Council approves the establishment of these foundations and research centres. Separate regulations are issued for the establishment of University research centres. Detailed description of the mission, area of specialization, and operation of each foundation or research centre is given in a separate document.

4.4 Research Office

Detailed description of the mission, area of specialization, and operation of the Research Office is given in a separate document.

5. Rules Governing External Research Programmes

5.1 Suggested procedure for submitting and implementing a funded research project

The following rules apply for externally funded research projects:

5.1.1 Submission of research proposals:

Faculty and research personnel that are interested in submitting a proposal or participate in a proposal for ANY kind of externally funded research project (commercial, consultancy, RPF, European etc) should consult and get the approval of the EUC Research Office. The formal procedures developed by the Research Office pertaining to the development of a research proposal and to participation in a research project should be followed in all cases. Given that in all research and consulting application forms a budget also needs to be prepared, the

budget will be developed in collaboration with the EUC Research Office, sharing their expertise with the faculty and research personnel and advising them accordingly about the cost models and cost categories used in each case. This procedure should make sure that the proposal satisfies all the necessary criteria of the particular research call.

The final approval for financial and administrative issues of proposals or projects will be signed by the legal representative of EUC.

5.1.2 Project implementation

The formal procedures developed by the Research Office pertaining to the administration of a research project should be followed in all cases.

In the case where a project is awarded, a copy of the contract and all the original receipts, invoices, contracts and other accounting documents regarding expenses of the project will be maintained by the EUC Research Office without any additional remuneration or personnel costs added to the budget of a project. The researcher/s involved in an externally funded project are responsible for submitting all receipts, invoices, contracts and other accounting documents relevant to their project to this department. No payment will be processed before the submission of the aforementioned documents to the Research Office.

Timesheets should be kept for all projects. These will be used as the basis for calculating the money to be paid to researchers for all types of projects. The EUC Research Office will assist researchers to calculate the hourly and daily rate for each staff member.

The researcher must also inform the Chief Financial Officer of the University, through the EUC Research Office, in order to create a separate ledger (account) in the University's Accounts Department. After completion of the project, the Accounts Department will keep the file on record for 5 years or more if needed by the contractual agreement.

The EUC Research Office should keep a file with all the details concerning the project. The file must be made available to the Senate Research Committee upon request.

5.1.3 Financial issues concerning externally funded research projects

All incoming funds for the execution of a project are deposited in a separate account (ledger) of the University and all necessary expenses with their receipts relating to the project are paid/signed by the Vice Rector for Research and External Affairs, the CFO and the CEO of the University.

The time spent by faculty and research personnel on national, European or international research projects is, with rare exceptions, an eligible cost for inclusion in a project budget at a level which reflects the time to be spent by faculty and research personnel on the project and the employer's cost. These are real project costs and their inclusion in project budgets is strongly required.

Salary payments to faculty and research personnel will be paid out regularly by the Accounts department upon the project coordinator's request to the Research Office and provided that the allocated amount for the previous period has been received from the funding agency and all reporting requirements for the previous period to the funding agency have been met.

In cases of delay in receiving the predetermined instalment, the University will grant to the researcher the required funds (not his/her compensation/remuneration but costs such as equipment, consumables, traveling) to initiate the research, provided that a copy of the contract and all necessary documentation had been submitted to the Research Office.

Employment of additional temporary staff, budgeted for completion of the research project, will be the responsibility of the project coordinator. The remuneration for temporary staff will depend on the corresponding budget of the project and the possible allocation of funds for this purpose.

Subcontracting activities within the framework of a research project will be the responsibility of the project coordinator. These activities should be in alignment with the corresponding budget of the project, the grant rules, and the EUC subcontracting policy.

In the case where a faculty or research personnel fails to complete a research project due to failure to meet his/her contractual obligations, or if it is clear that there was an intention of misconduct and there are financial damages laid upon the University relating to this event, the faculty or research personnel is liable to pay these damages. This will not be applied in cases such as health problem, etc, where there is clearly not an intention of misconduct.

5.1.4 University research fund

All funds allocated for research from externally-funded research projects, the University as well as funds offered for research purposes from third parties will be deposited in the University Research Fund. Recommendations for the allocation of funds are made by the Senate Research Committee and are subject to the final approval of the Management of the University. These funds can be used to finance such activities as:

(a) Participation of academic researchers in conferences, seminars, and meetings to co-ordinate activities, which are needed for submission of external programmes.

(b) The administration costs associated with providing support services to academic researchers.
(c) Organisation of training seminars for the faculty and research personnel of the University; these seminars shall be organized if and only will help/assist and/or facilitate researchers to enhance and further develop their knowledge in subjects related to their research fields and help them design and implement research projects.
(d) Purchase of software, hardware and equipment that are needed by faculty and research personnel for research projects.
(e) The funding for the University's Internal Research Awards such as PhD scholarships
(f) Development of Infrastructure related to the research activity of the University.
(g) Funding of the activities of the Research Office of the University.

6. Rules Governing Internal Research Awards

The University's "Internal Research Awards" (IRA) are launched on an annual basis by the Senate Research Committee, are announced by the Vice Rector for Research & External Affairs and financed by the University Research Fund and external sponsors as described in Section 5.1.4 above.

6.1 Purpose

IRAs are awarded to EUC faculty in order to pursue research and other creative work. IRAs provide support for exploratory research projects which might result in proposals submitted for external funding or in creative work that is likely to enhance the recognition of the faculty and research personnel and the University at large. IRAs may be used for funding travel, equipment, supplies, PhD student assistants' scholarships, student assistants, research assistants and other expenses. Funding for this programme comes from the University Research Fund.

6.2 Eligibility for the awards

All full-time faculty members of the University who have the rank of Assistant Professor or higher are eligible to apply for the awards. Specific eligibility criteria may apply for each type of award.

6.3 Application Procedure

The Vice Rector for Research and External Affairs initiates the selection process by issuing a call for proposals. The deadline for the submission of proposals will be announced. Application materials will be available from the office of the Vice Rector for Research and External Affairs and the proposals will be submitted electronically to the office of the Vice Rector.

7. Teaching Hours Reduction for Research Purposes

The University rewards members of staff who excel in research by awarding them Teaching Hours Reduction (THR). A THR may be awarded if the member of staff fulfils the conditions in one or more of the three schemes outlined below.

A member of staff may be awarded a THR under more than one of the schemes described below if he/she is eligible. The minimum teaching per semester can be reduced down to 6 hours per week based on the accumulated research load reduction hours. An exemption may be considered for Deans and Chairs.

All allocations of THR under the three schemes outlined below will be made after a recommendation of an ad-hoc committee chaired by the Vice Rector for Research and External Affairs. The committee will take into account scheduling constraints and other considerations for the sustainable development of research activity at the university. The committee will meet at an appropriate time in each semester in order to make the THR allocations in time for the preparation of the schedule of classes for the next semester.

7.1 Award of a THR for participation in research projects

Members of staff are eligible to apply for a Teaching Hours Reduction (THR) when conducting funded research for the full duration and until the completion of relevant funded projects. Should their application meets with success, funded project coordinators are entitled to a three-hour teaching reduction per semester for the whole duration of the project, whereas research partners are eligible for a THR equivalent to at least one third of the duration of the project.

Based on the policy of the University with regard to THR requests, Faculty, research and Other Teaching Personnel (OTP) members are expected to submit a written request to the Chairperson of his/her Department before the beginning of the academic year/semester. The Chairperson will process the THR request by way of making a relevant recommendation to the Dean of School. The Dean will then forward his/her recommendation to the Vice Rector for final approval. After the deadline expires, applications for teaching hours reduction will not be accepted.

The deadlines for submitting a request for teaching load reduction per semester are the following:

For the Fall Semester: 1st of May
For the Spring Semester: 31st of October

If a research proposal was awarded a grant after the special case of approval of a research/grant proposal (i.e. RPF, EU etc) while an academic year is in progress, a THR request should be submitted and be approved prior to the beginning of the next semester, during which the teaching load reduction will be applied. The

research project should commence at least one month before the beginning of the next semester for the THR to be awarded.

7.2 Award of a THR for writing a book

A three-hour teaching reduction per semester will be awarded for the purpose of writing a book upon submission of a publishing contract by a reputable publisher. A total of two THR allocations (maximum 6 credits) will be made under the scheme for each book contract. The same deadlines and application procedure apply as in the scheme described in section 7.1.

7.3 Award of a THR by accumulation of points

A third scheme for the award of a THR takes into account the research activity of members of staff and the points they have accumulated according to the tables given in Appendix D. A THR of 3 hours per week is awarded to faculty members once they accumulate 100 (one hundred) points and the same number of points are automatically deducted from his/her accumulated total. Points accumulated over time but not utilized by a member of staff will simply remain at his/her disposal.

Note that members of staff may consider the year 2016 as the starting point for calculating points accumulated through research. The calculation of points will be valid after it has been approved by the Dean of the School and the Vice Rector for Research and External Affairs.

New faculty members can also get THRs under this scheme from the first semester of their employment. The points accumulated from their publications in the five (5) years prior to their appointment will be taken into account.

8. Equipment Acquired through Internal and External Funding

8.1 Equipment acquired through University funds

All equipment that has been acquired through funds that come directly through the university's funds (internal research grants, university research funds) will belong solely to the University and will be used by the faculty and research personnel's affiliated department or lab, according to the affiliation used by said faculty and research personnel in the funded research proposal and/or project. The faculty and research member is entitled to use the equipment throughout the duration of the funded project and this remains within the research unit/laboratory once the project is completed, or within the faculty member's department, under his/her direct supervision if s/he does not belong to a unit / lab. Any required maintenance of the equipment should be undertaken by the University.

8.2 Equipment purchased through external funding

Equipment (software and hardware) is often provided in full or partly in the budget of proposals for external funding to enable the faculty and research member to carry out research effectively. This kind of equipment (computers, projectors, software programmes, fax and printing machines, etc.) is the property of the University but

remains in the faculty or research personnel's research unit/laboratory or when this is not applicable in his/her department, under his/her supervision. The faculty member is entitled to use the equipment throughout the duration of the externally funded project. When faculty or research personnel who have had externally funded research projects leave the University, the status of any equipment purchased remains a property of the unit/lab or department that the faculty or research personnel belonged.

Any required maintenance of the equipment should again be undertaken by the University.

In the unlikely event that a faculty or research personnel obtains equipment via external funding that is not processed through the University's budget, the status of the equipment should be negotiated with the Vice Rector to determine ownership and responsibility for repair and replacement. Faculty or research personnel are encouraged to seek outside funding to upgrade, or replace their research equipment.

The Research Office is committed to working with faculty or research personnel to develop proposals for research and teaching equipment. Equipment grants usually require an institutional match, and faculty or research members are advised to consult with the Research Office and the Director of MIS early in the process about this matter. The MIS should be able to help faculty or research personnel to identify the best hardware and software products and estimate costs for proposal budgets.

8.3 Provision of computing equipment by MIS

The MIS department supplies desktop office computers, computer teaching labs, copy and printing machines and other types of equipment needed for research (software and hardware). The Director of the MIS department is responsible for keeping the University's inventory records and adjust these in the case of equipment purchases or wearing out of equipment (being fully depreciated).

9. Policy on Research Staff

9.1 Introduction

Academic Research Staff are EUC contract employees hired to work on EUC research activities as defined below. As EUC employees, Academic Research Staff are subject to all policies and procedures related to EUC employment, and receive all benefits implied by the employment law.

9.2 Definitions of Roles

The following positions for research staff are being described in the following sections:

- Research Associate
- Research Fellow
- Senior Research Fellow
- Honorary Research Staff

9.2.1 Job Description for the Position of Research Associate

9.2.1.1 Overall Role

For researchers who are educated to first degree level (and Master's degree) and who possess sufficient breadth or depth of knowledge in the discipline of research methods and techniques to work within their own area. Role holders who gain their doctorate during the course of employment will normally be recommended for promotion to Research Fellow, if this is appropriate for the duties and responsibilities of the post.

As a team member of the Research Laboratory/Programme the Research Associate will contribute quality research outputs and conceptual support to projects. With the guidance of the supervisor/programme leader, and within the bounds of the Research Laboratory/Programme mandate, the Research Associate will:

9.2.1.2 Key Responsibilities

• Conceptualize and conduct short-term experiments and research activities in support of broadbased/longitudinal research projects, ensuring consistency with established methodological approaches and models, adherence to project timelines, and completeness of documentation;
• Conduct studies of related literature and research to support the design and implementation of projects and development of reports, ensuring conceptual relevance, comprehensiveness, and currency of information;
• Write and publish articles in peer-reviewed journals that highlight findings from research and experimental activities ensuring consistency with the highest standards of academic publication and showcasing the Centre's/Programme's scientific leadership;
• Communicate to Programme/Project team developments/progress and results of research activities ensuring that relevant information and issues in the implementation of projects/experiments are captured in as comprehensive and timely manner as possible;
• Develop collaborative links with core scientific personnel in related programme areas to gain exposure to, and build knowledge on experimental/research activities and approaches, in order to subsequently improve conceptual development and implementation of existing programmes;
• Utilize appropriate and current techniques/protocols in experimental laboratory management to ensure integrity and security of experimental process, comprehensive documentation, and replicability of experimental procedures;

• Design and organize databases along project frameworks and experimental research design that support overall research management, including the monitoring and evaluation of project inputs, actions, and outcomes, as well as the subsequent integration of these databases to other databanks;
• Identify areas of improvement within the research structure using integrated management approaches in pursuit of capacity building/strengthening and the preservation of scientific rigor in research studies.
• To contribute to the design of a range of experiments/fieldwork/research methodologies in relation to the specific project that they are working on
• To set up and run experiments/fieldwork in consultation with the Principal Investigator, ensuring that the experiments/fieldwork are appropriately supervised and supported. To record, analyse and write up the results of these experiments/fieldwork.
• To prepare and present findings of research activity to colleagues for review purposes.
• To contribute to the drafting and submitting of papers to appropriate peer reviewed journals.
• To prepare progress reports on research for funding bodies when required.
• To contribute to the preparation and drafting of research bids and proposals.
• To contribute to the overall activities of the research team and department as required.
• To analyse and interpret the results of their own research

9.2.1.3 Skills and Qualifications

Education: Level Bachelor and/or Master's in the Programme Area
Experience and Skills:
Basic research skills and knowledge of research techniques
Ability to analyse and write up data
Ability to present and communicate research results effectively to a range of audiences

9.2.1.4 EUC Pertaining Benefits

Researchers will have access to facilities which are necessary and appropriate for the performance of their duties.
- Desk, Telephone line and PC
- MS Office, SPSS, Email and Printing Rights
- Business Cards with the University Emblem and the Research Laboratory they belong to
- Full access to the library

All researchers must receive the same forms of employment documentation as other academic-related staff of the University:
- a formal contract signed by the relevant appointing authority;
- written confirmation of any changes in the terms of employment;
- job description or the generic description of the role and, where appropriate, a list of expected research goals;

- further to the completion of the contract, researchers are responsible for returning in good condition all the equipment as well as business cards that have been provided to them.

9.2.2 Job Description for the Position of Research Fellow

9.2.2.1 Overall Role

A Research Fellow is a researcher with some research experience and who has typically been awarded a doctoral degree. A Research Fellow will often have supervisory responsibilities for more junior researchers and will often lead a team of researchers to achieve a research project's aims. They will initiate, develop, design and be responsible for the delivery of a programme of high quality research and may have full authority over several phases of project work.

9.2.2.2 Key Responsibilities

• Design, Conceptualize and conduct short-term experiments and research activities in support of broadbased/longitudinal research projects, ensuring consistency with established methodological approaches and models, adherence to project timelines, and completeness of documentation;
• Supervise and Conduct studies of related literature and research to support the design and implementation of projects and development of reports, ensuring conceptual relevance, comprehensiveness, and currency of information;
• Write and publish articles in peer-reviewed journals that highlight findings from research and experimental activities ensuring consistency with the highest standards of academic publication and showcasing the Centre's/Programme's scientific leadership;
• Take the lead within the team and communicate to Programme/Project team developments/progress and results of research activities ensuring that relevant information and issues in the implementation of projects/experiments are captured in as comprehensive and timely manner as possible;
• Develop collaborative links with core scientific personnel in related programme areas to gain exposure to, and build knowledge on experimental/research activities and approaches, in order to subsequently improve conceptual development and implementation of existing programmes;
• Utilize appropriate and current techniques/protocols in experimental laboratory management to ensure integrity and security of experimental process, comprehensive documentation, and replicability of experimental procedures;
• Design and organize databases along project frameworks and experimental research design that support overall research management, including the monitoring and evaluation of project inputs, actions, and outcomes, as well as the subsequent integration of these databases to other databanks;

• Identify areas of improvement within the research structure using integrated management approaches in pursuit of capacity building/strengthening and the preservation of scientific rigor in research studies.
• Develop research objectives, projects and proposals.
• Conduct individual or collaborative research projects.
• Identify sources of funding and contribute to the process of securing funds.

• Act as principal investigator on research projects.
• Manage and lead a team of researchers to achieve the aims of a research project.
• Oversee and appropriately supervise and support the research activities (experiments, fieldwork etc.) of a research programme/project.
• Ensure that research results are recorded, analysed and written up in a timely fashion.
• Manage research grants in accordance with EUC Financial Regulations and the conditions of the funding body (e.g. EU, RPF etc.)
• Prepare and present findings of research activity to colleagues for review purposes.
• Submit papers to relevant peer reviewed journals and attend and present findings at relevant conferences.
• Prepare progress reports on research for funding bodies when required
• Participate in and develop external networks, for example to identify sources of funding or to build relationships for future research activities

9.2.2.3 Skills and Qualifications

Education: Level PhD in the Programme Area
Experience: at least 1-3 years relevant experience.
The candidate must possess sufficient specialist knowledge in the specific discipline to develop research programmes and methodologies*.*

9.2.2.4 EUC Pertaining Benefits

Researchers will have access to facilities which are necessary and appropriate for the performance of their duties.
- Desk, Telephone line and PC
- MS Office, SPSS, Email and Printing Rights
- Business Cards with the University Emblem and the Research Laboratory they belong to
- Full access to the library

All researchers must receive the same forms of employment documentation as other academic-related staff of the University:
• a formal contract signed by the relevant appointing authority;
• written confirmation of any changes in the terms of employment;
• job description or the generic description of the role and, where appropriate, a list of expected research goals;
• further to the completion of the contract, researchers are responsible for returning in good condition all the equipment as well as business cards that have been provided to them

9.2.3 Job Description for the Position of Senior Research Fellow

9.2.3.1 Overall Role

A Senior Research Fellow is an experienced researcher holding a leadership role in a research group/centre/institute. Post-holders are expected to undertake the role of Principal Investigator on major research projects, exhibit a strong reputation for independent research, and provide academic leadership. They are also expected to support the management activity of the relevant School/Research Centre, and contribute to the delivery of the School's/ Centre's/Laboratory's research strategy.

9.2.3.2 Key Responsibilities

- Supervise postgraduate research students
- Contribute to the development of research strategies for the relevant School/Centre/Laboratory.
- Define research objectives and questions
- Develop proposals for research projects which will make a significant impact by leading to an increase in knowledge and understanding
- Actively seek research funding and secure it as far as it is reasonably possible
- Generate new research approaches
- Review and synthesise the outcomes of research studies
- Interpret findings obtained from research projects and develop new insights
- Contribute generally to the development of thought and practice in the field
- Provide academic leadership to those working within research areas - for example, by co-ordinating the work of others to ensure that research projects are delivered effectively and to time
- Contribute to the development of teams and individuals through the appraisal system and providing advice on personal development
- Act as line manager (e.g. of research teams)
- Act as a personal mentor to peers and colleagues
- Provide advice on issues such as ensuring the appropriate balance of research projects, appointment of researchers and other performance related issues
- Identify opportunities for strategic development of new projects or other areas of research activity and contribute to the development of such ideas

9.2.3.3 Skills and Qualifications

Education: Level PhD in the Programme Area
Experience: at least 7-10 years relevant experience. Significant post-qualification research experience with a track record of high-quality publications.

Experience of successful supervision of students
Experience in a leadership role in a Research Group/Centre or Laboratory

9.2.3.4 EUC Pertaining Benefits

Researchers will have access to facilities which are necessary and appropriate for the performance of their duties.
- Desk, Telephone line and PC
- MS Office, SPSS, Email and Printing Rights
- Business Cards with the University Emblem and the Research Laboratory they belong to
- Full access to the library

All researchers must receive the same forms of employment documentation as other academic-related staff of the University:
• a formal contract signed by the relevant appointing authority;
• written confirmation of any changes in the terms of employment;
• job description or the generic description of the role and, where appropriate, a list of expected research goals;
• further to the completion of the contract, researchers are responsible for returning in good condition all the equipment as well as business cards that have been provided to them

9.3 Procedures for Appointment

9.3.1 Selection and Search Procedures

As a general rule, an appointment to the Academic Research Staff requires a search for a suitable candidate. Searches are initiated with a written vacancy announcement, such as in relevant professional journals or other publications.

The text for the announcement should be sent to the Office of the Vice Rector of Research and External Affairs and the Office of the Director of Human Resources, clearly describing the terms of employment, length of employment, identity and duration of funding sources contributing to his or her salary and line manager (the person the researcher will be reporting to). The text should be advertised for a reasonable amount of time. A copy of a current CV, a cover letter and at least one recommendation should be sought for. A short list of the potential candidates will be created based on merit and the top part of the list will be called for a structured interview with the line manager. At the end of the procedure, the line manager will report back to the Office of the Vice Rector of Research and External Affairs and the Office of the Director of Human Resources, the name(s) of the proposed Researcher.

9.3.2 Criteria for the Appointment to Rank of Research Associate

Minimum qualifications as described in Section 9.2.1.

9.3.3 Criteria and Procedures for the Promotion to the Rank of Research Fellow

A Research Associate may, during the course of his/her appointment obtain, his/her PhD. In such cases, the employee (provided that he/she fulfills the work experience as described in Section 9.2.2) is promoted to the rank of Research Fellow. If the funding source that sponsors the program the researcher is assigned to accounts for a pay rise this is immediately applied.

9.4 Honorary Research Staff

The work of Research Centers is enhanced by the involvement and collaboration in the Research Centers' activities of personnel who are not employees of the University. To recognise the association, EUC may confer an honorary title to such individuals during the period of their association. An honorary title may not be conferred on an employee of EUC.

The title to be conferred will depend on the level of distinction and qualification of the candidate. Applications should come from the Dean of the School with:

- a copy of the person's CV
- a citation that should include:
    - a description of contributions to teaching
    - research being undertaken with academic staff as evidenced by joint publications/research projects and research grants or contracts being held jointly or a significant involvement in industry/academic joint activities within the College
    - rationale for offering the association
    - the start date and end date of the association

Honorary titles are intended to recognise ongoing attachments and are awarded for a fixed term, normally up to three years in the first instance. No monetary honorarium is associated with the offer.

The honorary research titles that can be awarded are:

9.4.1 Honorary Principal Research Fellow

Will have made an outstanding contribution to teaching and research

9.4.2 Honorary Senior Research Fellow

Extensive research experience required, the quality of which is determined by refereed publications, invitations to speak at conferences, hold an established national reputation and a known or developing international reputation. Have the ability to attract significant external research funding. Will usually lead a team of other research staff, possibly drawn from several disciplines

9.4.3 Honorary Research Fellow

Proven ability of high quality research, evidenced by authorship of a range of publications. Capable of attracting external research funding. May be required to undertake project management and/or supervise teams and other research staff; expected to provide expert advice and guidance to others

9.4.4 Honorary Research Associate

Required to produce independent original research and to take initiatives in planning of research.

9.5 Intellectual Property Rights

All IP generated throughout the employment of an Academic Research Staff Member belongs to EUC. In such cases that the Researcher is employed in a project that assigns explicit IP rights (e.g. an EU funded project) then the rules as set out by the funding agency are followed.

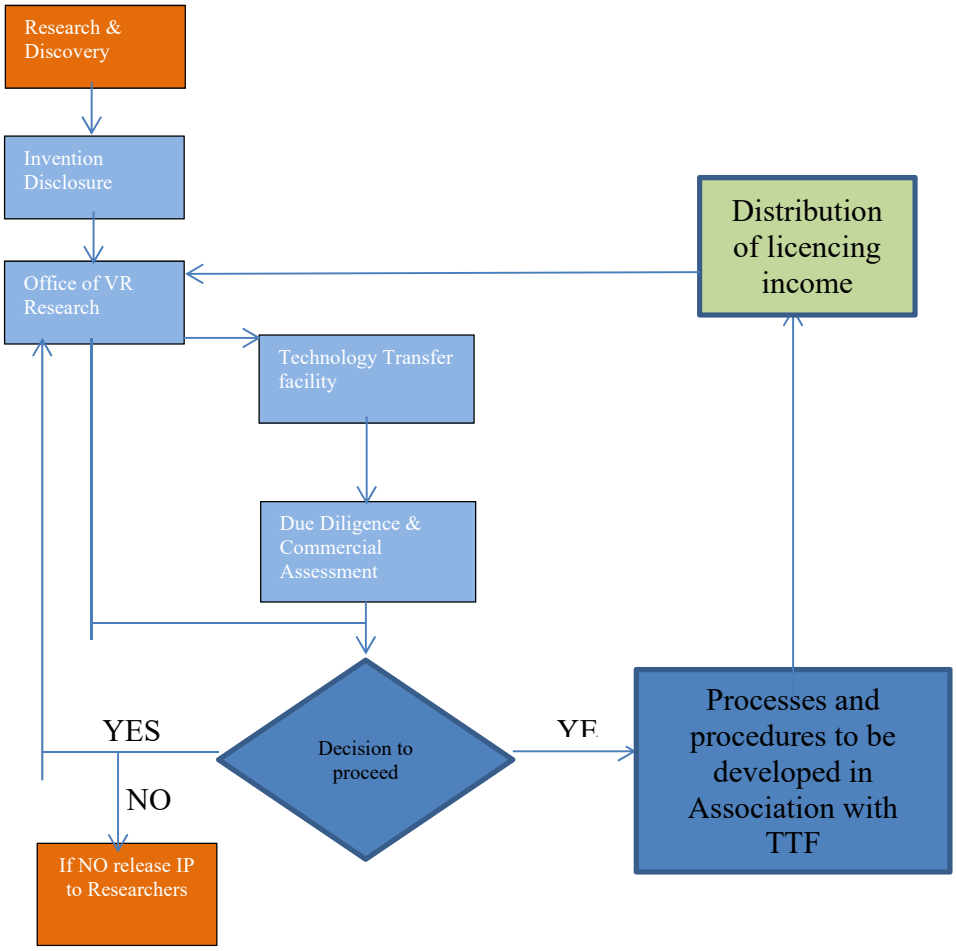
Honorary Research Staff may be required to assign the rights to any IP they create in the course of their academic activities to EUC. EUC may have obligations to organisations which are funding the research (e.g. an EU funded project) in question which it will not be able to honour without such an assignment of rights being in place. Associates are treated as if they were EUC Employees for the purposes of revenue sharing.

9.6 Involvement of Research Staff

Wherever possible, Academic Research staff should be encouraged to take part in university decision making processes, for example by inclusion in relevant departmental committees. Where appropriate, researchers should be included at University level, for example as representatives in working groups and staff consultation exercises.

Appendix A:

A Technology Transfer Process Map – to be completed when the TTF has been established.



Appendix B:

Invention Disclosure Guidelines

Invention Disclosure Form - Example

An Invention Disclosure Form (IDF) is designed to determine the basic facts relating to an invention, design, or copyright material. It is a way of capturing an invention and establishing who the inventors are, what the invention is, who is funding it, what the anticipated product/ market is and initiate Intellectual Property (IP) due diligence. Information on the following aspects of an invention should be included in an Invention Disclosure Form.

1. Descriptive Title of the Invention.
2. Who was involved? Please specify for each individual who contributed, invented or authored (if software):
    a. Their names and if any are foreign nationals;
    b. Who their employer is; are any contracts or arrangements in place?
    c. What they contributed to the development of the technology (e.g. came up with the original idea; designed experiments; carried out experimental work; wrote code)
3. Detail of your invention:
    a. What do you think your invention is?
    b. What will your invention be used for?
    c. What are the advantages of your invention and how does it improve on the present situation?
    d. What is new about your invention?
    e. How and why does it work? What is the science behind the invention
    f. Are there any other uses of the invention?
4. Interest from external organisations and their details.
5. Information on published literature (including patents) relevant to your invention?
6. When and where the invention was first conceived?
7. What are your future plans for developing the technology?
8. Who have you told about the invention, when and where?
9. When did you first describe the invention in writing or electronically?
10. Publications, abstracts, conferences to date.
11. Publication and conference plans.
12. Funding information (comprehensive), e.g including third party support, Material Sales or Transfers, patient consents.

    For inventions that include software, please provide the following additional information.

13. Application name and version number.

14. For source code developed by the researchers identified in question 2 above, include: source files used, programming languages, development tools, copyright protection in source code.
15. For new versions, include: source files changed, added or removed since the previous version, documentation required for others to use, if the source files have been distributed outside the university, and in what form, and are the source files available as a web-download – inc. URL and terms under which the download is available.
16. For other source files or libraries that are required to build the software application (external software), list the following: all external software required to use the application; who owns that software, how was the software obtained, licence terms or FOSS – name of the licence.

Appendix C:

Suggested Revenue Sharing Scheme

The EUC will share royalty income with employees and/or students involved in producing Disclosable Work whose exploitation generates revenue for the EUC. Payments are made at the Organisation's sole discretion, but the EUC will normally share royalty income in accordance with the table below. This may be either as a lump sum or as royalty income over a period of time.

Table C1

Net Revenue	Allocated to the Creator/s	Allocated to the EUC Central Budget	Allocated to the Creator'/s School of Study or Department Budget	Allocated to Support the TTF
100%	50%	20%	20%	10%

Appendix D

D1. Points accumulation from Research

Table D1 details the evaluation categories which will be used for the calculation of research points allocated to EUC researchers. The table has been constructed taking into account the following:

1. The points awarded are based on the evaluation of research accomplishments, not on the estimation / calculation of hours spent during the implementation of a research activity.
2. A research accomplishment is any research-related activity which strengthens the research portfolio and enhances the research esteem of a researcher in particular, and the EUC in general
3. It is apparent that specific research accomplishments cannot be evaluated in a similar manner across the range of research disciplines. Therefore, the following table is implicitly "averaging" the weight of these accomplishments, so that the scheme can be operational and fair.
4. The term "national", when used in association with a conference, refers to one which is local in nature (i.e. only researchers from Cypriot Universities and other Cypriot research establishments participated in it).
5. The term "international", when used in association with a conference, refers to one which is international in nature (i.e. researchers from Universities and other research establishments from at least two countries participated in it).
6. The term "national", when used in association with a publication refers to one published by a Cypriot university or other Cypriot academic publishing house.
7. The term "international", when used in association with a publication refers to one published by an international university or other international academic publishing house.

Where a publication of any type (conference, journal, book chapter, monograph, textbook, book, or other) concerns two or more authors, the following points' calculation rules will apply: For cases up to (and including) two (2) authors, full points are awarded to the author in consideration. For each additional co-author (three (3) authors or more), a deduction of 2 points will be implemented on the full points' allocation for the category considered. The minimum points that an author will be awarded cannot be smaller than 50% of the full points' allocation for the category considered.

Table D1

Points	Conferences	Journals	Books	Research Projects	Other*
5	1. Presentation of poster / article in national conference (refereed) 2. Presentation as invited keynote speaker (refereed national conference)			1. Unsuccessful submission of funded research proposal in national / international organization (research partner)	Member of scientific / conference organizing committee (national / international)
10	1. Presentation of refereed poster / article in international conference (refereed) 2. Presentation as invited keynote speaker (refereed international conference) 3. Editor of national conference proceedings (refereed)	1. Publication of refereed journal article (journal not in ISI / Scopus / ACM / IEEE/etc.) 2. Editor of refereed journal special issue (journal not in ISI / Scopus / ACM / IEEE/etc.)	Publication of refereed book chapter (national)	1. Unsuccessful submission of funded research proposal in national organisation (project coordinator)	General Chair or Program Chair of refereed national conference
15	1. Editor of international conference proceedings (refereed)		Publication of refereed book chapter (international)	1. Unsuccessful submission of funded research proposal in international organization (project coordinator)	General Chair or Program Chair of refereed international conference

Table D1 (continues)

Points	Conferences	Journals	Book Chapters / Editors	Research Projects	Other*
20		1. Editor of refereed journal special issue (journal in ISI / Scopus / ACM / IEEE/etc.)	Editor of refereed book / book series		
25		1. Publication of refereed journal article (journal in ISI / Scopus / ACM / IEEE/etc.)			

* For these categories only 50% of the points will be accumulated

D2. Points accumulation from Research / Department of Arts

Due to the nature of the research conducted in the Department of Arts, Table D2 has been produced to address the research output of the Department. For all other research outputs such as journal papers, conferences, books, etc. the European University Cyprus' "Points' accumulation" table given in section D1 must be followed.

Table D2

Points	Other				
	Performance /Exhibition (Artist		Creative works		Workshop/Seminars/Festivals /Competitions/ Broadcasts/Residencies
	Music	Graphic Design/Visual Arts	Music	Graphic Design/Visual Arts	
5	**A01** Performance - National level (partial performance)	**A02** Participation in local group exhibition	**A03** Composition for up to 4 musicians		**A04** • National Performance or Broadcast of a composition/arrangement • Adjudication of Competition • Invited workshop / art lecture in national conference/festival
10	**A05** Performance - International level (partial performance) Part of ensemble studio recording/ less than 3 tracks	**A06** Participation in international group exhibition	**A07** Composition from 5-10 musicians	**A08** Publication design (national/international) - booklets covers	**A09** • International Performance or Broadcast of a composition/arrangement • Competition Finalist • Invited workshop / art lecture in international conference/festival • Invited Artist (Workshop)
15	**A10** Performance - National level (entire concert) Performance with Large Ensemble Part of ensemble studio recording/ more than 3 tracks	**A11** Editor of exhibition catalogue (national/international)	**A12** Composition for 10 musicians and above	**A13** Publication design (international) - books and exhibition catalogues	**A14A** • Competition Winner • Invited Artist (Festival – duration more than three days) **A14B** Chair of international arts/music festival

20	**A15** ~~Performer –~~ International level (entire concert) / Solo studio Recording (CD) less than 3 tracks	**A16** ~~Participation in~~ national solo exhibition	**A17** ~~Composition~~ for Symphonic Orchestra	**A18** ~~Commissioned~~ work by government/museum/ other cultural institution	**A19** ~~Participation in funded~~ international residency
25	**A20** Solo studio Recording (CD) more than 3 tracks	**A21** Participation in international solo exhibition	**A22** Publication of a composition (Score/CD) by an International Music Publishing House /Recording company	**A23** Project: Curation of national / international exhibition	

European University Cyprus

INTERNAL REGULATION ON

SABBATICAL LEAVE

73rd Senate Decision: 22 May 2020

Policy on Sabbatical Leave

1. Purpose

The objective of a Sabbatical Leave is to increase a faculty's value to the University and thereby improve and enrich its programs. Such leave is not regarded as a reward for service or as a vacation or rest period occurring automatically at stated intervals. Sabbatical leaves are granted for planned travelstudy, formal education, research, writing of papers, monographs and books or other experience of academic value.

A Sabbatical Leave, as distinguished from a terminal leave, a leave without compensation, or a leave for reasons of health, is defined at EUC as a leave for encouraging faculty members to engage in scholarly research and international networking that will increase their scholarly achievement or their capacity for service to the University internationalization policy. A Sabbatical Leave is not granted for taking regular academic or other employment with a financial advantage elsewhere.

2. Terms

A Sabbatical Leave is granted to a faculty member, beginning September 1, for the usual teaching terms (i.e., September to June complete) of one academic year (two semesters). However, as an alternative, a faculty member who has qualified for a full year of Sabbatical Leave may apply for such sabbatical to be divided into two terms falling within a six-year period, each such term representing one semester.

The cost of replacing a faculty member during Sabbatical Leave is to be kept as low as possible by arrangements such as rotating courses, employing part-time academic staff, and making internal adjustments in the academic Departments concerned. In all cases, the relevant School must give the final approval for the implementation of the Sabbatical Leave in a particular semester so that the smooth operation of the academic programs offered by the School is not affected by severe staff shortage.

3. Procedure for Granting a Sabbatical Leave

Application for a Sabbatical Leave should be made by the faculty member and submitted to the Department Chairperson no later than December 1, preceding

the academic year in which the leave will be carried out. The faculty member should submit the completed application form which will include a plan of activities during the Sabbatical Leave. Letters of acceptance from the institutions which will host the faculty member during his/her leave should also be attached.

The Department Chairperson must forward the application with an accompanying recommendation to the appropriate Dean by the following December 15. The recommendation shall include a statement of the proposed method of handling the normal duties of the faculty member while on leave.

The Dean must forward each application and the accompanying recommendation of the Department Chairperson, together with the Dean's own recommendation, to the Office of the Rector by January 15.

The Office of the Rector will forward all applications to the Chair of the Ad-hoc Committee which will evaluate the proposals. The Ad-hoc Committee will consist of the Vice-Rector of Research & External Affairs (chair), the Vice-Rector of Academic Affairs and the Director of Human Resources. The evaluation procedure for the awards is described in the following section.

4. Evaluation Procedure for the Sabbatical Awards

The Committee will decide each year the number of new sabbatical awards which will be made to the whole University. This will not be less than 3% of EUC faculty in the current academic year.

The Committee will determine the number of new sabbatical awards which will be made to each School in the current academic year. To do this, the Committee will consider the proportion of sabbatical leave awards which have been made to faculty members of each School of the University in the last three years including the current academic year. The Committee will ensure that with the new awards this proportion for each School does not deviate by more than 20% from its proportion of faculty members. Deviations exceeding 20% from these proportions may be allowed in the first three years of the implementation of the policy (starting academic year: 2020-21).

Once the number of new sabbatical awards to each School is determined, the Committee will select the applicant(s) from each School who have the highest number of points as calculated with the scheme described in Appendix A (below).

Applicants will be notified about the outcome of their application by March 15.

5. Sabbatical Leave and Sponsored Research

A faculty member is entitled to supplement the salary provided by the University during the period of leave with funding provided by an institutional, national or international source for academic activities.

6. Eligibility

Eligibility for a Sabbatical Leave is limited to full-time faculty members who have achieved tenure rights and who have completed six years of full-time service as faculty at European University Cyprus. In general, at least six years must elapse between consecutive sabbaticals.

At the end of a sabbatical leave, the faculty member should forward to the Department Chairperson and the Dean copies of a report on activities undertaken during the period of the leave.

Chairs of Departments, Deans of Schools, Vice-Rectors and the Rector are not eligible for a sabbatical leave award during their term of office.

Appendix A

Point calculation system for Sabbatical Awards

This Appendix describes the point calculation system which will be used for selecting the candidates in each School which will be awarded a Sabbatical Leave (see section 4).

The point calculation system awards points by considering the research activity of faculty in the past 5 years.

- Scopus document in the past 5 years: 30 points
- Scopus citations to documents published in the past 5 years: 2 points per citation
- Successful research proposals–National:

Principal investigator (PI) of the whole proposal	Local Coordinator of the proposal	Participant in the proposal
50 points	20 points	10 points

- Successful research proposals–European Union

Principal investigator (PI) of the whole proposal	Local Coordinator of the proposal	Participant in the proposal
100 points	40 points	20 points

Example: A faculty member published 3 Scopus papers in the past 5 years which have 10, 1, 3 Scopus citations respectively. He/she submitted one national proposal as a PI. What are his/her total points?

The total points are calculated as follows:

Papers: 3*30=90pts

Citations: (10+1+3)*2=28pts

Proposals: 50=50pts

Total points 90+28+50=168pts

Erasmus Policy Statement

International engagement is a key educational strategy for improving the quality of teaching and research at European University Cyprus (EUC), in turn enhancing the University's overall reputation.

Following its award of University status in 2007, EUC has advanced to become one of the leading universities in Cyprus and has developed a network of international partnerships/networks with EU and non-EU states. EUC is a comprehensive University, which comprises five Schools (Medicine, Sciences, Law, Business Administration and Humanities, Social and Education Sciences) and a Distance Education Unit. EUC has one of the three Schools of Medicine and the only program in Dentistry on the island. Research activity at the University has increased by a factor of around 10 in the last decade, as measured by publications in peer-reviewed journals and external research funding. The University hosts the only Microsoft Innovation Center in Cyprus, one of 110 in the world. EUC is also one of around 500 organizations in Europe which have been awarded the EU 'HR Excellence in Research' badge.

The Partnerships and Networks of the University have been chosen on the basis of:

a. Proven innovative capacity,
b. Confirmed efficacy of knowledge and experience,
c. Demonstrated commitment to 'quality service' for students and society,
d. The significant competence and skills they bring to the overall workforce,
e. Pursuit of excellence, in line with its academic mission and strategic priorities.

The University has developed a Strategic Plan, following consultations with academic staff, students, the senior management team and members of the University Council. Based on the founding principle of being an open university, EUC promotes internationalization in accordance with its distinctive qualities.

Moreover, EUC has entered into international cooperation agreements with the EU, Mediterranean, Pacific Rim and Eurasia regions that are at the forefront of Cyprus' international strategy. Meanwhile, EUC promotes internationalization within local communities by taking advantage of the state's geographical location in the Eastern Mediterranean. The Office of the Vice Rector of Research and External Affairs, in close cooperation with the Committee on International Relations, Programs and Mobility which includes representatives from all Schools of the University and key Administrative Departments, drives EUC's internationalization strategy, fostering network memberships and partnerships and promoting international mobility for students and staff. More specifically, part of the EUC's Internationalization Strategy is to offer its staff and students a strong platform for international recognition, research collaboration and joint transdisciplinary programs, workshops and student opportunities in Europe and the rest of the world. It does this through membership/partnership with principal institutions, which, consequently, have an immense range of target groups.

The EUC internationalization strategy identifies seven key drivers for the institution to continue to be amongst the leading universities of the region:

1. Embed internationalization into EUC core activities,
2. Attract the best students, academics and researchers through sustainable recruitment processes,
3. Develop new forms of cross-border synergy,
4. Increase and sustain high quality strategic academic and professional partnerships/networks,
5. Build learning and teaching mobility more systematically into curricula,
6. Continue to internationalize the curriculum,
7. Cultivate our international alumni to develop a strong network of EUC graduates around the world, contributing to and benefitting from their close connection with our university.

There is currently a remarkable diversity of international partnerships in place across the University. The aim is to develop at least three prominent international partnerships per year. These will be expanded at a number of educational levels and will combine research, learning and teaching.

As the global research and innovation scene is changing rapidly, EUC has adopted a strategy aiming at:

a. Building and promoting a knowledge triangle (education, research and society/business),
b. Efficient mechanisms for supporting excellence.

Synergy with EU and non-EU countries is accomplished through a number of major university memoranda. Special weight is given to joint activities, which are important for the development of new programs, particularly at graduate level. Many bilateral and multilateral projects, including EU funded projects, identify EUC as an internationally acclaimed institution both in teaching and research. EUC has participated in more than 250 projects in recent years, funded by a number of national, EU and international programs and organizations. Current sources of funding include Horizon 2020,

Erasmus+, Directorates General of the European Commission, the European Space Agency, the Cyprus Research and Innovation Foundation, and other governmental bodies.

Whilst working to promote teaching and training, the EUC strategy for the organization and implementation of international projects focuses on:

1. A cooperation model for development, which aims to meet regional needs.
2. An educational strategy generated by the academic community to meet the needs of EU and non-EU institutions.
3. Training for lecturers and professionals from EU and non-EU countries.
4. Carrying out cutting-edge joint teaching programs with organizations, research groups and researchers.

The EUC strategy places exceptional emphasis on promoting the development of joint interdisciplinary programs. EUC maintains excellent relations with domestic and international academic institutions and has established regular cooperative mechanisms for personnel exchanges and/or running joint projects that perform innovative education activities. The faculty members have accumulated rich international experience by paying visits to, or teaching in, foreign universities, teaching in joint programs and participating in international conferences. In addition, every year EUC sends an increasing number of undergraduate and graduate students abroad. A vast number of distinguished scholars, domestically and internationally, serve as honorary, visiting or guest professors at EUC.

Under the internationalization strategy and, primarily, within the “EU Modernization Agenda for Higher Education”, EUC energetically pursues major multilateral projects through mobility and cross-border synergies. As synergies bring excellence, they also link research, teaching and learning programs with business. Meanwhile, they provide staff and students with opportunities for a dynamic contribution in multidisciplinary projects both at regional and international level. Consequently EUC, by adopting the priorities of the “Modernization Agenda”, has a strong regional and international impact on the networks/partnership programs offered in all disciplines.

This successful cross-organizational synergy has been realized through, inter alia:

a. Incentives for multidisciplinary, and
b. Reduction of regulatory and administrative barriers to affiliations between EUC and public-private stakeholders.

However, more is needed to maximize the contribution of Europe's higher education systems to innovative, sustainable and inclusive growth, and modernization of their policy objectives is therefore needed. Thus, EUC has adopted the five priorities of the “Modernization Agenda” so as to remain an attractive institution and partner of choice.

Additionally, EUC governance fosters efficient and up to date methods of management, based on an accurate appraisal of the educational environment in which universities operate, in Cyprus and abroad. In addition to the expected impact, we intend to continuously accomplish positive transformation as a result of the “Modernization Agenda”:

1. In strengthening quality through mobility and cross-border actions, some matters are prioritized, whilst others occur organically,
2. The systems by which Departments and Schools accomplish specific goals differ noticeably. Some aspects, for instance, of the “Modernization Agenda” seem simpler than others. Frequently, when procedures are examined in isolation, they appear to be the logical way to accomplish the priorities, but complexities emerge from the interactions between the actors. Some of these interactions hide divergences in the priorities of different actors,
3. One essential reason that the knowledge triangle is of pressing concern is the perpetuation of a severe economic crisis. Despite the fact that the triangle promises many benefits for improving quality and efficiency, its strategic execution can be very convoluted, particularly for business actors, due to problems of cost.

EUC will continue to expand and enhance priorities within the “Modernization Agenda” to further:

a. Advance and improve international exchange and cooperative arrangements,
b. Promote internationalization in parallel with the ‘knowledge triangle’
c. Carry out cutting-edge joint research with EU and non-EU organizations, groups and researchers,
d. Accept first-class students and faculty,
e. Integrate international perspectives into all study and research programs and administrative support matters.

IS 2010

Curriculum Guidelines for Undergraduate Degree Programs in Information Systems

Association for Computing Machinery (ACM)
Association for Information Systems (AIS)

Heikki Topi
Joseph S. Valacich
Ryan T. Wright
Kate M. Kaiser
J.F. Nunamaker, Jr.
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Leadership in Sponsoring Organizations

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Education Board

AIS

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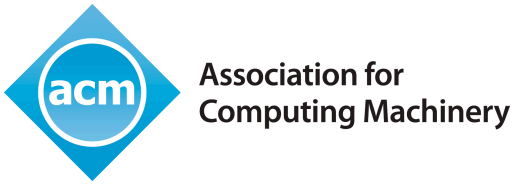
SPONSORING ORGANIZATIONS

Association for Information Systems
December 2009



Association for Computing Machinery
November 2009

ENDORSING ORGANIZATIONS

After receiving the approvals from the sponsoring organizations, the committee is pursuing endorsements from other computing organizations. Once the endorsements have been finalized, this document will be updated.

FOREWORD

The IS 2010 report is the latest output from model curriculum work for Information Systems (IS) that began in the early 1970s. Prior to this current effort, the most recent version of the IS undergraduate model curriculum is IS 2002 (Gorgone *et al.,* 2003), published in early 2003. IS 2002 was a relatively minor update of IS'97 (Davis *et al.*, 1997). Both IS 2002 and IS '97 were joint efforts by ACM, AIS, and DPMA/AITP (Data Processing Management Association/ Association of Information Technology Professionals). IS'97 was preceded by DPMA'90 (Longenecker and Feinstein 1991) and ACM Curriculum Recommendations 1983 (ACM 1983) and 1973 (Couger 1973). IS 2002 has been widely accepted and it has also been the basis for accreditation of undergraduate programs of Information Systems. This report represents the combined effort of numerous individuals and reflects the interests of thousands of faculty and practitioners. It is grounded in the expected requirements of industry, represents the views of organizations employing the graduates, and is supported by other IS-related organizations.

This report is one of the undergraduate curriculum volumes that have been produced for the core computing disciplines (see the CC2005 Overview Report; Shackelford 2005). In addition to IS 2010, curriculum recommendations exist for computer science (CS 2008), computer engineering (CE 2004), software engineering (SE 2004), and information technology (IT 2008) (see www.acm.org/education/curricula-recommendations). All of these reports are under the control of separate committees; updates are published as they are completed.

All aspects of the global computing field continue to face rapid and frequent change. As a result, university-level Information Systems curricula need frequent updating to remain effective. Since most academic units have mechanisms to maintain currency of curricula, what is the role of professional society curriculum committees? If an IS academic unit were providing graduates solely to local business and government, the input on program contents could be derived from representatives of local organizations that hire the graduates. However, local employment is not the sole objective for undergraduate majors in Information Systems. Students from IS programs accept jobs in widely dispersed geographic areas. Therefore, the availability of curriculum models enables local academic units to maintain academic programs that are consistent both with regional, national, or global employment needs and with the common body of knowledge of the IS field. The first IS curriculum models were introduced in the early 1970s. This early work was followed by model curricula developed by ACM and AITP. Details of this history are reviewed in Appendix 1: Background of IS Curricula and Related Disciplines.

Professional society curriculum reports serve several other objectives. One important use is to provide a local academic unit with rationale to obtain proper resources to support its program. Often, the administration at a local institution is not aware of the resources, course offerings, computing hardware, software, and laboratory resources needed for a viable program. The administration may be unaware of the specialized classroom technology, library resources, or laboratory assistants essential for proper education of IS undergraduates. Finally, the administration might not recognize the rapid turnover of knowledge in the field and the need for resources to support constant retooling of faculty. Curriculum reports provide recommendations in these resource areas as well as recommended content for the body of knowledge to be taught.

This document has incorporated the comments and suggestions based on feedback from senior scholar, numerous panels, presentations, and solicitation, in many forms, to the IS committee at large. We are very grateful for these contributions, which have significantly improved this report. Further, we encourage you to get engaged in the ongoing curriculum development process on

blogsandwikis.bentley.edu/iscurriculum that has been launched in the context of this curriculum revision project. We believe these efforts can be truly successful only if the broad global IS community participates widely. Incorporating IS 2010 into a wiki will allow the IS community to continually contribute to this now dynamic document.

The editors of IS 2010 thank those who have helped in this project. We also acknowledge with gratitude the permission we received from Communications of the AIS to include material in this report from the two CAIS papers that the task force published during the course of this project (Topi *et al.*, 2007; Topi *et al.*, 2008). We hope this ongoing cooperative curriculum development effort will continue to serve your needs. We are interested in your input and encourage you to let us know how you are using these materials and how they might be improved.

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EXECUTIVE SUMMARY

IS 2010 is the latest in a series of model curricula for undergraduate degrees in Information Systems. It builds on the foundation formed by this earlier work, but it is a major revision of the curriculum and incorporates several significant new characteristics. IS 2010 is the third collaborative effort by ACM and AIS. Both organizations have worldwide membership, and therefore, IS 2010 includes elements that make it more universally adaptable than its predecessors. IS 2010 is not directly linked to a degree structure in any specific environment but it provides guidance regarding the core content of the curriculum that should be present everywhere and suggestions regarding possible electives and career tracks based on those.

There are several reasons motivating this revision. The work leading to the previous significant revision, IS'97, took place more than 10 years ago, and in a rapidly changing field this alone is an important reason to re-evaluate the curriculum. There has been a great deal of change in technology and industry practices, including the globalization of IS development processes, introduction of Web technologies, emergence of a new architectural paradigm, widespread utilization of large-scale ERP systems, ubiquitous availability of mobile computing, and broad use of IT control and infrastructure frameworks, such as ITIL and COBIT. This curriculum is also introduced after a period when the interest in studies in Information Systems has significantly declined, and the field is attempting to reverse this trend. This curriculum revision represents an effort to re-evaluate the core principles of the discipline through a very careful specification of the degree learning outcomes. Finally, new social networking technologies made it possible to attempt to include the IS community as broadly as possible.

This revision has four broad key characteristics that have shaped the outcome significantly. First, the curriculum reaches beyond the schools of business and management. Previous versions of the IS curriculum have been targeted to a typical North American business school; this model curriculum is, however, guided by the belief that even though business will likely continue to be the primary domain for Information Systems, the discipline provides expertise that is critically important for an increasing number of domains. Second, the outcome expectations of the curriculum have been very carefully re-evaluated and articulated first in the form of high-level IS capabilities and then in three knowledge and skills categories: IS specific knowledge and skills, foundational knowledge and skills, and domain fundamentals. Third, the curriculum is structured so that it separates the core of the curriculum from electives with the intent of supporting the concept of career tracks. Finally, the design of this curriculum includes enough flexibility to allow its adoption in a variety of educational system contexts.

The high-level IS capabilities that the curriculum specifies as the highest level outcome expectations are as follows:

- Improving organizational processes
- Exploiting opportunities created by technology innovations
- Understanding and addressing information requirements
- Designing and managing enterprise architecture
- Identifying and evaluating solution and sourcing alternatives
- Securing data and infrastructure, and
- Understanding, managing and controlling IT risks.

These high-level capabilities are translated into knowledge and skills in three categories:

1. IS specific knowledge and skills
    a. Identifying and designing opportunities for IT-enabled organizational improvement
    b. Analyzing trade-offs
    c. Designing and implementing information systems solutions, and
    d. Managing ongoing information technology operations
2. Foundational knowledge and skills
    a. Leadership and collaboration
    b. Communication
    c. Negotiation
    d. Analytical and critical thinking, including creativity and ethical analysis, and
    e. Mathematical foundations
3. Domain fundamentals
    a. General models of a domain
    b. Key specializations within a domain and
    c. Evaluation of performance within a domain.

The curriculum is designed to educate graduates who are prepared to enter the workforce equipped with the knowledge and skills specified in these three categories. As discussed above, it separates the core from career track electives and includes seven core courses: 1) Foundations of Information Systems, 2) Data and Information Management, 3) Enterprise Architecture, 4) IS Project Management, 5) IT Infrastructure, 6) Systems Analysis & Design, and 7) IS Strategy, Management, and Acquisition. It is not possible to offer a complete collection of career track electives in a model curriculum document, but we include a number of elective course descriptions as examples. Notable changes in the included courses are as follows: a) application development is no longer included in the core of the curriculum; b) data networking and computer architecture are covered at a higher level of abstraction in an IT Infrastructure course; c) enterprise architecture and IS project management are now part of the core; d) the personal productivity tools course has been removed from the curriculum, and e) the prerequisite structure has been simplified. Notably, both data & information management and systems analysis & design have maintained their central roles in core of the curriculum. In addition to the core curriculum, we provide some examples of possible career tracks and career track electives; in addition, we illustrate the use of the model curriculum in three different academic contexts with varying general degree requirements.

The task force believes that the outcome expectations, structure, and content of the new curriculum make it significantly more broadly applicable than the previous IS model curricula were. We hope that this document demonstrates that Information Systems as a discipline can make significant contributions to a number of domains, including but not limited to business, and that its core areas of expertise are highly valuable and even essential for the best practices and further advancement of a variety of collaborating domains.

IS 2010 TABLE OF CONTENTS

1. USE OF THE IS 2010 CURRICULUM REPORT

The Information Systems (IS) undergraduate model curriculum report has several intended classes of users who have a stake in the achievement of quality IS degree programs:

- academic executives to whom the Information Systems program reports
- academic heads responsible for Information Systems programs
- accrediting bodies
- Information Systems faculty
- non-Information Systems faculty in the school or college where the Information Systems program resides
- information systems practitioners
- students in Information Systems programs

In this section, the uses of the report by these intended stakeholders are described and its value explained. First, a detailed explanation of resources is discussed. This includes information about faculty needs, classroom needs and computing needs followed by responsibilities for the stakeholders.

For Academic Executives to Whom the Information Systems Program Reports

The IS discipline contributes significantly to several domains, including business and government. Information systems are complex systems requiring both technical and organizational expertise for design, development, and management. They affect not only operations but also the organization's strategy.

The nature of this rapidly changing field requires a unique set of resources. The minimal level of resources required to provide a viable undergraduate degree program in Information Systems is outlined below. Specifics of the resource requirements are detailed elsewhere in the document. Additional resources are necessary to support the service courses provided by the IS faculty to other academic units of the university.

1. Faculty Resource Requirements

   The number of faculty depends upon the number of students majoring in Information Systems. At a minimum, a critical mass of faculty is needed to provide the degree of specialization essential for the proper coverage of the curriculum. The interests, qualifications, and scholarly contributions of the faculty members must be sufficient to teach the courses, plan and modify the courses and curriculum, and remain abreast of current developments in Information Systems. The rapid increase and change in knowledge in the Information Systems field require that faculty continuously upgrade their skills. Thus, all faculty members must remain current in the discipline. The inclusion of pertinent research would benefit both students and faculty. It is recommended that a significant part of each faculty member's workload be spent in receiving training in new technologies and acquiring new knowledge and skills. The changes in the field place heavy demands on IS faculty who are required to tailor the curriculum to meet local and regional conditions, develop up-to-date instructional

materials, and manage student projects and internships while also maintaining their own scholarly productivity in a way that is compatible with local university expectations.

2. Physical Space Requirements

Physical space requirements for the Information Systems program are often similar to those of engineering, biological and physical sciences. The facilities should include:

a. Access to specialized software (such as integrated development environments, modeling tools, etc.) either by making the software available to the students so that they can install it on their laptops or in sufficiently equipped laboratories.

b. Laboratories to provide experience in designing, installing, and running networks.

c. Project team laboratories to accommodate team projects essential to the IS program.

d. Classrooms equipped with computer projection, Internet, and local network access, and appropriate computing and software infrastructure.

3. Computing Infrastructure Requirements

Computing infrastructure consists of hardware, software, and technical support for computing and communication. Because of the need to keep abreast of the rapidly changing technology environment, Information Systems students and faculty must have access to computing facilities at least equivalent to those used in a typical organization operating within a program's domain. This is necessary to prepare the students for their profession and for the faculty to contribute to the creation of new knowledge in the field. The rate of change in technology suggests a rapid replacement cycle, with some technologies reaching obsolescence in less than 12 months. While some of the general university or school computing laboratories may meet some of the needs of Information Systems, special infrastructure resources are necessary to support the requirements of the curriculum, including systems development, network infrastructure, and other advanced and emerging technologies. It is paramount to the success of Information Systems programs that adequate technical support is provided.

For Academic Heads Responsible for Information Systems Programs

The report provides the rationale for adopting the curriculum recommendations for an undergraduate degree program in Information Systems. The curriculum recommendations are based on an assessment of industry expectations for entry-level professional employees in the Information Systems field. As discussed at a detailed level later in the report, the outcome expectations for Information Systems graduates have changed significantly with many schools increasing the emphasis on the design of domain solutions, such as the implementation of business processes using information technology. Written and oral communication skills and team skills continue to be important: graduates need to be able to interact effectively with clients and to work effectively in teams. This report gives the specific recommendations necessary to successfully implement and maintain a program in Information Systems stressing technical,

behavioral, and organizational elements. A summary of the resource requirements necessary to support a viable Information Systems program is outlined later in the document.

For Accreditation Bodies that Accredit Information Systems Programs and Others Interested in Program Assessment

Accreditation of IS programs and other processes that assess the quality of these programs require a widely accepted definition of the discipline and curriculum. This report, developed by the major professional and academic societies in Information Systems, provides the basis for the curriculum criteria employed in IS accreditation. This report provides a significantly more detailed discussion regarding educational outcomes of IS programs than the previous versions did, which is fully compatible with the recent direction in program assessment and accreditation.

For Information Systems Faculty

The IS model curriculum is intended to provide flexibility in designing IS curricula to satisfy various local requirements. IS faculty may be affiliated with schools of business, schools of public administration, schools of information science or informatics, stand-alone schools of Information Systems, or other variations. To better serve the diversity of IS programs, this model curriculum is the first IS curriculum to separate core and elective courses and explicitly acknowledge the significant local differences in the requirements for IS curricula. As a practical illustration of the flexibility this provides, we later present an IS Specific Course Matrix to provide examples of curriculum solutions that faculty can develop within the framework that this document provides.

The guidance and the structural flexibility that this curriculum provides enable faculty members to tailor and experiment with curriculum design. Based on local conditions, the desired number of core and elective courses with tailored depth of coverage for appropriate topics may be fashioned. This allows faculty to flexibly design IS curricula to meet career track expectations for graduates.

At the course level, this model curriculum continues to follow the tradition of IS curriculum recommendations and provides descriptions for core courses and a subset of key electives. These descriptions include a catalog description, learning objectives and topics for each of the courses. This material will be helpful for both individual faculty members who are working on course design and for departments that are making decisions regarding the direction their curricula should take.

For Non-Information Systems Faculty

The use of information technology is pervasive in society. The requirement of the workforce to use this technology is increasing. Users of information technology are now expected to take personal responsibility for much of what has been handled in the past by a centralized computing services unit. While many organizations provide some user training in information technology, graduates who have an in-depth understanding of the opportunities IT capabilities can provide to their organization are in a stronger position compared to their peers without this understanding. A strong, capable Information Systems program can benefit all students in a school and provide special benefits to non-majors who desire more competence in information technology and its application to their areas of interest.

IS 2010 identifies prerequisite skills needed by all students in basic personal productivity software. Students in all majors should have a working knowledge of how to effectively use software for word processing, electronic mail, Web browsing, spreadsheet modeling, database management, presentation graphics, statistical analysis, and external database retrieval. Although these skills are prerequisite and not part of the exclusive domain of Information Systems, the Information Systems faculty can provide useful competence for managing the self-study modules, course modules, and testing-out examinations for the prerequisites.

The IS 2010 curriculum specifies a general course (Foundations of Information Systems) to provide an understanding of and skills related to Information Systems suitable for all students. This course establishes a foundation for specialized courses related to functional area information systems.

Students majoring in other subjects may wish to have a minor in Information Systems. The IS 2010 curriculum defines a subset of the courses in the major suitable for a minor. The courses include IS Strategy, Management & Acquisition, Enterprise Architecture, and Data and Information Management.

For Information Systems Practitioners

The report provides a basis for practitioner interaction with IS academic units in at least three ways: to gain an understanding of the model curriculum and therefore, the competencies of the graduates of the program, to identify opportunities for enhancing the educational experience for the students (for example, guest speakers, internships, advisory board memberships, and so forth), and to enable a continuous dialogue to improve the curriculum and the educational experience of students.

For Information Systems Students

For students who are enrolled in an IS program, this report can add to their understanding of the breadth and depth of the IS field and the career opportunities. Information in this report can prepare students for discussions with academic advisors as to options and choices in the program and strategies for entering the job market. IS programs can prepare students for advanced IS studies. This can include both research-oriented and practitioner-oriented advanced programs.

Other Stakeholders

The primary audiences for this report are the stakeholders listed above. Other constituents may also find value in this report and should not be precluded. These groups include parents, secondary school guidance counselors, human resources personnel, career advisors, potential applicants and so on.

2. INFORMATION SYSTEMS MODEL CURRICULA

IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems is the latest report on the model curriculum work in the Information Systems field. The work of IS curriculum task forces began in the early 1970s and has continued for the past 30+ years. The Association for Computing Machinery (ACM) has been a major organizer for these task forces including the first efforts in the 1970s. Other organizations, including AIS (Association for

Information Systems), AITP (formerly DPMA) and IFIP (International Federation for Information Processing), have contributed significantly to model curriculum development.

IS 2010 is the third collaborative effort by ACM and AIS. Both organizations have worldwide membership. ACM has both professional and academic members in the broad field of computing. Through its Education Board, it supports a wide range of curriculum development including Computer Engineering, Computer Science, Information Systems, Information Technology, and Software Engineering. AIS, established in 1994, is primarily composed of faculty members in Information Systems. The partnership of ACM and AIS, therefore, combines the breadth of pedagogical and curriculum interests of these organizations.

Since ACM and AIS are worldwide organizations, IS 2010 includes elements that make it more universally adaptable than its predecessors. The separation of the core courses from the electives makes it easier to create curricula that both are compatible with the model curriculum and address local requirements that vary widely. IS 2010 is not directly linked to a degree structure in any specific environment but it provides guidance regarding the core content of the curriculum that should be present everywhere and suggestions regarding possible electives and career tracks based on those.

IS 2002 (Gorgone *et al.,* 2003) was a relatively minor update of IS'97, the latest comprehensive revision of the IS model curriculum. IS 2002 included new material related to the explosive growth of the Internet and electronic business, to the extent that it included a new course specifically targeted to this topic area. The previous curriculum model, IS '97 (Couger *et al.,* 1997; Davis *et al.,* 1997) was circulated in draft form in 1994 (Gorgone *et al.,* 1994; Longenecker *et al.,* 1994) and 1995 (Couger *et al.,* 1995) and finalized in 1996. Therefore, a significant revision of the model curriculum is needed and overdue. These reasons will be discussed at a more detailed level in Section 4.

The next sections present the principles guiding the curriculum revision and provide further motivation for updating IS 2002. This is followed by a review of guiding assumptions about the IS profession that helped to shape the curriculum design and evolution. A summary of key differences between IS 2002 and IS 2010 will follow. Next, the report provides a description of Information Systems as a field of academic study. The relationship of the IS courses and programs at various levels is explained. This document presents an entirely new, significantly expanded section on outcome expectations for Information Systems graduates. This is followed by a brief presentation of the curriculum architecture, the resources needed for IS degree programs, and courses shared with other computing disciplines. Finally, the report concludes by providing high-level course descriptions of the IS 2010 model curriculum and appendices for reference.

3. PRINCIPLES GUIDING THE CURRICULUM DESIGN

The key principles that guided this effort were as follows:

1. The model curriculum should represent a consensus from the Information Systems community.

2. The model curriculum should be designed to help Information Systems programs to produce competent and confident entry-level graduates well suited to workplace responsibilities or further studies of Information Systems.

3. The model curriculum should guide but not prescribe. Using the model curriculum guidelines, faculty can design their own courses and schools can design their own programs.

4. The model curriculum should be based on sound educational methodologies and make appropriate recommendations for consideration by Information Systems faculty.

5. The model curriculum should be flexible and adaptable to most Information Systems programs.

6. The model curriculum is not restricted to a specific domain; all Information Systems programs are, however, linked to some domain.

7. The model curriculum has a core of content that is common to all Information Systems programs internationally.

8. The model curriculum has career targets that require both core and elective content.

9. The model curriculum does not focus on specific issues related to pedagogy. This is not a reflection of our understanding of the importance of pedagogical decisions; we simply believe that these highly significant issues are outside the scope of this document.

4. MOTIVATION FOR REVISING IS 2002

There are several factors motivating the IS curriculum revision. This section will provide an overview of the reasons why it was critically important for the IS community to go through the curriculum revision process.

The first, and most obvious, reason is the time elapsed since the previous revision. As discussed above, the last comprehensive undergraduate curriculum revision was IS'97 (Davis *et al.,* 1997). Most of the work done on IS'97 was completed in the mid-1990s, making the curriculum elements closely linked to a specific set of technologies quite antiquated.

Second, there has been a great deal of change in technology and industry practices. This major contextual change has several factors driving it, including:

1. Complex globally distributed information systems development – The skills needed by IS graduates have to work globally changed significantly. Increasingly, many IS jobs require skills in working with colleagues and development team members around the world. Further, for business school graduates capabilities in the management of globally distributed development resources are increasingly in demand.

2. Web technologies and development – Mature modeling, management and development platforms for the Web environment have become a core part of IS development.

3. Emergence of a new architectural paradigm – Service-oriented architecture, Web services, software-as-a-service, and cloud computing are all important elements in the new way of organizing the fundamental architecture for computer-based systems and solutions that is gradually becoming the dominant paradigm of organizational computing.

4. ERP/packaged software – Information systems and business processes have become closely integrated, and increasingly often, core infrastructure applications are based on large-scale enterprise systems so that the focus has shifted from development to configuration and implementation.

5. Ubiquitous mobile computing – Global organizational life using a variety of devices has become dependent on mobile and ubiquitous platforms.

6. IT control and infrastructure frameworks – Frameworks and standards such as COBIT, ITIL, and ISO 17799 have become very important sources of guidance for IT/IS practices in organizations through governance models.

The professional context in which our graduates do their work has changed considerably over the past decade, and curriculum needs to reflect this change. Not only should curriculum cover the new concepts but also the new model they collectively specify for organizational computing has a profound impact on the capabilities that Information Systems graduates need.

Third, the interest in the study of IS as a field has dramatically declined among students at most institutions in North America, Western Europe, and Oceana. Therefore, it is imperative that the IS community as a whole addresses this problem from several different perspectives, including curriculum design. The response to the enrollment crisis cannot only be based on curriculum changes; however, an outdated curriculum can be a sufficient reason to turn a prospective student away from the discipline. For other areas such as India, China, Eastern Europe, and Russia where there is growth, the dominant form has been engineering and scientific rather than business-oriented; therefore, suggests curriculum design that meets global needs.

Fourth, the IS discipline must address its core principles and values within and through the curriculum. By doing so, the importance of clearly articulating the identity of the IS discipline can be established and strengthened. The recent approval of the model curriculum for the emerging IT discipline has made this reason particularly important.

Finally, the revision process was seen as a mechanism to engage the IS community in a more comprehensive way than was possible during earlier update efforts. The task force believed that the Internet and, specifically, Web 2.0 technologies would provide a strong set of technical capabilities to enable and encourage collaboration among IS academics and practitioners around the world.

Of course, this list cannot be inclusive of all motivations for the curriculum revision. We hope, however, that these issues stress the importance of substantially and systematically overhauling the current curriculum.

5. GUIDING ASSUMPTIONS ABOUT THE INFORMATION SYSTEMS PROFESSION

In conceptualizing the role of information systems in the future and the requirements for IS curricula, several elements remain important and characteristic of the discipline. These characteristics evolve around four major areas of the IS profession and therefore must be integrated into any IS curriculum:

1. IS professionals exist in a broad variety of domains, including, for example, business, health care, government, and non-profit organizations. Students must therefore understand that:
   - IS professionals enable successful performance in many organizations
   - IS professionals span and integrate across organizational levels and functions
   - IS professionals need both an excellent understanding of the domain within which they work and appropriate technology knowledge for their organizational role
   - Information systems in organizations have increasing strategic significance because of the scope of the organizational systems involved and the role systems play in enabling organizational processes and strategies.

2. IS professionals must have strong analytical and critical thinking skills to thrive in a competitive global environment. Students must therefore:
   - Be problem solvers and critical thinkers
   - Use systems concepts for understanding and framing problems
   - Be capable of applying both traditional and new concepts and skills
   - Understand that a system consists of people, procedures, hardware, software, and data within a global environment.

3. IS professionals must exhibit strong ethical principles and have good interpersonal communication and team skills. Students must understand that IS professionals should be able to:
   - critically evaluate and possibly act on current ethical issues in the IS field
   - apply professional codes of conduct
   - collaborate with other professionals as well as perform successfully at the individual level
   - communicate effectively with excellent oral, written, and listening skills.
   - demonstrate persistence, flexibility, curiosity, creativity, risk taking, and a tolerance of these abilities in others.

4. IS professionals must design and implement information technology solutions that enhance organizational performance. Students must therefore:
   - Possess skills in understanding and modeling organizational processes and data, defining and implementing technical and process solutions, managing projects, and integrating systems within and across organizations.
   - Be fluent in techniques for acquiring, converting, transmitting, and storing data and information, including those related to data quality
   - Focus on the application of information technology in helping individuals, groups, and organizations achieve their goals within a competitive global environment.

6. KEY ELEMENTS OF THIS CURRICULUM REVISION

The Information Systems landscape has changed significantly over the past several years. Therefore, the foundations of the curriculum must be evaluated. There are four key elements of the revision:

1. **Reaching beyond the business school.**

There is an ongoing debate regarding the nature and identity of Information Systems as a discipline. At the center of this debate is whether Information Systems is exclusively a business discipline or whether Information Systems can exist in a variety of domains, including law, biology, healthcare, and so on. Earlier model curricula have clearly identified business as the domain in which IS was located. As shown in Figure 1 below (excerpted from IS 2002), business was the exclusive domain for prior versions of the model curriculum where domain content was shown as "business fundamentals." Although IS 2002 acknowledges that IS programs could and do exist outside business schools, it also took the position that the primary (exclusive) domain for graduates was business and "technology-enabled business development" (further clarified as systems analysis and design, business process management, systems implementation, and IS project management).

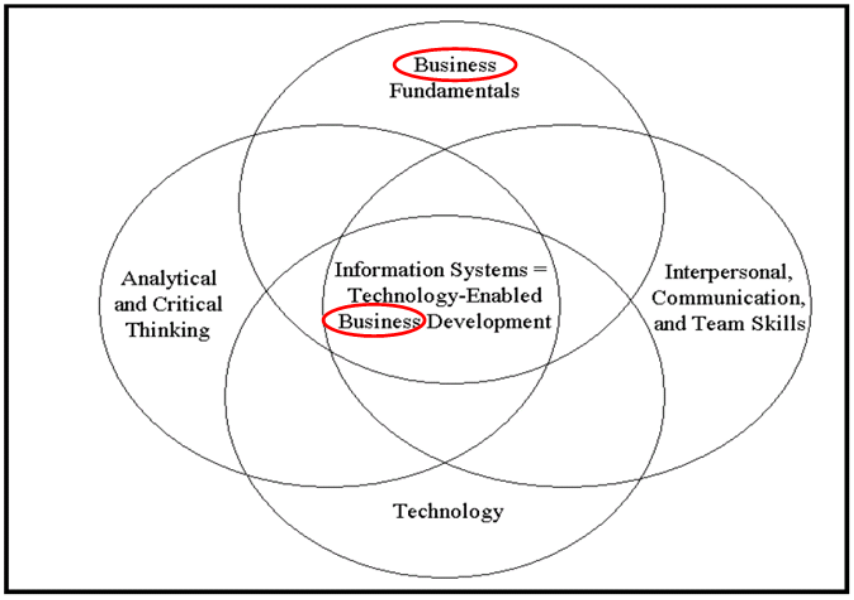

Figure 1: Demonstration of the close linkage between Information Systems and Business in IS 2002.

No longer should the Information Systems paradigm be exclusive to the business school context. Even though business will likely continue to be the primary domain for Information Systems, the discipline provides expertise that is critically important for an increasing number of domains.

2. Revising the outcome expectations for IS graduates and proposing subsequent changes to the curriculum topics.

This category includes subsequent changes to the curriculum topics to reflect the changed outcome expectations. This change centers on the radical contextual change both in terms of technology and business discussed above. These actions are a critically important and natural part of the revision process.

The IS 2002 curriculum had taken a "one size fits all" philosophy, whereby there is no separate core specified within the curriculum. In essence, all courses are required. This model left little

room for local innovation and adaptation in institutions that wanted to adopt the model curriculum in its entirety. For many schools, it was impossible to follow the curriculum guidelines because they had fewer courses in their program than the 10 specified in IS 2002. On the other hand, at other institutions there might be much more room available for IS courses, and again, the fixed-size model curriculum is an obstacle. As a result, many institutions did not find IS 2002 to be responsive to their particular situations. To overcome this limitation of IS 2002, the task force wanted to introduce greater flexibility into the new curriculum. To do so, the task force identified a set of core courses common to all Information Systems programs.

The seven core courses are:

1. Foundations of Information Systems
2. Data and Information Management
3. Enterprise Architecture
4. IT Infrastructure
5. IS Project Management
6. Systems Analysis and Design
7. IS Strategy, Management, and Acquisition

It is important to note that these seven courses in the model can be implemented in a specific local context as independent courses or as components within fewer courses. The task force strongly believes that there is core content that every undergraduate Information Systems program should incorporate, and that the list of core courses captures this content. By specifying the core, the task force emphasizes the content that defines Information Systems. The model curriculum acknowledges that not all programs are able to cover all aspects of the core at the same level of depth, but some level of coverage of these topics is required for a program to be identified as an Information Systems program.

3. Evaluating the assumptions underlying the curriculum structure and modifying it accordingly.

Past revisions have ended by providing a basket of classes that were recommended for IS programs. This curriculum revision process hopes to be more inclusive by providing a short list of core topics that are essential to Information Systems programs, allowing them to customize other topics by creating a list of electives. This can be done by offering a curriculum that does not specify a single career objective (i.e., technology-enabled business development or career as a systems analyst) but will provide numerous career tracks. These career tracks will integrate a combination of the core courses and some set of career track electives. How the core courses are instantiated depends on the needs of a specific career track. Career tracks can be associated with one or several domains. For example, a database administrator career track is compatible with business, government, nonprofit, and healthcare domains and many others.

4. Involving the global IS community

Traditionally, curriculum projects have been largely based on the work of a small task force that has shared its work at a variety of conferences and incorporated the feedback from the sessions to the model curriculum. Written drafts have been shared widely and comments solicited. Surveys have been used to gather industry input. This process was driven by a few individuals with little input from the academy as a whole. We are using the wiki environment to allow for global community involvement in the revision process. This is critical if the new undergraduate Model Curriculum is to reflect the perspectives of the global Information Systems discipline.

Engaging the entire IS community will be a metric of success for this task force's work. One of the first tasks in the current curriculum revision project was to establish a feedback mechanism that is globally accessible. For this, the task forced turned to current thinking in system design, expressly Web 2.0 (O'Reilly 2005). Through the use of Web 2.0 technologies, we created a platform for discussion and harnessing the collective intelligence of the global IS community. The specific Web 2.0 platform selected was MediaWiki, an open source wiki platform originally written for Wikipedia. By using this Web-based platform, the task force believes that it can better engage the broader IS community to assist in developing and maintaining the curriculum. Despite its relative simplicity, ours appears to be a novel approach for developing curricula. It is our hope that the task force's work can help other academic disciplines find ways to improve their curriculum development processes.

The current version of the IS curriculum wiki is available at:
blogsandwikis.bentley.edu/iscurriculum .

Implementation of the Key Elements

In order to meet the goals outlined in the four key elements above, it was noted by the Joint AIS/ACM Curriculum Task Force early on in the process that the IS 2010 document would have to include a very different course structure than previous curriculum revisions. Therefore, the task force started the process of evaluating the target high-level capabilities of an IS graduate. By doing so, the committee believed that it could draw the knowledge and skills from the high-level capabilities and further draw the curriculum topic for the knowledge and skills. This process was very labor intensive and is described in detail in the outcome expectation section below.

This revision process required that we evaluate new ways to offer curriculum course structure. The first option was staying with a standard structure similar to that presented in IS 2002 and its predecessors. By doing so the task force would offer the IS committee a rigid outline that included a basket of courses that could be implemented, in its entirety or in part, by IS programs. This was problematic for the committee as the rigid structure would not allow the IS 2010 curriculum to meet the needs of 1) global IS programs and 2) programs outside business schools. For this reason we used another approach.

The task force proposed an innovative course structure to address the need of the different global constituents. By doing so, the revised curriculum could be tailored to the strengths and needs of any program around the world while also recommending a structured core that would standardize the foundational knowledge and skills for all IS graduates. This semi-flexible curriculum meets the goal stated in the key elements for IS 2010. For this reason, the task force proceeded to develop the structure of the core topics while also allowing for specializations in IS. The following will describe the need for Information Systems as a distinct academic field.

7. INFORMATION SYSTEMS AS A FIELD OF ACADEMIC STUDY

Computer-based information systems continue to be a critical part of the products, services, operations, and management of organizations. Indeed, information systems and information technology can be so critical as to disrupt classic business models, threatening traditional revenue streams and even driving industry sectors to extinction. The print newspaper industry, travel agencies, real estate agencies, and video rental stores represent industries that have been forced to

change their business models and operations in response to the introduction of new information technologies and systems. The effective and efficient use of information and communications technologies is an important element in maintaining or achieving competitive advantage for business organizations and excellence in service for government and non-profit organizations. The information technology/information systems strategy is an integral part of organizational strategy. Information systems support management processes at all levels – operational, tactical, and strategic management. Information systems are vital to problem identification, analysis, and decision making. The importance of information technology and information systems to organizations and the need for well-educated professionals in the field is the basis for a strong link between educational programs and the professional community of IS practitioners (Abraham *et al.*, 2006; Bullen *et al.,* 2009; Dick *et al.,* 2007; Mawhinney *et al.,* 1994; Trauth *et al.,* 1993).

Information Systems as a field of academic study began in the 1960s, a few years after the first use of computers for transaction processing and reporting by organizations. As organizations extended the use of information processing and communication technology to operational processes, project management, decision support, and enterprise and industry strategy, the academic field also grew in scope and depth. An IS organization function emerged to manage computer and communications technologies and information resources within an organization. In the same way that universities have degree programs reflecting important organizational functions, such as financial resource management, marketing resource management, and human resource management, a degree program emerged for management of information technology and information resources. During this nearly half century of growth and change, different names have been used and the definition of the field has been enlarged. The simple term Information Systems (IS) has become the most commonly accepted, generic term to describe the discipline.

Differing Names for the Academic Field of Information Systems

Information Systems as a field of academic study exists under a variety of different names. The different labels reflect historical development of the field, different ideas about how to characterize it, and different emphases when programs were begun. The names of computer-related majors offered in undergraduate institutions accredited by the Association to Advance Collegiate Schools of Business (AACSB) in the United States, for example, are represented by the following terms) (Pierson *et al.,* 2008):

- Management Information Systems, representing 41% of programs
- Information Systems, representing 21% of programs
- Computer Information Systems, representing 18% of programs

The remaining 21% of programs are known by names such as:

- Information Management
- Information Systems Management
- [Business] Information Systems
- [Business] Computer Systems
- [Business] Computer Information Systems
- [Business] Information Technology Management
- [Business] Informatics
- Information Resources Management
- Information Technology
- Information Technology Systems
- Information Technology Resources Management

- Accounting Information Systems
- Information Science
- Information and Quantitative Science

The Scope of Information Systems

Information Systems as a field of academic study encompasses the concepts, principles, and processes for two broad areas of activity within organizations: 1) acquisition, deployment, management, and strategy for information technology resources and services (the information systems function; IS strategy, management, and acquisition; IT infrastructure; enterprise architecture; data and information) and 2) packaged system acquisition or system development, operation, and evolution of infrastructure and systems for use in organizational processes (project management, system acquisition, system development, system operation, and system maintenance). The systems that deliver information and communications services in an organization combine both technical components and human operators and users. They capture, store, process, and communicate data, information, and knowledge.

The information systems function in an organization has a broad responsibility to plan, develop or acquire, implement, and manage an infrastructure of information technology (computers and communications), data (both internal and external), and enterprise-wide information processing systems. It has the responsibility to track new information technology and assist in incorporating it into the organization's strategy, planning, and practices. The function also supports departmental and individual information technology systems. The technology employed may range from large centralized to mobile distributed systems. The development and management of the information technology infrastructure and processing systems may involve organizational employees, consultants, and outsourcing services (both domestic and offshore).

The activity of developing or acquiring information technology applications for organizational and inter-organizational processes involves projects that define creative and productive use of information technology for transaction processing, data acquisition, communication, coordination, analysis, and decision support. Design, development or acquisition, and implementation techniques, technology, and methodologies are employed. Processes for creating and implementing information systems in organizations incorporate concepts of systems analysis and process design, innovation, quality, human-machine systems, human-machine interfaces, e-business design, socio-technical systems, and change management.

Information systems professionals work with information technology and must have sound technical knowledge of computers, communications, and software. Since they operate within organizations and with organizational systems, they must also understand organizations and the functions within organizations (administration, accounting, finance, marketing, operations, human resources, and so forth). They must understand concepts and processes for achieving organizational goals with information technology. In addition to sound technical knowledge and organizational understanding, they must possess systems thinking, the ability to analyze business problems, communication skills, and teamwork skills (Overby 2006) in face-to-face and virtual settings. The academic content of an Information Systems degree program therefore includes information technology, information systems strategy and management, information systems development and implementation, organizational functions, and concepts and processes of organizational management.

Information Technology has emerged as a new academic discipline under the broad umbrella of computing. Its role has been recognized in two recent documents produced by the computing

education community. CC 2005 Overview Report, a broad survey of five established computing disciplines (Computer Engineering, Computer Science, Information Systems, Information Technology, and Software Engineering) was the first published work to identify the formal role of Information Technology as a computing discipline (Shackelford *et al.,* 2005). Based on published and draft curriculum documents, the overview report compares and contrasts computing disciplines, and it positions Information Systems and Information Technology as disciplines that on one hand operate in the same space (focusing on organizational needs) but on the other hand address a very different set of questions. The document presents the contrast as follows:

> *"Professionals in the [Information Systems] discipline are primarily concerned with the information that computer systems can provide to aid an enterprise in defining and achieving its goals, and the processes that an enterprise can implement or improve using information technology. ... Information Systems focuses on the information aspects of information technology. Information Technology is the complement of that perspective: its emphasis is on the technology itself more than on the information it conveys. IT programs exist to produce graduates who possess the right combination of knowledge and practical, hands-on expertise to take care of both an organization's information technology infrastructure and the people who use it." (CC 2005, p. 14).*

The other recently published document that specifies the Information Technology discipline is the IT model curriculum, IT 2008. This document, approved in late 2008, defines the Information Technology Body of Knowledge and an undergraduate curriculum for the IT discipline. In comparing the curriculum specified in IT 2008 and the core of this IS curriculum, we can clearly see that the disciplines share areas of interest, such as Data and Information Management, IT Infrastructure, and Human Computer Interaction, but that there are also specific areas of distinction. Particularly important is the IS emphasis on Systems Analysis and Design (including Business Analysis and Business Process Design and Management), IT Strategy, Management, and Acquisition, and Enterprise Architecture. It is very likely that the discussion regarding the identities of the IT and IS disciplines will continue actively.

8. RELATIONSHIP BETWEEN THE FOUNDATIONS OF IS COURSE, THE MINOR, AND THE MAJOR

Prerequisite Technology Skills: The prerequisite skills level provides a personal capability for student use of information technology. Several applications useful to students and graduates are covered, including: word processing, Web browsing, electronic mail, spreadsheet processing, database management, presentation graphics, and external database retrieval. Although word processing is included here, it is typically acquired prior to formal courses. Some institutions provide the prerequisite IS skills level via a course required of all students. Other institutions enable students to acquire this competency through laboratories with computer-based tutorial modules. Others assume proficiency gained at high school or based on personal experience. Competency tests may be used to ensure adequacy of prior knowledge. The Information Systems faculty may also have major responsibilities for remedial work relative to the prerequisite skills.

All Students: The Foundations of Information Systems course provides all students with an introduction to the purposes, uses, and value of information systems and information resources in organizations. It introduces concepts and methods by which IT professionals design and implement systems and explains the technologies and processes for providing information and communications resources. The course illustrates opportunities for business professionals to

employ technology resources. Students can build on their prerequisite understanding to investigate useful concepts, functions, and capabilities provided by information systems. Exercises will assist students in understanding system development processes, effective use of information systems, and quality concepts in providing inputs and using outputs from systems.

Exercises may enable students majoring in functional areas to gain additional IS skills and system understanding through use of application packages in their major fields of study, such as accounting, finance or marketing. Team projects with actual clients demonstrate applied learning.

IS Minors: In addition to the courses all students take, an IS minor consists of a subset of the major courses that form a cohesive set of knowledge complementary to the student's major field of study. Individuals with a minor in IS often act as technology liaisons and as functional area representatives on teams to develop and enhance major applications. A minor may be tailored to these unique functional area requirements, such as marketing or accounting, or a second field, such as health sciences.

IS Majors: An IS major consists of the entire model curriculum targeted for a particular career track. Students proficient at this level are prepared to enter a career in the IS field. They have competencies in basic technical areas and apply these to business processes and project management. Graduates of IS programs can work for different industries such as manufacturing, financial services, health care, and others including information technology providers of hardware, software, and services.

Figure 2 below summarizes the courses suggested for each of the audiences discussed above.

Student Groups	Curriculum Model
All Students	IS 2010.1 Foundations of Information Systems
IS Majors and Minors	IS 2010.2 Data and Information Management IS 2010.3 Enterprise Architecture IS 2010.7 IS Strategy, Management, and Acquisition
IS Majors	IS 2010.4 IS Project Management IS 2010.5 IT Infrastructure IS 2010.6 Systems Analysis & Design

Figure 2: Representative IS 2010 Curriculum Design for All Students, IS Minors, and IS Majors

9. OUTCOME EXPECTATIONS FOR INFORMATION SYSTEMS GRADUATES

Overall Structure of Basic Concepts

The restructuring of the Model Curriculum is driven by changes in high-level organizational needs and graduate capabilities. The work underlying the curriculum specification first identified the high-level capabilities needed by IS graduates. These overall capabilities, in turn, are based on knowledge and skills that have been categorized as IS-specific Knowledge and Skills, Foundational Knowledge and Skills, and Domain Fundamentals. By doing so, the revised Model Curriculum links curriculum content and structure to graduate capabilities in a well-defined and transparent way. Figure 3 shows how the high-level IS capabilities are extrapolated to the final curriculum topics delivered through courses.

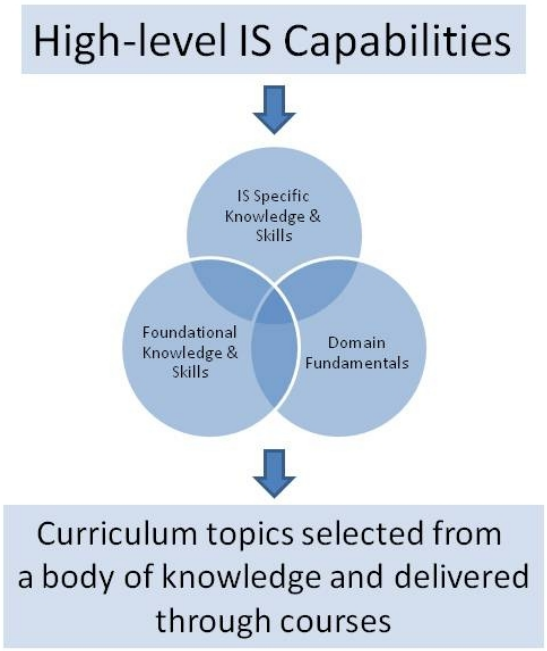

Figure 3: Overall Structure of the Basic Concepts.

High-level IS Capabilities

The new curriculum will be based on a significantly revised set of degree outcome expectations, that is, expectations regarding the capabilities of graduating IS students when entering the full-time workforce. The new capability set recognizes the change in the nature of the jobs IS graduates are likely to have by focusing on business analysis, organizational processes, enterprise architecture, sourcing options, and security/risk management. The curriculum acknowledges explicitly the contribution that the Information Systems discipline can make to domains outside business (such as government, education, non-profit sector, health care, etc.) and, therefore, the high-level capabilities are not limited to a specific domain. They are, however, driven by organizational needs and more abstract and stable than knowledge and skills. The following will give a more detailed description of each capability.

Improving Organizational Processes

The new curriculum assumes that understanding and improving organizational processes is one of the key capabilities of all IS graduates. This requires the graduates to:

1. Understand the fundamental concepts related to organizational processes

2. Understand general principles of process analysis in order to apply them to specific situations

3. Analyze existing processes based on interviewing, observation, documentation analysis, and other similar methods

4. Understand how the very large amounts of data collected by modern organizations can be used to review, redesign, and improve processes

5. Identify and capture the essential findings from the large amount of data produced by the analysis process

6. Research and apply industry reference models and best practices in order to improve process designs

7. Use analysis results as a basis for designing revised processes based on the graduates' strong understanding of both organizations and information technology

8. Simulate proposed processes and revising them as necessary

9. Negotiate solutions that satisfy the political requirements for new processes

10. Understand the limitations of what can be achieved with available technology, financial resources, and organizational capabilities.

11. Lead the implementation of new processes.

12. Customize processes to address cultural and ethnic needs.

The specification of high-level IS capabilities does not include a particular set of process improvement methods or techniques, but the graduates are expected to be aware of and benefit from at least one such method.

Exploiting Opportunities Created by Technology Innovations

Graduates of Information Systems programs should be experts in seeing how organizations can benefit from technology capabilities, converting opportunities created by information technology innovations into sustainable organizational value through systematic processes. An essential element of this high-level capability is the ability to understand both information technology and the needs of an organization within a specific domain at such a deep level that IS graduates see new opportunities to create value faster and with greater clarity during various analysis processes than their non-IS counterparts. Achieving a high level of performance related to this capability requires in-depth knowledge of technology and the domain, skills in analyzing problems and designing solution alternatives, ability to analyze the strengths and weaknesses of various alternatives, understanding issues related to the feasibility of possible solutions, as well as demonstrable skills in sourcing, designing, and implementing technology solutions.

Understanding and Addressing Information Requirements

Another key capability of all IS graduates is the ability to analyze and document organizational information requirements at various levels, starting from those of individual knowledge workers responsible for specific tasks and ending with very high level institutional requirements. IS graduates are able to analyze information needs of an individual, organizational unit, or an organization in order to determine how information technology-based solutions can best be designed to support these information needs. Increasingly, the core capabilities in this area are related to effective utilization and integration of data that is generated in a rich variety of organizational systems and includes multiple types and formats.

Designing and Managing Enterprise Architecture

Information Systems graduates should be experts in high level design and management of IT capabilities that are fully aligned with general organizational goals. These capabilities are typically organized and presented as an enterprise architecture, consisting of high-level internally compatible representations of organizational business models, data, applications, and information technology infrastructure. The capabilities of the graduates of undergraduate IS programs are typically at a level suitable for focusing on the component architectures. One of the knowledge and skill areas that is directly derived from this high-level IS capability is related to IT infrastructure, including networking technology, data centers, and so on. This high-level capability also requires an understanding of the IT management and control frameworks, such as ITIL and COBIT.

Identifying and Evaluating Solution and Sourcing Alternatives

Graduates of IS programs are capable of producing high-level design alternatives for various organizational IT-based solutions. There are always a large number of ways to achieve a specific set of organizational capabilities using information technology, but not all of approaches are feasible in a specific context. An essential high-level capability that IS graduates have is an ability to identify a small subset of operationally, financially, and technically feasible solution alternatives and the mechanisms through which an organization can acquire these technology resources. Most projects require reusing or building on the existing components (such as modules, reusable objects, databases, information architectures, etc.) used in the current systems, and therefore, it is essential that graduates have the capability to understand a variety of technologies and their integration.

In particular, the globalization of the IS/IT supply chain has made the traditional "buy vs. build" questions significantly more complex to answer, but the core issues remain: once an IT capability need has been identified, what is its high-level design and how should an organization acquire this capability?

Securing Data and Infrastructure

It has been increasingly important for organizations to ensure that their data and IT infrastructure resources are protected from a variety of security threats, which can potentially create significant financial liabilities as well as damage the organizational image. Understanding these threats and identifying high-level solutions to protecting the organization are essential capabilities of all graduates of Information Systems degree programs.

Understanding, Managing and Controlling IT Risks

IS graduates should have strong capabilities in understanding, managing, and controlling organizational risks that are associated with the use of IT-based solutions (e.g., security, disaster recovery, obsolescence, etc.). At the undergraduate level, the emphasis should be on in-depth understanding of a variety of risks. Because IT solutions are so closely integrated with all aspects of a modern organization, it has become essential to manage the risks related to their use in a highly systematic and comprehensive way.

Knowledge and Skills of IS Graduates

Graduates of Information Systems undergraduate degree programs need a wide variety of specific skills and knowledge as a foundation for the high-level IS capabilities specified earlier. The high-level capabilities typically encompass skills and knowledge from various areas. For example, in order to determine and address information requirements, IS graduates need to understand and apply data management technologies, have excellent interpersonal, analytical, and problem solving skills as well as have a strong command of the organizational domain for which the information requirements are specified. The knowledge and skills that graduates in Information Systems are expected to have can be divided into three categories:

1. Information Systems Specific Knowledge and Skills
2. Foundational Knowledge and Skills
3. Knowledge and Skills Related to Domain Fundamentals

The category of Information Systems Specific Knowledge and Skills includes elements that are in the core of the IS discipline. Other types of educational programs would not develop these knowledge and skills; they are specific to Information Systems as a discipline. Foundational Knowledge and Skills are shared by many disciplines that educate knowledge professionals, and they include broad categories such as leadership and collaboration, communication, and analytical and critical thinking. Finally, the category of Domain Fundamentals covers skills and knowledge related to the domain to which a specific Information Systems program applies computing. For most IS programs the domain is general business, but it could focus on a specific business specialty (e.g., finance), industry (e.g., health care), organization type (e.g., government, non-profit), and so on. As discussed above, undergraduate IS programs will develop knowledge and skills in each of these three categories. When combined over the course of a student's studies, they will lead to the high-level IS capabilities.

Information Systems Specific Knowledge and Skills

Information Systems specific knowledge and skills are divided into four main categories (and subcategories), as follows:

1. **Identifying and designing opportunities for IT-enabled organizational improvement.** The integrating theme of this category is the focus on an organization and the ways it can develop its capabilities using information technology. In many ways, the specific items in this category are related to requirements analysis and specification at a high level of abstraction, including strategic alignment, the analysis of information needs, and the evaluation of user experience.
   These include:
   a. Ensuring alignment between IT strategy and organizational strategy
   b. Improving organizational processes with information technology solutions
   c. Understanding and designing the role of information systems in managing organizational risks and establishing controls
   d. Identifying and exploiting opportunities created by emerging technology innovations
   e. Understanding and documenting information requirements
   f. Improving various stakeholders' experience in interacting with the organization, including issues in human-computer interaction.

2. **Analyzing trade-offs.** One of the most important knowledge and skill categories for Information Systems graduates is the ability to design and compare solution and sourcing

alternatives in a way that takes into account various sources of risks and dimensions of feasibility, including technology characteristics, availability of and organizational ability to use human resources, scheduling, organizational politics, regulatory issues, and return on investment. A particular strength of Information Systems graduates is the ability to integrate a variety of these perspectives and avoid analysis that narrowly focuses on only technology or business requirements. A key element of this capability is to be able to evaluate sourcing alternatives. Subcategories include:

a. Identifying and designing high-level solution and sourcing options
b. Analyzing and documenting the feasibility of various options
c. Comparing solution options using multiple decision criteria
d. Capital budgeting for IT-intensive projects; creating a financial justification for choosing between alternatives
e. Evaluating cultural differences for options that cross geographical boundaries.

3. **Designing and implementing information systems solutions.** Although the knowledge and skills that IS graduates need have recently moved significantly in the direction toward higher levels of abstraction, individual skills related to design and implementation are still essential for IS graduates. Those who can demonstrate the ability to integrate high performance in design and implementation, along with strong business capabilities, are typically the most highly sought after graduation. This category of knowledge and skills also includes the management of people and organizations that are used to develop IS/IT capabilities, whether internal or external, regardless of their geographic location. Knowledge and skills related to specific issues of IS project management are in this category. The specific subcategories include:

a. Designing enterprise architectures
b. Identifying, evaluating, and procuring detailed solution and sourcing options; configuring and integrating organizational solutions using packaged solutions
c. Designing and implementing solutions that provide a high-quality user experience
d. Designing secure systems and data infrastructures
e. Designing and implementing applications, application architectures and integrated systems
f. Managing and exploiting organizational data and information; designing data and information models
g. Managing information systems development/procurement resources
h. Managing information systems projects.

4. **Managing ongoing information technology operations.** IS graduates need knowledge and skills related to the management of the ongoing information systems operations within the organization, including the management, operation, and securing of the IT infrastructure. This can include:

a. Managing the use of enterprise technology resources
b. Managing application performance and scalability
c. Maintaining existing information systems
d. Managing relationships with technology service providers
e. Securing data and systems infrastructure
f. Ensuring business continuance.

Foundational Knowledge and Skills

Foundational knowledge and skills are not unique to Information Systems as a discipline. Instead, most programs that educate knowledge professionals intend to develop some or all of these skills and capabilities. Still, they are very important for Information Systems programs because it is impossible for IS graduates to exhibit the required high-level IS capabilities without these foundational knowledge and skills. Individual IS programs typically implement educational experiences that develop these areas in an IS specific context.

1. **Leadership and collaboration.** The graduates of Information Systems programs will be required to act in various collaborative roles during their professional careers, and it is likely that most of them will be assuming leadership positions at various levels. Increasingly, these roles are performed in a genuinely global context. It is essential that programs prepare their graduates to be effective collaborators and inspiring leaders. Capabilities should include:

    a. Leading cross-functional global teams
    b. Managing globally distributed projects
    c. Working effectively in diverse teams
    d. Structuring organizations effectively.

2. **Communication.** It is impossible for an IS professional to perform effectively in any organizational role without excellent oral and written communication skills. IS professionals work closely with colleagues in a variety of different organizational roles, and invariably, their job performance is partially dependent on their ability to communicate. Capabilities should include:

    a. Listening, observing, interviewing, and analyzing archival materials
    b. Writing memos, reports, and documentation
    c. Using virtual collaboration tools (such as wikis, blogs, shared collaboration spaces, etc.)
    d. Giving effective presentations.

3. **Negotiation.** Related to the previous category, negotiation skills are very important for IS professionals. In their organizational roles, they have to navigate carefully between different, competing interests within the organization. In these situations, excellent negotiation skills are essential. Finally, IS professionals increasingly play a role in the negotiations with external IT service providers and other vendors. Capabilities should include:

    a. Negotiating with users about funding, resources of time, staff, and features
    b. Negotiating with providers about service levels
    c. Negotiating with providers about quality and performance of deliverables
    d. Facilitating negotiations between competing internal interests.

4. **Analytical and critical thinking, including creativity and ethical analysis.** Strong analytical and critical thinking skills are a foundation for everything IS professionals do – it is essential that they are able to systematically analyze complex systems and situations, break them down into manageable components, understand deep connections within systems, and create solutions based on the results of a systematic analysis. Problem solving is also omnipresent in the life of IS professionals. Capabilities should include:

a. Analyzing the ethical and legal implications of complex situations
b. Analyzing the risks associated with complex systems
c. Solving complex problems
d. Using quantitative analysis techniques appropriately and effectively
e. Enhancing innovation and creativity in oneself and others.

5. **Mathematical foundations**. Even though IS professionals do not need the same level of mathematical depth as many other computing professionals, there are, however, some core elements that are very important for IS professionals (of course, these needs will vary depending on an individual's specialty). To support in-depth analysis of data, IS professionals should have a strong background in statistics and probability. For those who are interested in building a strong skill set in algorithmic thinking, discrete mathematics is important.

Knowledge and Skills Related to Domain Fundamentals

Domain Fundamentals is the third category of knowledge and skills. It is equally important as the other two, but different because its contents vary significantly depending on the domain that together with the other two categories forms the outcome expectations for an Information Systems degree. The most common domain for Information Systems is business in general, but many other domains are possible components, including business specialties (such as accounting or finance), government, health care, the legal profession and non-governmental organizations. Within each domain, it is typically possible to identify at least three subcategories of domain knowledge:

- General models of the domain. This subcategory refers to the general foundational material that provides an overall understanding of the domain at the level that is needed to both understand the general concepts within the area and form a basis for studying the key specializations within the domain.

- Key specializations within the domain. Within each domain, there is a core set of the most important specializations that are essential for understanding the domain and operating within it. It is typical that within the domains there is vigorous discussion regarding what these specializations are, but, for example, within business it appears that few experts would dispute the need to include finance, accounting, marketing, and management (both organizational behavior and strategy).

- Evaluation of performance within the domain. Within many domains, issues related to performance analysis and evaluation are essential for understanding the domain fully, and, therefore, we include it as a separate subcategory. Performance evaluation also reveals important aspects of the philosophy of a domain. For example, both general models and key specializations might be essentially the same for businesses and non-profit organizations, but their key performance metrics could differ quite significantly.

Examples of these three subcategories within the general business domain are as follows:

General models of business
- Business models
- Business process design and management
- Organizational theory

- Business strategy

Key business specializations
- Finance
- Accounting
- Marketing
- Operations management; service science and management
- Organizational behavior
- Business law

Evaluation of business performance
- Analysis of organizational performance
- Analysis of individual and team performance
- Business analytics
- Business intelligence

10. ARCHITECTURE OF THE INFORMATION SYSTEMS CURRICULUM

Architecturally, IS 2010 is quite different from its predecessors. IS 2002 was largely organized around the concept of a course, and it simply consisted of ten courses without any opportunities to vary the curriculum depending on the local requirements or other contextual factors. The Body of Knowledge included in IS 2002 was largely unchanged from IS'97, and the linkage between the courses in the curriculum and the Body of Knowledge was relatively weak.

In this section, we first describe the key curriculum architecture concepts and the way they are applied in this curriculum implementation. We will follow with a description of the overall curriculum structure for the courses that focus on IS Specific Skills and Knowledge, followed by a more in-depth discussion regarding the core. Finally, we will discuss how Foundational Skills and Knowledge and Domain Fundamentals are typically covered in an IS undergraduate degree and illustrate the use of the model curriculum in three different academic degree requirement contexts.

Key Concepts

The structural architecture of IS 2010 is informed by the concept structure represented in Figure 4, which illustrates a proposed structure for a computing curriculum. This structure includes three major elements: Course, Learning Objective, and the three-level Knowledge Area – Knowledge Unit – Topic hierarchy that is used also in all other computing curriculum volumes (CS 2008, IT 2008, SE 2004, and CE 2004). The concept of Coverage represents the coverage of a specific Topic within a Course in order to support the achievement of a specific Learning Objective. Please note that Topics themselves can be organized hierarchically into multiple levels. A Level is specified for each Learning Objective, indicating the type of cognitive processing that the student is required to demonstrate in order to achieve the learning objective. A slightly revised version of Bloom's taxonomy described in Appendix 4 of IS 2002 and included in Appendix 3 of this document will be used for the Levels.

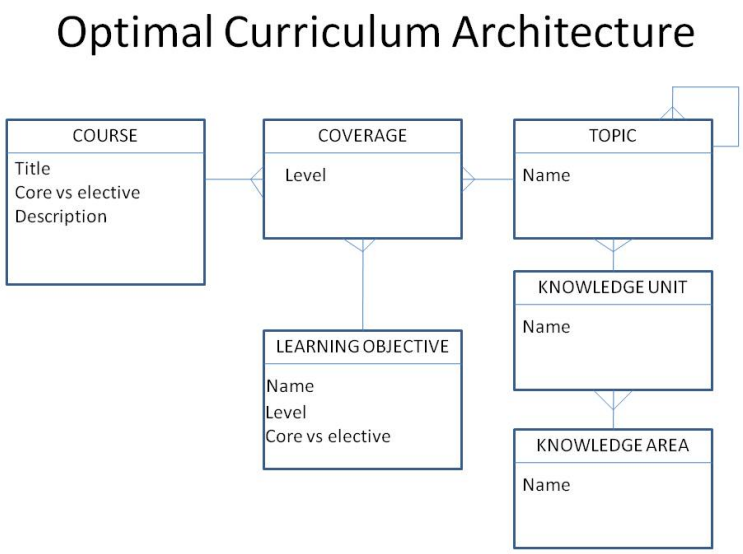

Figure 4: Proposed Curriculum Architecture

Fundamentally, the intent is to specify the goal state regarding the students' abilities in relation to a concept/topic: whether the students are required to be aware of a topic, understand it at a deeper level, use the concept in an analysis, or create new concepts or artifacts in the context of a learning outcome.

At the current time, the process of organizing IS knowledge is not, however, specified at a sufficiently advanced level to allow us to fully implement the curriculum using the optimal structure described above. Instead, IS 2010 uses a simplified model (see Figure 5) that links the Learning Objectives to Courses and Courses directly to Topics with a many-to-many relationship. The Knowledge Area – Knowledge Unit – Topic hierarchy is used for the first time in an IS model curriculum, which brings this document structurally closer to the other computing curricula. Each Knowledge Area, Knowledge Unit, and Topic is specified as either core or elective. The level of coverage is specified at the course level.

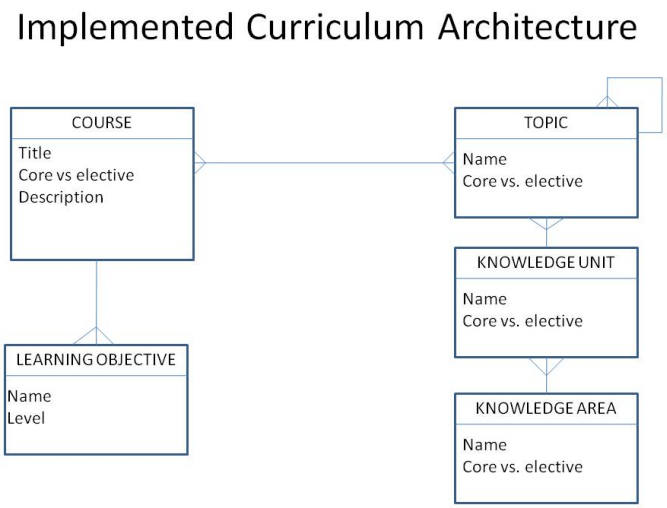

Figure 5: Simplified Curriculum Architecture Model

The Core Information Systems Body of Knowledge is presented in Appendix 4 of this document. This Body of Knowledge organizes the IS curriculum core content into four different Knowledge Area categories: 1) General Computing, 2) IS Specific, 3) Foundational, and 3) Domain-specific. We believe that Information Systems as a discipline can effectively borrow content from other computing disciplines for the General Computing Knowledge Areas and that the content in Foundational and Domain-specific Knowledge Areas is largely determined outside computing. Therefore, the IS discipline will only have to develop and maintain a Body of Knowledge structure for the Knowledge Areas that are truly IS Specific.

General Curriculum Structure for Courses focusing on IS Specific Skills and Knowledge

In this section, we discuss the general architecture for the courses that focus on the development of Information Systems specific skills and knowledge. The coverage of content that focuses on the development of Foundational and Domain-specific knowledge and skills is discussed later in this section (see p. 29).

IS 2010 introduces a separation between core and elective courses. IS 2010 consists of seven **core courses**, which specify the required knowledge units and topics that have to be covered in every Information Systems program. We acknowledge that the time available to cover the core material and the needs of the program vary depending on the local context. Therefore, the depth and type of coverage of the core topics differ between programs, even though every core topic has to be covered in every Information Systems curriculum. Every instance of a Course is not always technically a separate course in the schedule; it is possible that an implemented curriculum may, for example, combine two instances of a Course into one.

The model curriculum includes examples of **elective courses**, which either expand on the coverage provided by the core course within a specific knowledge area or introduce new knowledge areas to the curriculum. The elective courses are essential building blocks of **career tracks**, which consist of the core and a set of elective courses. The matrix included in Figure 6 includes the core courses and sample electives mapped to a number of suggested career tracks.

Structure of the IS Model Curriculum:Information Systems specific courses

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Core IS Courses:																	
Foundations of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Enterprise Architecture	○	●	○	○	○	●	○	○	○	○	●	○	○	○	●	○	○
IS Strategy, Management and Acquisition	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○
Data and Information Management	●	○	○	●	●	○	○	●	●	○	●	○	●	○	○	○	○
Systems Analysis & Design	●	●	●	○	○	○	●	○	○	○	○	○	○	○	●	●	●
IT Infrastructure	○	○	○	●	○	○	○	●	●	●	○	○	●	●	○	○	○
IT Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●
Elective IS Courses:																	
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●
Business Process Management		●	●			○	○	○		○	●				○		
Collaborative Computing						○								○			○
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○
Enterprise Systems		●	●	○	○	○	●	●	○		●	●	○	○			
Human-Computer Interaction	●					○	○				○					●	
Information Search and Retrieval		○		○	●								○				●
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○
Knowledge Management		●		○		○	○			○							
Social Informatics													○		○		

	A = Application Developer
	B = Business Analyst
	C = Business Process Analyst
	D = Database Administrator
	E = Database Analyst
	F = e-Business Manager
	G = ERP Specialist
	H = Information Auditing and Compliance Specialist
	I = IT Architect
	J = IT Asset Manager
	K = IT Consultant
	L = IT Operations Manager
	M = IT Security and Risk Manager
	N = Network Administrator
	O = Project Manager
	P = User Interface Designer
	Q = Web Content Manager

Key:

● = Significant Coverage

○ = Some Coverage

Blank Cell = Not Required

Figure 6: Structure of the IS 2010 Model Curriculum

The IS Specific Course Matrix is structured based on career track outcomes. This approach allows a high level of local flexibility and variability while maintaining the core of the discipline. Students undertaking a program's course of study could be preparing for career tracks such as Application Developer, Business Analyst, Business Process Analyst, Database Administrator, and so on. Based on the career track focus of an IS program, recommendations for the relative importance of core and elective knowledge areas are provided in the IS Specific Course Matrix. Specific course implementations may thereby be tailored to include an emphasis on one or more knowledge areas, forming the required and elective courses, appropriate to the career track outcomes of individual instances of IS programs of study.

Further definition of each of the career tracks is provided on the Web site blogsandwikis.bentley.edu/iscurriculum. Included are a description of the career track, skills necessary to the career track, and coverage level for core and elective topics. Depth of coverage for the topics is specified as significant, some, and no coverage.

The core courses and their recommended sequence are presented in Figure 7 below. The IS 2010.1 *Foundations of Information Systems* course is a prerequisite for all the other courses, and the IS 2010.7 *IS Strategy, Management, and Acquisition* course is a capstone that should be either the last or one of the last courses that students take. The elective courses can be offered in the curriculum at any point that fits course-specific prerequisite requirements.

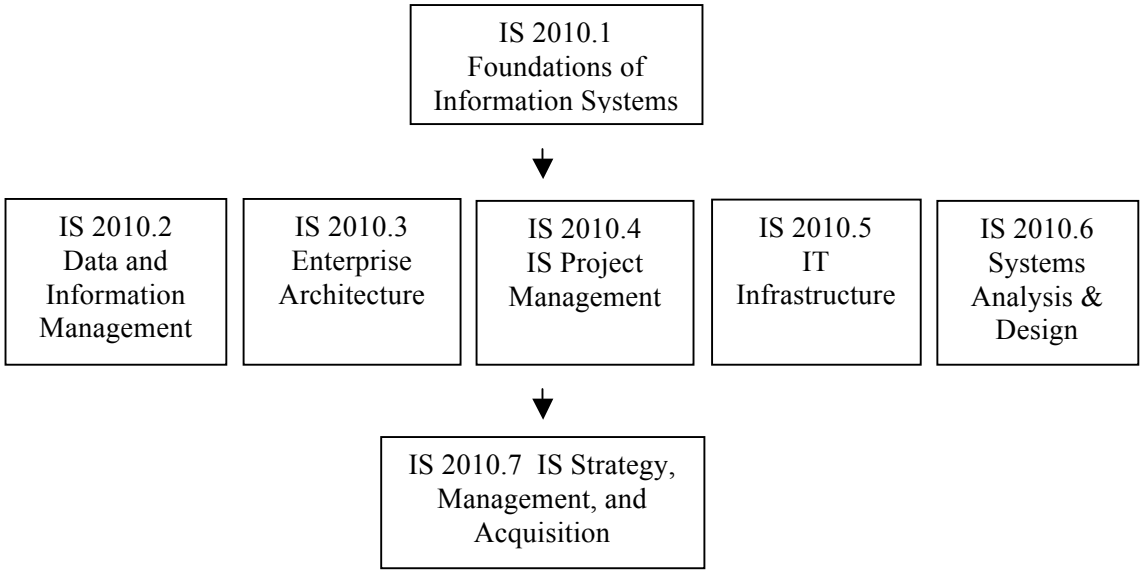

Figure 7: IS 2010 Core Courses

Core Course Changes in IS 2010

For those readers who know IS 2002 well and in order to illustrate recent changes in the field, this section will discuss the differences between IS 2010 and the previous curriculum recommendation, IS 2002. There are several major differences between the course recommendations in these two independent volumes. The following lists these major differences and describes in detail why the task force implemented these changes.

1. **Status of Application Development in the curriculum**. One of the more noticeable changes to the IS model curriculum is the removal of application development (IS 2002.5 Programming, Data, File, and Object Structures) from the prescribed core. It is important to understand that although application development is not included in the core, it has not been removed from the IS program, and the task force acknowledges that a strong case can be made for inclusion of programming, computational thinking, data structures, and related material in an IS program (see, for example, Topi *et al.,* 2008). Application development can still be offered in most IS programs. By offering application development as an elective the IS 2010 model curriculum increases its reach into non-business IS programs while also creating flexibility for curricula that choose to include an application development course. The programs that want to go even further and include a sequence of programming courses can choose from approaches introduced either in the Computer Science or in the Information Technology curriculum volumes (CS 2008 or IT 2008, respectively).

2. **Inclusion of both enterprise architecture and IT infrastructure** – The IS 2002 model curriculum includes both an IT Hardware and System Software course (IS 2002.4) and a Network and Telecommunication course (IS 2002.6) to edify the concepts and practices related to IT infrastructure. The IS 2010 model curriculum proposes a different approach, which integrates the material included in IS 2002 into IS 2010.5 IT Infrastructure course and introduces a new IS 2010.3 Enterprise Architecture course that focuses on concepts

at a higher level of abstraction. IT Infrastructure includes computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT infrastructure solutions provide in an organizational context. Enterprise Architecture focuses on organizational level issues related to planning, architecting, designing, and implementing IT-based solutions that use the platform technologies covered in the IT Infrastructure (IS 2010.5) course and the application and data & information management solutions covered in the Systems Analysis & Design (IS 2010.6) and Data and Information Management (IS 2010.2) courses, respectively. This course adopts a strongly integrative perspective related to the design and utilization of information and organizational processes across functional areas with a unified system view. IT Infrastructure covers the core technical foundations whereas Enterprise Architecture provides an integrated organizational perspective to planning and designing institutional solutions.

3. **Removal of Personal Productivity Tools Course –** The revised IS 2010 **c**urriculum recommends dropping the course focusing on personal productivity tools from IS programs. The task force has found that most institutions require all students to be proficient in personal productivity applications such as word processing, spreadsheets, and presentation software prior to enrolling in any major. Most high schools are preparing students in this area before they reach a higher education environment.

4. **Sequencing –** The IS 2002 model curriculum recommended various levels of sequencing in the curriculum (e.g., Foundations of IS is a prerequisite to Analysis and Logical Design, IT Hardware and Systems Software was a prerequisite to Networks and Telecommunications and so on). By flattening the sequencing of the curriculum, IS 2010 offers a flexible structure that can integrate electives easily. The flattened curriculum structure allows students to pass more easily through IS programs avoiding possible sequencing bottlenecks.

Detailed descriptions of the seven core courses and a set of sample electives are included in the last section of this document.

Overall Degree Structures and Coverage of Foundational and Domain-specific Skills and Knowledge

This curriculum recommendation does not provide specific courses that address the outcome expectations related to foundational skills and knowledge or domain-specific skills and knowledge. As specified earlier in the document in the section related to IS program outcome expectations, these two areas are essential for IS graduates and need to be covered in every IS curriculum in a way that ensures that the high-level outcome expectations are met.

Fundamentally, there are two ways to accomplish this: either the degree programs are offered in an environment (for example, a business school or a school of public policy) in which general curriculum requirements for the school as a whole ensure that these educational objectives are met or the school specifically designs and implements courses that are intended to develop capabilities in these two areas. Without sufficient coverage related to foundational skills and knowledge and to domain-specific skills and knowledge a curriculum is not compatible with this curriculum recommendation, even if this document does not specifically articulate how to meet these requirements.

For example, in a typical business school context general education and business core courses would cover foundational knowledge and skills, whereas the business core would be used to develop the domain-specific skills and knowledge.

In order to illustrate the adaptability and flexibility of the curriculum structure and demonstrate how different types of academic contexts can use it, several examples of three different degree requirement contexts in which undergraduate degree programs in Information Systems illustrate this. These are by no means exclusive but only provided as illustrations of how to use this model curriculum in a number of different academic environments. The first example describes an instantiation of the IS curriculum at a North American AACSB-accredited business school. Next, we illustrate the IS curriculum within a non-business school environment (i.e., Information School or School of Informatics). Finally, we present an example of a typical European Business School that follows a three-year Bologna degree structure.

AACSB-accredited North American Business School

Figure 8 illustrates a typical degree structure in the context for which IS 2002 and IS'97 were primarily developed: a North American AACSB-accredited business school. In these schools, it is still typical that 50% of the curriculum content is reserved for general education – mostly liberal arts courses in a variety of disciplines. From the perspective of the IS Model Curriculum, this part of the curriculum typically provides a strong basis for the development of foundational knowledge and skills, particularly those related to communication, analytical and critical thinking, and mathematical foundations. Eight courses or 20% of a 40 course[1] curriculum is a relatively typical number of courses reserved for the core business subjects (such as accounting, finance, marketing, organizational behavior, strategy, etc.). This portion of the curriculum addresses the domain fundamentals area of the IS curriculum, but also develops foundational knowledge and skills, particularly in leadership and collaboration, communication, and negotiation (and increasingly often, we hope, in ethical analysis).

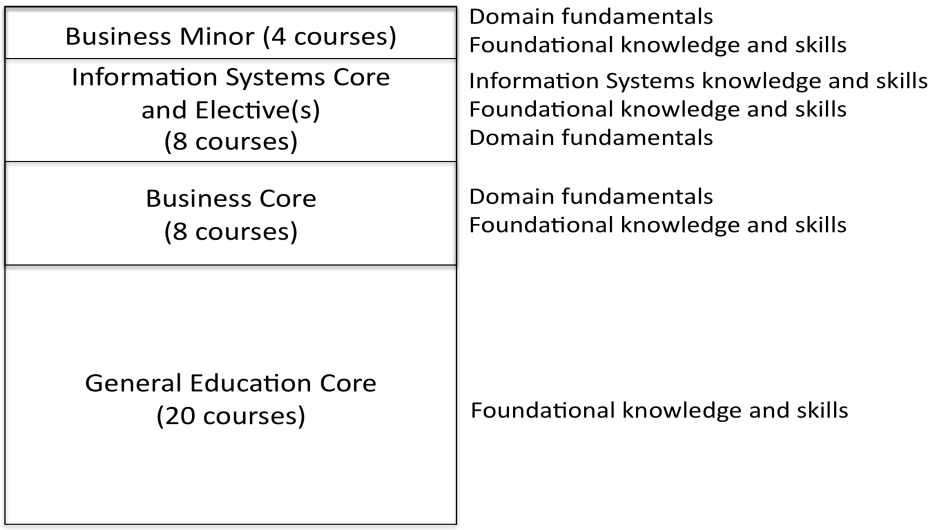

Figure 8: Undergraduate Information Systems Degree in a Typical AACSB-accredited North American Business School

[1] Please note that we are referring with the term "course" here to a three North American credit hour or six ECTS credit educational experience, which consists typically of 35-45 contact hours and 110 – 140 hours of work outside the classroom.

In this curriculum context, eight courses (20%) is often considered a generous allocation of courses to a major and thus, we will assume this for the Information Systems major. This curriculum component develops IS specific knowledge and skills, but also foundational skills (particularly in collaboration, communication, and analytical and critical thinking) and, taking the business school context into account, also domain fundamentals through business-focused IS material. Finally, there is typically room for a few business electives, which can be used for a minor or with a few additional courses a double major. Either one of these can be used to develop further domain fundamentals and foundational knowledge and skills. In this context, there is not much freedom to build alternative degree structures for the IS major – if there are eight courses available and the core requires seven, flexibility is minimal.

Non-Business School Environment in North America

Information Systems degrees are often quite different at non-business institutions, such as colleges and schools of computing or information technology. In Figure 9 presents an example of a realistic degree structure in this type of a school, which has significantly more space for courses that are intended to develop IS specific knowledge and skills. The example shows the IS major consists of 15 courses or 37.5% of the degree. With this curriculum structure, the department offering IS degrees has the opportunity to build on the core and offer (depending on the number of students) potentially a large number of career tracks and career track electives, as specified previously in Figure 6. The primary price that these degree programs pay is much less focus on the domain fundamentals (often covered in only a few courses). The purpose of the different elements are similar to those at the business schools, except that the IS major courses may have a weaker connection to a specific domain.

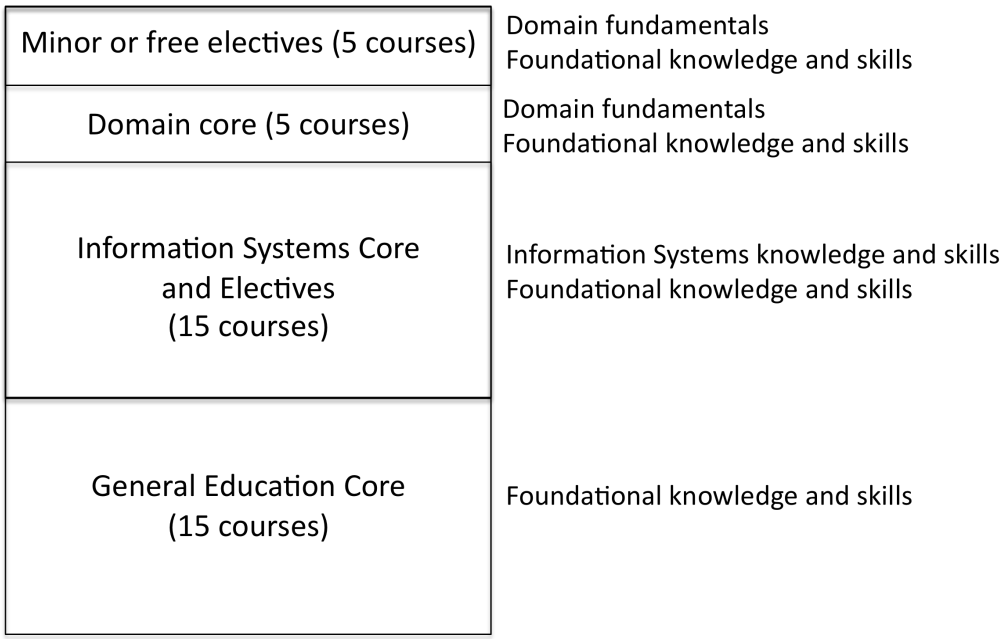

Figure 9: Undergraduate Information Systems Degree in a Non-Business School Environment in North America

A Three-Year Bologna Process Degree Structure at a European Business School

The final example illustrates the structure of a hypothetical three-year business school undergraduate program in a European country that follows the 3+2 Bologna process degree structure (three-year undergraduate followed by a two-year specialized master's degree). The most significant difference between this degree structure and the North American ones is significantly less focus on general education, which is primarily based on the fact that much of this content is covered in these countries at the high school level. Otherwise, the degree structure provides about 25% more coverage for the IS major and the business core (focusing on domain fundamentals). Therefore, these programs are also able to provide their students with flexible options following the career track / career track elective structure described previously in this section. It is also useful to remember that many European students follow directly to a specialized master's.

We emphasize these as illustrations of a few possible ways in which an undergraduate degree program in Information Systems can be implemented. We believe that the curriculum model described in this document is adaptable to a wide variety of contexts and we are looking forward to learning more about how schools will adopt it.

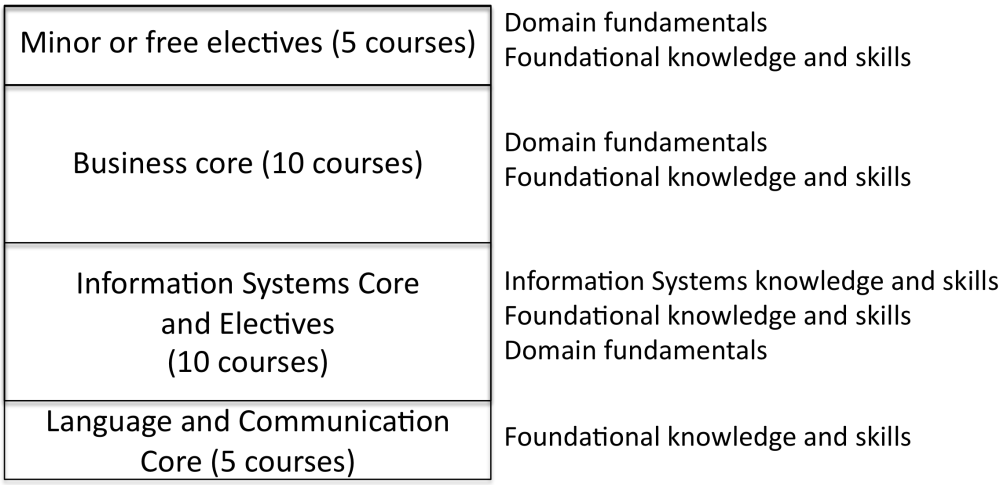

Figure 10: Undergraduate Information Systems Degree at a European Business School that Follows a Three-Year Bologna Process Degree Structure

11. RESOURCES FOR IS DEGREE PROGRAMS

The resources for the IS degree programs have changed substantially since the last curriculum revision. Similar to past curriculum revisions a capable faculty is the first required resource (Firth *et al.,* 2008). In addition to faculty the resources needed for an IS degree program are Internet access, laboratories and library resources. In a rapidly changing technical environment, students should be exposed to a variety of up-to-date hardware and software systems that adequately represent the professional setting in which they will be employed.

Faculty Requirements

Faculty members are vital to the strength of an Information Systems program. Its faculty needs both academic training and practical experience (Looney *et al.,* 2007). There must be enough faculty to provide course offerings that allow the students to complete a degree in a timely

manner. The interests and qualifications of the faculty must be sufficient not only to teach the courses but also to plan and modify the courses and curriculum.

Faculty members must remain current in the discipline. Professional development and scholarly activities are a joint obligation of the institution and the individual faculty members. The school should support continuing faculty development. Given the rapidly changing technology, it is particularly critical that faculty members have sufficient time for professional development and scholarly activities. Resources should be provided for faculty to regularly attend conferences, workshops, and seminars, and to participate in academic and professional organizations. The program is enhanced significantly when faculty acquire practical experience in the profession through activities such as training, consulting, sabbatical leaves, and industry exchange programs. Faculty must also be equipped to develop teaching materials for their students. Faculty must have available technology at least equivalent to and compatible with that available to students so that they may prepare educational materials for use by students. Faculty must be connected to the Internet in order to have access to students and to the larger academic and professional community.

The number of full-time faculty needed by the program is influenced by such factors as the number of students in the program, the number of required courses, the number of service and elective courses offered, and the teaching load of the faculty. A program should have a minimum number of full-time faculty with primary commitment to the Information Systems program in order to meet the teaching and advising needs of the program and to provide depth and breadth of faculty expertise. Courses must be offered with sufficient frequency for students to complete the program in a timely manner. The professional competence of the faculty should span a range of interests in information systems including computer systems concepts, information systems concepts, data management, telecommunications and networks, systems design and development, systems integration, and information systems management and policy. Additional faculty will be needed to teach the service courses that provide foundation-level knowledge across the campus.

Computing Infrastructure Requirements

Computing infrastructure consists of hardware, software, and technical support. Adequate computing facilities are essential for effective delivery of the IS program though the form in which this infrastructure is allocated has changed significantly. These formerly involved a blend of computer facilities of varying capabilities and complexity. Most freshmen enter college with computer resources so access plays a much more significant role (Lee 2009). Therefore, network access should be available for faculty and students to use with their own computers. Students at different levels in the curriculum have different needs. Substantial resources must be provided to support the courses targeted to all students. More sophisticated resources are necessary for Information Systems minors and majors who are developing skills in computing and IS fundamentals. Specialized laboratories or access to specialized simulation software is needed for advanced students where group and individual projects are developed. Contemporary and emerging software development tools should be available to create the most current enterprise solutions.

In addition to software and hardware, it is paramount that these tools have adequate technical support. Modern computing infrastructure is highly complex requiring technically trained support staff to maintain the equipment. This is beyond the scope of faculty duties, a waste of precious faculty resources, and often outside their individual expertise. Support staff who maintain hardware, software and communications resources rarely have overlapping skills an interest in

teaching due to the focus on product design and provider relationships. These technical experts are a vital necessity 24 x 7 in a campus environment.

Laboratory Requirements

Systems require hardware and software for structured, open/public, and specialized laboratories. Students must have an opportunity to use learning materials in both structured and unstructured laboratories.

Hardware and software are rapidly changing and improving. It is critical that faculty and students have access to facilities reflecting an environment that graduates will be expected to use professionally. All computing systems should be kept current. A plan should exist to continuously upgrade and/or replace software and equipment in a timely manner. The rate of change in technology suggests a rapid replacement cycle, with some technologies reaching obsolescence in less than 12 months.

Having said this, simulation software is becoming more prevalent for teaching advanced IS topics. This can include simulations for using applications to manage single workstations to complex enterprise-level networks. Many companies including Microsoft, Cisco, and even the textbook companies have developed sophisticated simulation software that does not require the latest equipment.

Various courses and areas of study have their own specialized requirements, such as the large database with realistic sample data that are needed for effective work in the area of data management.

Students should be provided opportunities to work together on team-oriented projects. The group skills developed in this mode are critical to a successful information systems professional. Technological support, such as groupware, is expected for group and team activities.

All laboratories must have adequate technical support in terms of professional staff to provide for installation and maintenance of the equipment. The staff should be proficient in both the hardware and software applications. Complete documentation must also be available.

Laboratories should be able to support the following types of functions:

1. **Structured Laboratories**

   A structured laboratory is a closed, scheduled, supervised experience in which students complete specified exercises. An instructor who is qualified to provide necessary support and feedback to the students provides supervision. Exercises are designed to reinforce and complement the lecture material.

2. **Open/Public Laboratories**

   Student ownership of computers has continued to increase. However, laboratories remain essential for those students who do not own a computer and for providing additional resources not available on personal machines.

3. **Specialized Laboratories**

   Laboratory facilities are necessary to support team projects and special computing environments. Special facilities may be needed for systems development, network infrastructure, and other advanced technologies.

Classrooms

Suitable classroom facilities, equipped with information technology teaching resources, should be provided. A computing system with multimedia facilities is necessary for demonstrating the development, implementation, and application of information technology as well as conducting walkthroughs and making presentations. Classrooms should have access to the Internet and extranet networks, either with port per seat or wireless networking capabilities.

Library

Library support is an important part of an academic program. It is especially important for disciplines with rapid development of knowledge such as the Information Systems field. Libraries should provide both traditional and digital access wherever possible to journals, proceedings, monographs, and reference books. The holdings should include access to digital journals and proceedings of the computing professional societies.

12. SHARED COURSES WITH OTHER COMPUTING DISCIPLINES

As explained earlier in the report, there is a close relationship between the academic fields of Information Systems and other computing disciplines, and there are also very significant differences. The context for Information Systems is an organization and its systems. In contrast, the context for Computer Science would typically include algorithmic processes for information processing and associated technical issues. There are complementary strengths for these academic units in preparing graduates for information systems work in organizations.

An Information Systems academic unit is typically strong in preparing students for the organizational environment. This advantage is especially strong when the Information Systems program is within or closely tied to organizational or business studies. The challenge for an IS unit may be in maintaining adequate depth of instruction in some technology subjects. On the other hand, a Computer Science program sometimes reverses the comparative position of an IS unit. It is typically strong in teaching technology and related algorithmic processes, but organizational functions and systems may not be an area of emphasis for them.

The variety in the organization of academic units tempers these remarks. Even in a single academic unit that covers multiple computing curricula, one often sees complementary strengths among programs.

This high level perspective of complementary strengths suggests that there may be opportunities for courses taught by any computing area that also meets the needs of IS majors; similarly for courses taught by IS for students desiring more IS knowledge from other areas. It is possible to conceptualize a common core for multiple programs, and in fact, such shared core courses are taught at a number of institutions. This report has not attempted a formal definition of such a course sequence because there is no fixed organizational model of these types of relationships. If

a common core sequence appears feasible for an institution, it could take the core requirements for IS described here and customize a common core sequence that fits the local organization of academic units and distribution of strengths of faculty and laboratory resources.

13. IS 2010 COURSE SPECIFICATIONS

This section provides high-level course descriptions for IS 2010, including the seven core courses and a subset of the electives discussed above. Each course is described with a catalog description and a scope statement, a topic list and finally, a discussion of the explanations and expectations for each course.

The courses included are:

Core Courses

IS 2010.1 Foundations of Information Systems
IS 2010.2 Data and Information Management
IS 2010.3 Enterprise Architecture
IS 2010.4 IS Project Management
IS 2010.5 IT Infrastructure
IS 2010.6 Systems Analysis and Design
IS 2010.7 IS Strategy, Management and Acquisition

Sample Elective Courses

Application Development
Business Process Management
Enterprise Systems
Introduction to Human-Computer Interaction
IT Audit and Controls
IS Innovation and New Technologies
IT Security and Risk Management

Title: IS 2010.1 Foundations of Information Systems
Core Course

Catalog description

Information systems are an integral part of all business activities and careers. This course is designed to introduce students to contemporary information systems and demonstrate how these systems are used throughout global organizations. The focus of this course will be on the key components of information systems - people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage. Through the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organizations and how IT enables improvement in quality, speed, and agility. This course also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become prevalent or are emerging in modern organizations and society.

Learning objectives

Students will learn to

1. Understand how and why information systems are used today.
2. Explain the technology, people, and organizational components of information systems.
3. Understand globalization and the role information systems has played in this evolution.
4. Understand how businesses are using information systems for competitive advantage vs. competitive necessity.
5. Understand the value of information systems investments as well as learn to formulate a business case for a new information system, including estimation of both costs and benefits.
6. Know the major components of an information systems infrastructure.
7. Mitigate risks as well as plan for and recover from disasters.
8. Understand how information systems are enabling new forms of commerce between individuals, organizations, and governments.
9. Be aware of emerging technologies that enable new forms of communication, collaboration, and partnering.
10. Understand how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.
11. Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes.
12. Understand how organizations develop and acquire information systems and technologies.
13. Understand how to secure information systems resources, focusing on both human and technological safeguards.
14. Evaluate the ethical concerns that information systems raise in society and the impact of information systems on crime, terrorism, and war.

Topics

- Characteristics of the Digital World
- Information systems components
    - Hardware
    - Software
    - Data
    - Networks
    - Facilities
    - Personnel
    - Services
    - Partners
- Information systems in organizations
    - Characteristics of IS professionals
    - IS career paths
    - Cost/value information
    - Quality of information
    - Competitive advantage of information
    - IS and organizational strategy
    - Value chains and networks
- Globalization
    - What is globalization?
    - Technology enabled change
    - Digital divide
    - Cultural, ethnic, political challenges
    - Global information systems strategies
- Valuing information systems
    - How information systems enable organizational processes
    - Making a business case for information systems
    - Productivity paradox of information systems
    - Investment evaluation
        - Multi-criteria analysis
        - Cost-benefit analysis
    - Identifying and implementing innovations
- Information systems infrastructure
    - Hardware
    - Software
    - Collaboration and communication technologies
    - Data and knowledge
    - Faculties
    - Services
    - Personnel
    - Partnerships
- The Internet and WWW
    - E-business
        - B-to-C
        - B-to-B
    - Intranets, Internet, extranets
    - E-government
    - Web 2.0

        - Technologies: e.g., wikis, tags, blogs, netcasts, self-publishing
        - New forms of collaboration: social networking, virtual teams, viral marketing, crowd-sourcing
- Security of information systems
    - Threats to information systems
    - Technology-based safeguards
    - Human-based safeguards
    - Information systems security planning and management
- Business intelligence
    - Organizational decision making, functions, and levels
        - Executive, managerial, and operational levels
        - Systems to support organizational functions and decision making
    - Information and knowledge discovery
        - Reporting systems
        - Online analytical processing
        - Data, text, and Web mining
        - Business analytics
    - Application systems
        - Executive, managerial, and operational support systems
        - Decision support systems
        - Functional area information systems
        - Collaboration technologies
        - Intelligent systems
        - Knowledge management systems
    - Information visualization
        - Visual analytics
        - Dashboards
        - Geographic information systems
- Enterprise-wide information systems
    - Enterprise resource planning
    - Supply chain management
    - Customer relationship management
- Development and acquisition
    - Systems development lifecycle
    - Alternative development approaches
    - External acquisition
    - Outsourcing
    - End-user development
- Information systems ethics and crime
    - Information privacy, accuracy, property, and accessibility
    - Computer crime
    - Cyberwar / cyberterrorism

Discussion

- Information systems have become pervasive in organizations in society. It is crucial for students to gain a comprehensive understanding of what information systems are, and how they are being used to facilitate organizational processes and societal change.
- Students must understand the various types of issues involved in building, acquiring, managing, and safeguarding information systems. They must also have

an understanding of various types of systems and how they aid organizational decision making, business processes, collaboration, partnerships, and so on.

- Students with practical end-user knowledge will study systems theory and quality concepts as an introduction to information technology concepts and information systems development. Structure and functions of computers, telecommunications, and other infrastructure components will be examined.
- The concept that information is of significance in stating and attaining organizational goals will be used as the basis for exploring the need for various types of information systems. Information systems will be introduced as a method for not only processing data to produce information, but as a method for enhancing communication and collaboration within and outside the organization. The dynamic nature of organizations and the necessity for growth and re-design of the organization as well as its information systems will be presented and used as the motivator for understanding information systems development methodologies and approaches for technology acquisition.
- The development path for entry level to senior information systems professionals will be explained. Professional ethical expectations and obligations will be reviewed. The necessity for personal and interpersonal communications skills will be discussed.

Title: IS 2010.2 Data and Information Management
Core Course

Catalog description

This course provides the students with an introduction to the core concepts in data and information management. It is centered around the core skills of identifying organizational information requirements, modeling them using conceptual data modeling techniques, converting the conceptual data models into relational data models and verifying its structural characteristics with normalization techniques, and implementing and utilizing a relational database using an industrial-strength database management system. The course will also include coverage of basic database administration tasks and key concepts of data quality and data security. In addition to developing database applications, the course helps the students understand how large-scale packaged systems are highly dependent on the use of DBMSs. Building on the transactional database understanding, the course provides an introduction to data and information management technologies that provide decision support capabilities under the broad business intelligence umbrella.

Learning objectives

Students will learn to

1. Understand the role of databases and database management systems in managing organizational data and information.
2. Understand the historical development of database management systems and logical data models.
3. Understand the basics of how data is physically stored and accessed.
4. Understand the fundamentals of the basic file organization techniques.
5. Apply information requirements specification processes in the broader systems analysis & design context.
6. Use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.
7. Link to each other the results of data/information modeling and process modeling.
8. Design high-quality relational databases.
9. Understand the purpose and principles of normalizing a relational database structure.
10. Design a relational database so that it is at least in 3NF.
11. Implement a relational database design using an industrial-strength database management system, including the principles of data type selection and indexing.
12. Use the data definition, data manipulation, and data control language components of SQL in the context of one widely used implementation of the language.
13. Perform simple database administration tasks.
14. Understand the concept of database transaction and apply it appropriately to an application context.
15. Understand the basic mechanisms for accessing relational databases from various types of application development environments.
16. Understand the role of databases and database management systems in the context of enterprise systems.
17. Understand the key principles of data security and identify data security risk and violations in data management system design.

18. Understand the core concepts of data quality and their application in an organizational context.
19. Understand the difference between on-line transaction processing (OLTP) and on-line analytic processing (OLAP), and the relationship between these concepts and business intelligence, data warehousing and data mining.
20. Create a simple data warehouse ("data mart").
21. Understand how structured, semi-structured, and unstructured data are all essential elements of enterprise information and knowledge management. In this context, the students will learn the principles of enterprise search.

Topics

- Database approach
- Types of database management systems
- Basic file processing concepts
- Physical data storage concepts
- File organizations techniques
- Conceptual data model
    - Entity-relationship model
    - Object-oriented data model
    - Specific modeling grammars
- Logical data model
    - Hierarchical data model
    - Network data model
    - Relational data model
        - Relations and relational structures
        - Relational database design
            - Mapping conceptual schema to a relational schema
            - Normalization
- Physical data model
    - Indexing
    - Data types
- Database languages
    - SQL: DDL, DML, and DCL
- Data and database administration
- Transaction processing
- Using a database management system from an application development environment
- Use of database management systems in an enterprise system context
- Data / information architecture
- Data security management
    - Basic data security principles
    - Data security implementation
- Data quality management
    - Data quality principles
    - Data quality audits
    - Data quality improvement
- Business intelligence
    - On-line analytic processing
    - Data warehousing
    - Data mining

- Enterprise search

Discussion

- The course still has a strong focus on traditional data management: conceptual data modeling (using ER modeling as the primary technique), logical data modeling using the relational data model (including ER – relational conversion and normalization), and physical database implementation and manipulation using SQL.
- Information requirements specification processes must be firmly linked to the organizational systems analysis and design processes and that students understand the role of conceptual data modeling as an integral part of the process of understanding a domain.
- The focus on the physical data model and the DBA-level work on database implementation has been reduced for improved understanding of the role of databases in the enterprise application context and various business intelligence topics, including enterprise search. Students should understand the basic nature of the DBA tasks and be able to make intelligent decisions regarding DBMS choice and the acquisition of DBA resources.
- It is critically important that students understand how dependent various large-scale packaged systems (including ERP systems) are on relational databases and how maintaining them and in supporting their use in organizations depends on understanding data structures and data manipulation with SQL.
- The course should provide a practical understanding of how relational databases support Web-based applications.

Title: IS 2010.3 Enterprise Architecture[2]
Core Course

Catalog description

This course explores the design, selection, implementation and management of enterprise IT solutions. The focus is on applications and infrastructure and their fit with the business. Students learn frameworks and strategies for infrastructure management, system administration, data/information architecture, content management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, IT investment analysis, and emerging technologies. These topics are addressed both within and beyond the organization, with attention paid to managing risk and security within audit and compliance standards. Students also hone their ability to communicate technology architecture strategies concisely to a general business audience.

Learning objectives

Students will learn to

1. Understand a variety of frameworks for enterprise architecture analysis and decision making.
2. Evaluate the total cost of ownership and return on investment for architecture alternatives.
3. Utilize techniques for assessing and managing risk across the portfolio of the enterprise.
4. Evaluate and plan for the integration of emerging technologies.
5. Administer systems, including the use of virtualization and monitoring, power and cooling issues.
6. Manage proliferating types and volume of content.
7. Understand the core concepts of data/information architecture and evaluate existing data/information architecture designs.
8. Plan for business continuity.
9. Understand the benefits and risks of service oriented architecture.
10. Understand the role of audit and compliance in enterprise architecture.
11. Understand the integration of enterprise systems with interorganizational partners such as suppliers, government, etc.

Topics

- Service oriented architecture
- Enterprise architecture frameworks
- Systems integration
- Enterprise resource software

[2] Acknowledgement: This material is largely based on work by Dr. Bill Schiano, Bentley University.

- Monitoring and metrics for infrastructure and business processes
- Green computing
- Virtualization of storage and systems
- The role of open source software
- Risk management
- Business continuity
- Total cost of ownership and return on investment
- Software as a service
- Enterprise data models
- Data / information architecture and data integration
- Content management
- Audit and compliance
- System administration
- IT control and management frameworks
- Emerging technologies

Discussion

- The course can be structured at varying levels of technical depth.
- The course can be a relatively easy way to introduce newer technologies into the curriculum, e.g. Web 2.0.
- This course operates at a higher level of abstraction than a typical infrastructure course, and it includes significant coverage of business issues related to an enterprise's technology architecture.
- This course introduces modern enterprise IT concepts, such as SOA, green computing and SaaS.
- This course also covers the topics related to IT control and service management frameworks (COBIT, ITIL, etc.).

Title: IS 2010.4 IT Infrastructure
Core Course

Catalog description

This course provides an introduction to IT infrastructure issues for students majoring in Information Systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require in-depth understanding of the IT infrastructure capabilities and limitations. It also prepares the students for organizational roles that require interaction with external vendors of IT infrastructure components and solutions. The course focuses strongly on Internet-based solutions, computer and network security, business continuity, and the role of infrastructure in regulatory compliance.

Learning objectives

Students will learn to

1. Understand key principles of data representation and manipulation in computing solutions.
2. Understand the principles underlying layered systems architectures and their application to both computers and networks.
3. Understand the differences and similarities between the core elements of an IT infrastructure solution, such as clients, servers, network devices, wired and wireless network links, systems software, and specialized security devices.
4. Understand how IT infrastructure components are organized into infrastructure solutions in different organizational environments.
5. Understand the principles underlying service virtualization.
6. Understand through practical examples how protocols are used to enable communication between computing devices connected to each other.
7. Configure an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices, and several different types of computing clients.
8. Apply the core concepts underlying IP networks to solve simple network design problems, including IP subnetting.
9. Understand the role and structure of the Internet as an IT infrastructure component and design simple infrastructure solutions based on the use of the Internet.
10. Understand the components and structure of a large-scale organizational IT infrastructure solution at a level that allows them to use it effectively.
11. Understand the role of IT control and service management frameworks in managing a large-scale organizational IT infrastructure solution.
12. Negotiate with vendors providing design and implementation solutions.
13. Understand the opportunities that virtual computing service provision models, such as cloud computing, create for organizations.
14. Analyze and understand the security and business continuity implications of IT infrastructure design solutions.
15. Configure simple infrastructure security solutions.

16. Minimize the environmental and resource consumption impacts of IT infrastructure decisions

Topics

- Core computing system architecture concepts
- Core computing system organizing structures
- Core technical components of computer-based systems
- Role of IT infrastructure in a modern organization
- Operating systems
    - Core operating systems functionality
    - Internal organization of an operating system
    - Types of devices that require and use operating systems
    - Multitasking and multithreading
    - File systems and storage
    - User interfaces
    - Operating system configuration
    - Securing an operating system
    - Virtualization of computing services
- Networking
    - Types of networks
    - Core network components
    - TCP/IP model
    - Physical layer: wired and wireless connectivity
    - Data link layer: Ethernet
    - Network layer: IP, IP addressing and routing
    - Transport layer: TCP
    - Application layer: core Internet application protocols
    - Network security and security devices
    - The Internet as a key networking platform
    - Network device configuration
- Organizing storage on organizational networks
- Data centers
- Securing IT infrastructure
    - Principles of encryption and authentication
    - Component level security: clients, servers, storage network devices, data transport, applications
    - Perimeter security: firewalls
    - Using public networks for secure data transport: VPNs
- The role of IT control and service management frameworks (COBIT, ITIL, etc.) in managing the organizational IT infrastructure
- Ensuring business continuity
- Grid computing
- Cloud computing, computing as a service
- System performance analysis and management
- Purchasing of IT infrastructure technologies and services

Discussion

- This course recognizes that Information Systems programs are increasingly preparing students for organizational roles that do not require in-depth skills in

designing or configuring hardware and systems software solutions. The key focus is on helping the students understand the infrastructure issues at a level that is required for effective work as business and systems analysis.

- The course also forms the foundation for further study related to both computer architecture and communication networks. Specifically, it is important to recognize that many technically focused IT risk management, security, and forensics jobs require more in-depth understanding of technology issues than this single course can provide.
- Whenever possible, it is recommended that this course uses hands-on laboratory work and practical exercises to teach the complex concepts that are often too abstract to grasp without practical examples.

Title: IS 2010.5 IS Project Management
Core Course

Catalog description

This course discusses the processes, methods, techniques and tools that organizations use to manage their information systems projects. The course covers a systematic methodology for initiating, planning, executing, controlling, and closing projects. This course assumes that project management in the modern organization is a complex team-based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This course also acknowledges that project management involves both the use of resources from within the firm, as well as contracted from outside the organization.

Learning objectives

Students will learn to

1. Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects.
2. Understand the foundations of project management, including its definition, scope, and the need for project management in the modern organization.
3. Understand the phases of the project management lifecycle.
4. Manage project teams, including the fundamentals of leadership and team motivation.
5. Manage project communication, both internal to the team, and external to other project stakeholders.
6. Initiate projects, including project selection and defining project scope.
7. Manage project schedules with appropriate techniques and tools.
8. Manage project resources, including human resources, capital equipment, and time.
9. Manage project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved.
10. Manage project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled.
11. Manage the project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external procurement.
12. Manage project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status.
13. Control projects through information tracking and cost and change control techniques.
14. Close projects, including administrative, personnel, and contractual closure.
15. Understand the mechanisms for dealing with legal issues in complex project contexts.
16. Appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers.

Topics

- Introduction to Project Management
    - Project management terminology

    - Project failures and project successes
    - Unique features of IT projects
    - What is project management?
- The Project Management Lifecycle
    - What is the project management lifecycle?
    - Project management and systems development or acquisition
    - The project management context
    - Technology and techniques to support the project management lifecycle
    - Project management processes
- Managing Project Teams
    - What is a project team?
    - Project team planning
    - Motivating team members
    - Leadership, power and conflict in project teams
    - Managing global project teams
- Managing Project Communication
    - Managing project communication
    - Enhancing team communication
    - Using collaboration technologies to enhance team communication
- Project Initiation and Planning
- Managing Project Scope
    - Project initiation
    - How organizations choose projects
    - Activities
    - Developing the project charter
- Managing Project Scheduling
    - What is project scheduling?
    - Common problems in project scheduling
    - Techniques for project scheduling
- Managing Project Resources
    - What are resources?
    - Types of resources (human, capital, time)
    - Techniques for managing resources
- Managing Project Quality
    - What is project quality?
    - What are the threats to project quality?
    - How can we measure project quality?
    - Tools for managing project quality
- Managing Project Risk
    - What is project risk?
    - What are the threats to project risk?
    - Tools for managing project risk
- Managing Project Procurement
    - Alternatives to systems development
    - External acquisition
    - Outsourcing-domestic and offshore
    - Steps in the procurement process
    - Managing the procurement process
- Project Execution, Control & Closure
    - Managing project execution
    - Monitoring progress and managing change

    - Documentation and communication
    - Common problems in project execution
- Managing Project Control & Closure
    - Obtaining information
    - Cost control
    - Change control
    - Administrative closure
    - Personnel closure
    - Contractual closure
    - Project auditing

Discussion

- The core course in information systems project management is primarily focused on initiating, planning, executing, controlling, and closing information systems projects. Project charters, schedules, resource assignments, communication, risk and quality control plans, as well as an understanding of leadership and group processes are all tools which can enhance effective project management. This course will teach the student methods that allow them to manage projects resources, including those internal and external to the organization.
- The course specification intentionally leaves discussion regarding specific methods and approaches unanswered. While there are common techniques to project management institutions, programs will still have the ability to make local decisions regarding specific tools and techniques based on the capabilities of their faculty, their available resources, and the needs of the companies hiring the students.
- Using a course project to teach the concepts in this course is highly recommended.

Title: IS 2010.6 Systems Analysis & Design
Core Course

Catalog description

This course discusses the processes, methods, techniques and tools that organizations use to determine how they should conduct their business, with a particular focus on how computer-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analyzing a business problem or opportunity, determining what role, if any, computer-based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements, and specifying the requirements for the information systems solution in particular, in-house development, development from third-party providers, or purchased commercial-off-the-shelf (COTS) packages .

Learning objectives

Students will learn to

1. Understand the types of business needs that can be addressed using information technology-based solutions.
2. Initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects.
3. Clearly define problems, opportunities, or mandates that initiate projects.
4. Use at least one specific methodology for analyzing a business situation (a problem or opportunity), modeling it using a formal technique, and specifying requirements for a system that enables a productive change in a way the business is conducted.
5. Within the context of the methodologies they learn, write clear and concise business requirements documents and convert them into technical specifications.
6. Communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.
7. Manage information systems projects using formal project management methods.
8. Articulate various systems acquisition alternatives, including the use of packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources.
9. Use contemporary CASE tools for the use in process and data modeling.
10. Compare the acquisition alternatives systematically.
11. Incorporate principles leading to high levels of security and user experience from the beginning of the systems development process.
12. Design high-level logical system characteristics (user interface design, design of data and information requirements).
13. Analyze and articulate ethical, cultural, and legal issues and their feasibilities among alternative solutions.

Topics

- Identification of opportunities for IT-enabled organizational change
- Business process management
- Analysis of business requirements
    - Business process modeling

    - Information requirements
- Structuring of IT-based opportunities into projects
- Project specification
- Project prioritization
- Analysis of project feasibility
    - Operational
    - Tangible costs and benefits (financial and other measures such as time savings)
    - Intangible costs and benefits such as good will, company image
    - Technical
    - Schedule
    - Legal
    - Cultural (organizational and ethnic)
- Fundamentals of IS project management in the global context
- Using globally distributed communication and collaboration platforms
- Analysis and specification of system requirements
    - Data collection methods
    - Methods for structuring and communicating requirements
    - Factors affecting user experience
    - User interface design
    - System data requirements
    - Factors affecting security
    - Ethical considerations in requirements specification
- Different approaches to implementing information systems to support business requirements
    - Packaged systems; enterprise systems
    - Outsourced development
    - In-house development
- Specifying implementation alternatives for a specific system
- Impact of implementation alternatives on system requirements specification
- Methods for comparing systems implementation approaches
- Organizational implementation of a new information system
- Different approaches to systems analysis & design: structured SDLC, unified process/UML, agile methods

Discussion

- The focus of the core course in systems analysis & design is primarily focused on analyzing and documenting business requirements as well as converting these requirements into detailed systems requirements and high-level design specifications (e.g., mock-ups of forms, reports, HCI, and other user interface components), not on internal design or system implementation design. The course content will explicitly be built on the assumption that most organizational systems are built based on various types of packaged systems, system components, or implemented by using outsourced development capabilities (whether on- or off-shore). The course will teach students methods that allow them to specify requirements precisely and communicate effectively with both business stakeholders and developers, but it will not include material related to the design or implementation of the technical structure of the system.
- The course specification intentionally leaves discussion regarding specific methods and approaches unanswered. Institutions have to make these decisions

regarding the capabilities of their faculty and the needs of the companies hiring the students. It is, however, important that the course will provide some exposure to the structured SDLC, object-oriented analysis and design (some Unified Process variant using UML as a grammar) and agile methods.

- Using a course project is highly recommended.
- The course specifically emphasizes the importance of incorporating security issues and user experience from the earliest stages of the process.
- The course includes exposure to project management concepts and practice. The importance of this element will depend on the extent to which project management is covered elsewhere in the curriculum.

Title: IS 2010.7 IS Strategy, Management & Acquisition
Core Course

Catalog description

This course explores the issues and approaches in managing the information systems function in organizations and how the IS function integrates / supports / enables various types of organizational capabilities. It takes a senior management perspective in exploring the acquisition, development and implementation of plans and policies to achieve efficient and effective information systems. The course addresses issues relating to defining the high-level IS infrastructure and the systems that support the operational, administrative and strategic needs of the organization. The remainder of the course is focused on developing an intellectual framework that will allow leaders of organizations to critically assess existing IS infrastructures and emerging technologies as well as how these enabling technologies might affect organizational strategy. The ideas developed and cultivated in this course are intended to provide an enduring perspective that can help leaders make sense of an increasingly globalized and technology intensive business environment.

Learning objectives

Students will learn to

1. Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm.
2. View an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers.
3. Understand the concepts of information economics at the enterprise level.
4. Appreciate how IS represents a key source of competitive advantage for firms.
5. Structure IS-related activities to maximize the business value of IS within and outside the company.
6. Understand existing and emerging information technologies, the functions of IS and its impact on the organizational operations.
7. Evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm.
8. Understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options.
9. Apply information to the needs of different industries and areas.
10. Understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organization.

Topics

- The IS function
- IS strategic alignment
- Strategic use of information
- Impact of IS on organizational structure and processes
- IS economics
- IS planning

- Role of IS in defining and shaping competition
- Managing the information systems function
    - IS leadership: The role of the CIO and IS management
    - Structuring the IS organization
    - Hiring, retaining, and managing IS professionals
    - Managing a mixed set of internal and external resources
    - Determining staffing skills allocation models
- Financing and evaluating the performance of information technology investments and operations
- Acquiring information technology resources and capabilities
    - Acquiring infrastructure capabilities
    - Sourcing information systems services
    - Sourcing information systems applications
- Using IS/IT governance frameworks
- IS risk management
    - Managing business continuity
    - Managing security and privacy

Discussion

- The core course in IS Strategy, Management and Acquisition will take a high-level approach to the management and acquisition of IS-resources within the firm.
- The course will deliver the student specific strategies used in firms today to help form the basis of IS strategic management. Students will apply these strategies to management issues within an IS context.
- Specifics on the types of strategic thinking are used in this course are left unanswered. Institutions may have certain capabilities or constraints that can be optimized to offer the best thinking for the companies that are hiring their graduates. Also, there are different regional issues that need to be addressed in order to match the trends of specific IS strategies.
- Using a case study methodology is highly recommended for this course as it will help the students strategically identify issues in a real-world setting. In general, it is essential that the pedagogical approaches chosen for this course will carefully consider the fact that the issues covered are at a higher level of abstraction than what the students are used to based on their practical experience in organizations. Inviting senior management practitioners to address topics such as alignment, strategic planning, and restructuring is especially useful in targeting regional needs and allowing a divers set of industry verticals.

Title: Application Development
Elective Course

Catalog description

The purpose of this course is to introduce the students to the fundamental concepts and models of application development so that they can understand the key processes related to building functioning applications and appreciate the complexity of application development. Students will learn the basic concepts of program design, data structures, programming, problem solving, programming logic, and fundamental design techniques for event-driven programs. Program development will incorporate the program development life cycle: gathering requirements, designing a solution, implementing a solution in a programming language, and testing the completed application.

Learning objectives

Students will learn to:

1. Use primitive data types and data structures offered by the development environment
2. Choose an appropriate data structure for modeling a simple problem
3. Understand basic programming concepts
4. Write simple applications that relate to a specific domain
5. Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard conditional and iterative structures, and the definition of functions.
6. Test applications with sample data
7. Apply core program control structures

Topics

- Program design
- Program development lifecycle
- Requirements determinants and analysis
- Modular design
- Techniques for modeling program structures
- Programming concepts
  - Variables
  - Literals
  - Types
  - Expressions
  - Procedures
  - Functions
  - Parameters
  - Operators and operations
  - Decision logic
  - Looping
  - Subprocedures
  - Passing parameters
- Coding
- Unit testing
- Control structures

    - Sequential
    - Conditional
    - Iterative
- Input/Output (I/O) design
    - Text-based
    - Graphical user interface (GUI)
- Data structures
    - Primitive data types, composite data types, arrays
    - Memory management
    - Sequential and random file processing
- Database access
- Development approaches
    - Object-oriented
    - Procedural
    - Declarative
    - Rapid application
    - Structured
- Application integration
- Prototyping
- Overview and history of programming languages

Discussion

- The course benefits from computer lab resources either in class or available for licensing on individual students' computers. The choice of language should reflect commonly used languages and tools with the expectation that learning any language will generalize to other languages. For this reason it may be best to concentrate on one language to develop depth rather than breadth across several languages.

Title: Business Process Management
Elective Course

Catalog description

In this course students will be introduced to key concepts and approaches to business process management and improvement. The main focus of this course is both understanding and designing business processes. Students will learn how to identify, document, model, assess, and improve core business processes. Students will be introduced to process design principles. The way in which information technology can be used to manage, transform, and improve business processes is discussed. Students will be exposed to challenges and approaches to organizational change, domestic and offshore outsourcing, and inter-organizational processes.

Learning objectives

Students will learn to:

1. Model business processes
2. Benchmark business processes performance
3. Assess business processes performance
4. Design business process improvements
5. Understand the role and potential of IT to support business process management
6. Understand the challenges of business process change
7. Understand how to support business process change
8. Understand different approaches to business process modeling and improvement
9. Understand the challenges and risks concerning business process outsourcing, especially those dealing with ethnic cultural differences from offshore engagements.
10. Use basic business process modeling tools
11. Simulate simple business processes and use simulation results in business process analysis

Topics

- Overview
  - Challenges in managing business processes
  - Approaches to business process management & improvement

- Understanding organizational processes
  - Business process definition and classification
  - Identifying core processes
  - Modeling processes
  - Documenting processes

- Process assessment
  - Measuring performance
  - Benchmarking
  - Statistical techniques for process measurement

- Process improvement
  - Process design guidelines and principles

  - Continuous process improvement
  - Change management

- Using IT for process management and improvement
  - Business process improvement and modeling software
  - Tools of business process simulation
  - ERP systems
  - Use cases

- Organizational issues in business process management
  - Understanding the customer
  - Business process outsourcing
  - Managing processes that cross organizational borders

Discussion

- The course description does not identify specific approaches and methods for business process management and improvements, such as BPR, TQM, or Six Sigma. This will allow instructors and institutions to decide which specific approaches to cover.
- The demonstration of leading ERP systems such as SAP is highly recommended.
- The use of case studies for discussion and reflection in this course is highly recommended.
- The use of group project in this course is highly recommended.
- The organization of an SAP Practicum can be considered.

Title: Enterprise Systems
Elective Course

Catalog description

This course is designed to provide students with an understanding of the theoretic and practical issues related to the application of enterprise systems within organizations. The main focus of this course is to demonstrate how enterprise systems integrate information and organizational processes across functional areas with a unified system comprised of a single database and shared reporting tools. Enterprise systems, by their multi-dimensional integrative nature, offer the depth of functionality and breadth of integration to demonstrate how global operations of organizations are managed. Thus, students will gain an appreciation of the scope of enterprise systems and the motivation for implementing them. [Optional: Example software will be used to illustrate how enterprise systems work. An integrated project, which requires the application of conceptual as well as technical (software) skills of students, will be required.]

Learning objectives

Students will learn to:

1. Understand the fundamentals of enterprise systems and issues associated with their implementation.
2. Evaluate the costs and benefits of implementing an enterprise system.
3. Understand how enterprise systems integrate functional areas into one enterprise-wide information system.
4. Explain how "best practices" are incorporated in enterprise systems.
5. Recognize how an organizational process often spans different functional areas.
6. Describe the role of enterprise systems in carrying out processes in an organization.
7. Learn to integrate key concepts from functional-oriented courses, such as accounting, marketing, and organizational behavior, to promote the development of integrative skills.
8. Explain how integrated information sharing increases organizational efficiencies.
9. Identify, describe, and evaluate the major enterprise system software providers and their packaged systems.
10. Understand current trends related to enterprise systems.

Topics

- Business processes and business process integration
- Making the case for acquiring and implementing enterprise systems
- Analyzing business requirements for selecting and implementing an enterprise system
- Selection of enterprise systems software
- Challenges associated with the implementation of global enterprise systems applications
- Organizational change and change management
- Strategic alignment
- User commitment
- Communications
- Training

- Job redesign
- Governance of processes and data
- Post-implementation issues
- Enterprise system processes
- Order processing
- Purchasing
- Production logistics
- Accounting
- Planning and control
- Human resource functions
- How enterprise systems support business

Discussion

- The course intentionally does not specify enterprise system software. Institutions have to make the decision of whether and how to provide students with experience with actual enterprise system software. It is preferable that the course includes exposure to and hands-on use of one of the many enterprise system vendors (SAP or Oracle, SSA Global, Microsoft (Axapta, Great Plains and Solomon), Intuit, or Minicom). The importance of actual use is clear. Enterprise system software is in place in a majority of large organizations and increasing in use in small and medium-sized organizations.
- A group project is highly recommended to assess both practical/applied aspects and the conceptual/theoretical content of the course. For example, a group project could require students to study a real-world organization and evaluate the suitability of SAP R/3 or another software solution. This evaluation would then be compared with other enterprise system software products in terms of product functionality, support and flexibility for configuration and customization, architecture and technology compatibility, Web-based functionality, ease of interfacing with other legacy systems, and implementation costs. If software resources permit, the group could then design and configure a simple workable integrated enterprise system, using SAP R/3 for example, that demonstrates the integration of information from several modules, such as accounts receivable, sales, manufacturing/production, procurement, accounts payable, or general ledger. Student groups would analyze the functional areas in a real-world organization and map them into SAP R/3. Students would create an enterprise structure, relevant master data in the software, transactions that demonstrate integration of core processes, and provide documentation. Students thereby apply specialist skills and knowledge drawn from other traditional disciplines to an actual organization and demonstrate the development of skills such as analytical skills, communication, critical thinking, problem solving, and teamwork.
- The course provides a pedagogical basis for a change in the delivery of education from a functional orientation to a process orientation, leading to the integration of curriculum across functions.

Title: Introduction to Human-Computer Interaction
Elective Course

Catalog description

This course provides an introduction to the field of human-computer interaction (HCI), an interdisciplinary field that integrates cognitive psychology, design, computer science and others. Examining the human factors associated with information systems provides the students with knowledge to understand what influences usability and acceptance of IS. This course will examine human performance, components of technology, methods and techniques used in design and evaluation of IS. Societal impacts of HCI such as accessibility will also be discussed. User-centered design methods will be introduced and evaluated. This course will also introduce students to the contemporary technologies used in empirical evaluation methods.

Learning objectives

Students will learn to:

1. Design, implement and evaluate effective computer interfaces.
2. Understand the concepts of user differences, user experience and collaboration as well as how to design contextually.
3. Understand the basic cognitive psychology issues involved in HCI.
4. Understand the different devices used for input and output and the issues / opportunities associated with these devices.
5. Interact with the software design process in order to create computer interfaces.
6. Understand the role of theory and frameworks in HCI.
7. Apply a number of design techniques.
8. Apply contemporary techniques to evaluate computer interfaces.

Topics

- Relevance of HCI
- Principles in HCI design
    - Ergonomic engineering
    - Cognitive engineering
    - Affective engineering
- User-Centered Design
    - Users
        - Capabilities
            - Conceptual models
            - Metaphors
            - Mental models
        - Individual differences
        - Learning
        - Errors
        - Training
- Special HCI Issues Related to
    - Users
        - Children
        - Elderly
        - Accessibility

        - Gender
    - Organizations
    - Society
    - Task Analysis
- Devices
    - PCs
    - Industrial devices
    - Consumer devices
    - Mobile devices
- Development
    - Introduction to projects
    - Prototyping
    - Contextual inquiry
    - Usability engineering
- Evaluation Methods
    - Heuristics
    - Cognitive evaluation
    - Usability testing
    - Questionnaires
    - Research design

Discussion

- This course is not about developing basic interactive technologies (such as input/output devices), but rather, it briefly introduces these technologies, and then focuses on developing human-centered organizational information systems that support users' organizational tasks. Human physical, cognitive, and affective characteristics are discussed, as are organizational tasks and context. Such discussions are oriented toward achieving a good fit between human, technology, and tasks within the organizational and business context.

- This course in HCI will take the student through the HCI life-cycle (analysis, design, testing and implementation) in order to be competent in all aspects of HCI practice. This includes understanding the theory perspective of HCI research, the current methods in design and testing and the final implementation of the project. For this reason fundamental SA&D skills will have to be injected into the course or prerequisites needed.

- A project-based approach is highly recommended for this course. This includes implementing several hands-on skills either in a laboratory or through self-paced learning at home. This will help students develop the full range of skills that is needed for HCI work.

- Students need to understand that concepts and techniques outlined in this class draw from many disciplines (e.g., cognitive psychology, consumer behavior, etc.). By gaining a solid understanding of core theories that inform HCI design, the student can then translate this knowledge into building working prototypes in a broad range of contexts.

Title: IT Audit and Controls
Elective Course

Catalog description

This course introduces the fundamental concepts of the information technology audit and control function. The main focus of this course is on understanding information controls, the types of controls and their impact on the organization, and how to manage and audit them. The concepts and techniques used in information technology audits will be presented. Students will learn the process of creating a control structure with goals and objectives, audit an information technology infrastructure against it, and establish a systematic remediation procedure for any inadequacies. The challenge of dealing with best practices, standards, and regulatory requirements governing information and controls is addressed.

Learning objectives

Students will learn to:

1. Understand the role and objectives of information technology audits.
2. Develop an appropriate information technology audit process.
3. Identify risks to the confidentially, integrity, and availability of information and processes.
4. Describe the risks inherent in various types of information systems ranging from manual, basic accounting, to advanced operational information and knowledge for decision making.
5. Understand how to design and implement assurance procedures and control measures to effectively manage risks.
6. Understand best practices, standards, and regulatory requirements governing information and controls that may vary for an organization's locations and customers. Gain the ability to measure the degree of compliance with them.
7. Understand the role of auditing in systems development, including the review of the development process and participation in systems under development.
8. Understand data forensics.
9. Secure and preserve evidence.
10. Develop disaster recovery and business continuity plans.

Topics

- The need for information technology audit & controls
- Information technology risks – Business Process and Business Continuity
  - Protection of information assets
  - Business process evaluation and risk management
  - Systems development and maintenance activities
  - Disaster recovery and business continuity
- Auditing ethics, guidelines, and standards of the profession
  - Generally Accepted Auditing Standards (GAAS)
  - Control Objectives for Information and related Technology (COBIT)
  - ISACA
  - Val IT
- Undertaking an information system audit

  - Internal audit and external audit
- Controls over information and processes
  - Physical and environmental controls
  - Network controls
  - System software controls
  - Database controls
  - Application controls
  - Internet and e-commerce controls
  - Installation and operational controls
  - Change controls
  - Access controls
  - Encryption, authentication and non-repudiation
  - End-user controls
  - Software licensing controls
  - Governance
- Controls Assessment
  - Separation of duties
  - Delegation of authority & responsibility
  - System of authorizations
  - Documentation & records
  - Physical control over assets & records
  - Management supervision
  - Independent checks
  - Recruitment & training

Discussion

- This course can be used as a complement by accounting majors as well as IS majors. Because of Sarbanes-Oxley, many accounting firms have recruited IS graduates to grow their consulting services. Practitioners of these firms' senior management have expressed more emphasis in IS programs for audit and control topics.
- This course is closely linked to IT Security Management (see below).
- Opportunities for discussion of business ethics fit well with examples of companies that have failed due to poor IT auditing and control procedures.
- The use of case studies, professional standards, and sample audit software programs are encouraged to exemplify concepts covered.

Title: IS Innovation and New Technologies
Elective Course

Catalog description

New IS technologies are being used to change how organizations operate, produce products and services, and communicate both internally and as well as with external partners. This course is designed to introduce students to new and innovative technologies and examine how these powerful systems have fundamentally reshaped modern organizations along with our society. Using online collaborative technologies that were developed in the context of social networking and online communities, corporations are reengineering both internal business processes and those related to customers, suppliers, and business partners. Developing innovative ways to communicate and collaborate can lead to new business opportunities, and new efficiencies. This course investigates the technologies, methods and practices of developing new innovations such as online communities, and how this knowledge and these skills are applied to re-engineer business processes. For example, how products, services and information systems are developed, and how geographically disperse virtual teams collaborate.

Learning objectives

Students will learn to:

1. Understand how technologies are increasing the ability of organizations to globalize business processes and to extend their reach to global customers.
2. Apply the techniques used to innovate IS technologies.
3. Understand how businesses have used IS technologies to innovate and reengineer business processes.
4. Understand the concepts associated with network effects.
5. Understand how the Web as a platform enhances creativity, information sharing and functionality.
6. Understand the role of Web technologies such as online communities in the business world, and how they deliver value.
7. Apply the popular community-oriented tools, such as online social networking tools, to business problems.
8. Apply basic tools of economics to digital goods and services.
9. Deal with the challenges associated with new technologies and innovation.

Topics

- Globalization
- Conversation about the commoditization of IT
- Technologies that have shaped the electronic world
- Process of IS innovation
    - Diffusion
    - Innovation cycles
- Strategic importance of the Web as a platform
    - Web services
    - Collective intelligence
    - Peer-to-peer networking
    - Social networking
- Web 2.0 tools

    - RSS
    - Podcasts
    - Wikis
    - Blogs
    - Mash-ups
- Information organization
    - Categorization
    - Taxonomies
    - Tagging
- Virtual teams
- Economics of digital goods and services
    - E-commerce distribution
        - The Long Tail
        - Wikinomics
        - The Free Economy
- Search space
    - How search works
    - How search is monetized
    - Strategic importance of search
- Knowledge management
- Future trends

Discussion

- It is essential for the health of the IS discipline to actively recruit IS students. This course will focus on topics designed to excite students about the IS discipline. Specifically, this course will look at how IS is used in the world around the student and how IS can be used to create powerful applications. This is done by delivering topics that will gain traction with the target audience. In turn, by exposing students to a variety of business views of IS the students would better understand the possibilities within the field.
- This course is different from the introduction to IS as it does not provide a comprehensive overview of IS, rather topics are selected that may peak students' interest in IS. The topics are a means to delivering an understanding of how IS shapes and enables organizations for competitive advantage by leading industries in IT-enabled innovations.
- It is critically important that we expose students to how IS is impacting the world around them and more specifically how IS functions in the business world.
- This course should include hands-on demonstrations and projects that allow students to manage these online tools; understand the importance of information flows and provide the strategic importance of such systems.

Title: IT Security and Risk Management
Elective Course

Catalog description

This course provides an introduction to the fundamental principles and topics of Information Technology Security and Risk Management at the organizational level. Students will learn critical security principles that enable them to plan, develop, and perform security tasks. The course will address hardware, software, processes, communications, applications, and policies and procedures with respect to organizational IT Security and Risk Management.

Learning objectives

Students will learn to:

1. Understand the fundamental principles of information technology security.
2. Understand the concepts of threat, evaluation of assets, information assets, physical, operational, and information security and how they are related.
3. Understand the need for the careful design of a secure organizational information infrastructure.
4. Perform risk analysis and risk management.
5. Understand both technical and administrative mitigation approaches.
6. Understand the need for a comprehensive security model and its implications for the security manager or Chief Security Officer (CSO).
7. Create and maintain a comprehensive security model.
8. Understand and apply security technologies.
9. Understand basic cryptography, its implementation considerations, and key management.
10. Design and guide the development of an organization's security policy.
11. Determine appropriate strategies to assure confidentiality, integrity, and availability of information.
12. Apply risk management techniques to manage risk, reduce vulnerabilities, threats, and apply appropriate safeguards/controls.

Topics

- Introduction to information security
- Inspection
  - Resource inventory
  - Threat assessment
  - Identifying vulnerabilities
  - Assigning safeguards
- Protection
  - Awareness
  - Access
  - Identification
  - Authentication
  - Authorization
  - Availability
  - Accuracy

    - Confidentiality
    - Accountability
    - Administration
- Detection
    - Intruder types
    - Intrusion methods
    - Intrusion process
    - Detection methods
    - Monitoring systems
- Reaction
    - Incident determination
    - Incident notification
    - Incident containment
    - Assessing damage
    - Incident recovery
    - Automated response
- Reflection
    - Incident documentation
    - Incident evaluation
    - Legal prosecution
- Risk assessment frameworks
    - COSO Integrated Control Framework
    - CoBiT – ISACA
    - Australia/New Zealand Standard – Risk Management
    - ISO Risk Management – Draft Standard
- Security engineering
    - Protocols
    - Passwords
    - Access controls
    - Cryptography
- Physical aspects
    - Biometrics
    - Physical tamper resistance
    - Security printing and seals
- Security in connected systems and networks
    - Distributed systems
    - Telecom system security
    - Network attack and defense
    - Protecting e-commerce systems
- Policy and management issues
    - Copyright and privacy protection
    - E-policy

Discussion

- This course is intended as a first course in Information Assurance at the undergraduate level. This course will be a pre-requisite for additional information and network security courses for an Information Security track in the undergraduate program or a complement to accounting majors.
- The course description does not prescribe the specific approaches and methods for inspection, protection, detection, reaction, reflection, risk assessment and

mitigation. This will allow instructors and institutions to decide which specific approaches to cover.

- The use of case examples for discussion and reflection in this course is highly recommended.
- It is recommended to include an applied project for a potential client in which students conduct a risk assessment of a part of the client's IT infrastructure.

14. REFERENCES

Abraham, T., Beath, C., Bullen, C., Gallagher, K., Goles, T., Howland, J., Kaiser, K. M., J., Simon, J.," IT Workforce Trends: Implications for IS Programs", Communications for the Association for Information Systems, (17:50), pp.1147-1170, 2006. http://aisel.aisnet.org/cais/vol17/iss1/50/, accessed January 19, 2010.

Association for Computing Machinery. "ACM Recommendations for Information Systems, Volume II," New York: ACM Committee on Computer Curricula of ACM Education Board, 1983.

Bullen, C.V., Abraham, T., Gallagher, K., Simon, J.C., and Zwieg, P. "IT Workforce Trends: Implications for Curriculum and Hiring," Communications of the Association for Information Systems (24:9) 2009. http://aisel.aisnet.org/cais/vol24/iss1/9/, accessed January 19, 2010.

CE 2004. IEEE/ACM Joint Task Force on Computing Curricula. Computer Engineering 2004, Curriculum Guidelines for Undergraduate Degree Programs in Computer Engineering, IEEE Computer Society Press and ACM Press, December 2004, http://www.acm.org/education/curricula.html, accessed January 19, 2010.

CS 2008. IEEE/ACM Joint Task Force on Computing Curricula. Computer Science 2008, Curriculum Guidelines for Undergraduate Degree Programs in Computer Science, ACM and IEEE Computer Society, November 2008.

Couger, J. (Ed.) "Curriculum Recommendations for Undergraduate Programs in Information Systems," Communications of the ACM, (16:12), December 1973, pp. 727-749.

Couger, J.D., Davis, G.B., Dologite, D.G., Feinstein, D.L., Gorgone, J.T., Jenkins, A.M., Kasper, G.M., Little, J.C., Herbert E. Longenecker, J., and Valacich, J.S. "IS'95: Guideline for Undergraduate IS Curriculum," MIS Quarterly (19:3) 1995, pp 341-359.

Couger, J.D., Davis, G.B., Feinstein, D.L., Gorgone, J.T., and Herbert E. Longenecker, J. "IS'.97: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," The DATA BASE for Advances in Information Systems, SIG-MIS Association for Computing Machinery, (26:1) 1997, pp 1-94.

Davis, G., Gorgone, J.T., Couger, D.L., Feinstein, D., and Longenecker, H.E. "IS'97: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," The DATA BASE for Advances in Information Systems, SIG-MIS Association for Computing Machinery, (28:1) 1997.

Firth, D., Lawrence, C., and Looney, C.A. "Addressing the IS Enrollment Crisis: A 12-step Program to Bring about Change through the Introductory IS Course," Communications of the Association for Information Systems (23:2) 2008, http://aisel.aisnet.org/cais/vol23/iss1/2/, accessed January 19, 2010.

Gorgone, J.T., Couger, J.D., Davis, G.B., Feinstein, D.L., Kasper, G., and Longenecker, H.E. "Information Systems '95," The DATA BASE for Advances in Information Systems, SIG-MIS Association for Computing Machinery, (25:4) 1994, pp 5-8.

Gorgone, J., Davis, G., Valacich, J.S., Topi, H., Feinstein, D., and Longenecker, H.E. "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," The DATA BASE for Advances in Information Systems,, SIG-MIS Association for Computing Machinery, (34:1) 2003.

Granger, M. Dick, G., Luftman, J. Van Slyke, C., and Watson, R. "Information Systems Enrollments: Can They Be Increased?" Communications of the Association for Information Systems (20:41) 2007, http://aisel.aisnet.org/cais/vol20/iss1/41/, accessed January 19, 2010.

IT 2008. IEEE/ACM Joint Task Force on Computing Curricula. Information Technology 2008, Curriculum Guidelines for Undergraduate Degree Programs in Information Technology, ACM and IEEE-Computer Society, November 2008

Lee, A. "University Deleting Most Computer Labs," Charlottesville Daily Progress, March, 22, 2009, http://www2.dailyprogress.com/cdp/news/local/education/article/university_deleting_most_computer_labs/37607/, accessed January 19, 2010.

Longenecker, H.E., Clark, J.D., Couger, J.D., Feinstein, D.L., and Clark, J.T. "Development of IS'95: A Joint Activity of DPMA, ACM, ICIS, AIS," ISECON'94, 1994, p. 1.

Longenecker, H. E., Jr., and Feinstein D.L. (Eds.). IS'90: The DPMA Model Curriculum for Information Systems for 4 Year Undergraduates. Park Ridge, Illinois: Data Processing Management Association 1991.

Looney, C., and Akbulut, A. "Combating the IS Enrollment Crisis: The Role of Effective Teachers in Introductory IS Courses," Communications of the Association for Information Systems (19:38) 2007, pp 781-805, http://aisel.aisnet.org/cais/vol19/iss1/38/, accessed January 19, 2010.

Mawhinney, C.H., Morrell, J.S., and Morris, G.J. "The IS Curriculum: Closing the Gap," ISECON'94 Proceedings, 1994, pp. 249-256.

O'Reilly, T. "What is Web 2.0. Design Patterns and Business Models for the Next Generation of Software.", O'Reilly, http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html, accessed January 19, 2010.

Overby, S. "How to Hook the Talent You Need," CIO, 2006, pp. 40-54, http://www.cio.com/article/24439/Staffing_How_to_Hook_the_Talent_You_Need, accessed January 19, 2010.

Pierson, J.K., Kruck, S.E., and Teer, F. "Trends In Names Of Undergraduate Computer-Related Majors in AACSB-Accredited Schools of Business in the USA," The Journal of Computer Information Systems (49:2) 2008, pp 26-31.

SE2004. IEEE/ACM Joint Task Force on Computing Curricula. Software Engineering 2004, Curriculum Guidelines for Undergraduate Degree Programs in Software Engineering, IEEE Computer Society Press and ACM Press, August 2004.

Shackelford, R., Cross, J., Davies, G., Impagliazzo, J., Kamali, R., LeBlanc, R., Lunt, B., McGettrick, A., Sloan, R., and Topi, H. Computing Curricula 2005 – The Overview Report ACM / IEEE Computer Society, 2005.

Topi, H., Valacich, J.S., Kaiser, K.M., Nunamaker, J.F., Sipior, J.C., Vreede, G.J. de and Wright, R.T. "Revising the IS Model Curriculum: Rethinking the Approach and the Process," Communications of the Association for Information Systems (20: 45) 2007, pp. 728–740, http://aisel.aisnet.org/cais/vol20/iss1/45/, accessed January 19, 2010.

Topi, H., Valacich, J.S., Wright, R.T., Kaiser, K.M., Nunamaker, J.F., Sipior, J.C., and Vreede, G.J. de. "Revising the Undergraduate IS Model Curriculum: New Outcome Expectations," Communications of the Association for Information Systems (23:32) 2008, pp 591-602, http://aisel.aisnet.org/cais/vol23/iss1/32/, accessed January 19, 2010.

Trauth, E.M., Farwell, D.W., and Lee, D. "The IS Expectation Gap: Industry Expectations versus Academic Preparation," MIS Quarterly (15:3) 1993, pp 293-307.

APPENDIX 1 — BACKGROUND OF IS CURRICULA AND RELATED DISCIPLINES

Computer Science Curricula

A curriculum for Computer Science (CS) was first outlined in 1968 (see list in Figure A1.1; ACM, 1968) and revised a decade later (ACM, 1979). These curricula helped define the field of Computer Science. A joint task force of the IEEE-CS and ACM revised the curriculum in 1991 (Turner and Tucker, 1991). The next comprehensive revision was called Computing Curricula 2001, Computer Science Volume (Engel and Roberts, 2001), which was updated in with an interim revision in 2008 (CS2008 Review Task Force, 2008).

Information Systems Curricula

Curriculum development for Information Systems (IS) began in the early 1970s (Ashenhurst, 1972; Couger, 1973); both the ACM and DPMA published versions of IS model curricula in the 1980s (DPMA, 1981, 1986; Nunamaker, Couger, and Davis, 1982). The IS'97 model curriculum (Davis *et al.*, 1997) represented the first formal and combined effort of ACM, AIS, and AITP, and it was followed with IS 2002 (Gorgone *et al*, 2003). Key events leading to that recommendation are listed in Figure A1.1.

May, 1972	ACM Graduate Professional Programs in Information Systems (Ashenhurst, 1972)
December, 1973	ACM Undergraduate Programs in Information Systems (Couger, 1973)
March, 1981	ACM Educational Programs and Information Systems (Nunamaker, Couger and Davis, 1982)
1981	DPMA Curriculum for Undergraduate Information Systems Education (DPMA, 1981)
1983	ACM Information Systems Curriculum Recommendations for the 80s, Undergraduate and Graduate Programs (ACM, 1983; Nunamaker, Couger and Davis, 1982)
October, 1984	DPMA Secondary Curriculum on Information Technology and Computer Information Systems
October, 1985	DPMA Associate-Level Model Curriculum in Computer Information Systems
October, 1985	DPMA Model Curriculum for Undergraduate Computer Information Systems
May, 1990	ACM/IEEE Computing Curriculum for Computer Science for Undergraduates
October, 1990	DPMA IS'90 draft document (Longenecker and Feinstein, 1991c)
June, 1991	DPMA IS'90 Curriculum for Undergraduate Programs in Information Systems
July, 1991	ACM CS Curriculum (Turner and Tucker, 1991)
January, 1994	DPMA IS'94 Curriculum for Two Year Programs in Information Systems (Longenecker *et al.*, 1994)
January, 1994	ACM Curriculum for Two Year Programs in Computer Information Systems
December, 1994	First Draft of IS'95 from the Joint ACM, AIS, DPMA Task Force (Gorgone *et al.*, 1994; Longenecker *et al.*, 1995; Couger, 1996)
February, 1996	First Draft of IS'97 from the Joint ACM, AIS, DPMA Task Force
December, 1997	ACM, AIS, AITP IS'97 Model Curriculum and Guidelines for Undergraduate Programs of Information Systems
December, 1999	ISCC An Industry Based Curriculum
December, 2002	IS 2002 Model Curriculum and Guidelines for Undergraduate Programs of Information Systems

Figure A1.1 – Key Chronology of IS Curriculum Events

The DPMA IS'90 model was begun in November 1988 and completed by July of 1991 (Longenecker and Feinstein, 1991b, 1991c). This model was based on a survey of Information Systems programs in approximately 1,000 colleges and universities in North America (Longenecker and Feinstein, 1991a). Participants in the effort, the Curriculum Task Force (CTF 90), were drawn from an international community of industry, business, and academia including both two and four year institutions. The work was supported by the DPMA but participants were also active in other organizations. Material from the unpublished work of the ACM-IS curriculum committee that met in the late 1980s was incorporated into the model.

The draft version "Information Systems – The DPMA Model Curriculum for a Four Year Undergraduate Degree (IS'90)," was released in October 1990. This draft was presented at ISECON (Information Systems Educational Conference) in Chicago, at the DSI (Decision Sciences Institute) meeting in San Diego, and at

ICIS (International Conference for Information Systems) in Copenhagen. A final document was released in June 1991. IS'90 prompted considerable dialogue. A partial list of papers that discuss various aspects of IS education is found in the bibliography (Aggarwal and Rollier, 1994; Burn *et al.*, 1994; Cale, 1994; Chow, Dick and Edmundson, 1994; Cohen, 1993, 1994; Daigle and Kemp, 1993, 1994; Daniels *et al.*, 1992; Denison, 1993; Doran, Longenecker and Pardu, 1994; Granger and Schroeder, 1994; Haney, 1994; Klein, Stephens, and Bohannon, 1994; Lim, 1993; Longenecker, Feinstein, and Gorgone, 1994; Longenecker *et al.*, 1996; Longenecker *et al.*, 1997; Lorents and Neal, 1993; Mawhinney, Morrell, and Morris, 1994; McKinney, Agarwal, and Sanati, 1994; Pick and Schenk, 1993; Pick, Baty, and Phoenix, 1994; Sanati, McKinney, and Agarwal, 1994; Smith, 1994; Waguespack, 1994).

Characteristics of IS'97 Development

In February 1994, the initial meeting of a Joint Task Force for ACM, AIS, and DPMA collaboration on a model IS curriculum was held. At the meeting, the IS'90 body of IS knowledge was reviewed and updated. During subsequent meetings, curriculum presentation areas were described. Courses were also developed based on specific goals and objectives. Statements specifying the characteristics of graduates were reviewed and extended. Preliminary versions of the curriculum were presented in 1994 and 1995 at ISECON (Information Systems Educational Conference, Louisville), DSI (Decision Science Institute, Honolulu), IAIM (International Academy for Information Management, Las Vegas), ICIS (International Conference on Information Systems, Vancouver), and SIGCSE (Special Interest Group for Computer Science Education, Nashville).

The IS'97 materials were presented for review to 900 faculty, chairs, and distinguished IS professionals during the summer of 1995. The critique from the review process was used by the co-chairs in developing the edited version now called IS'97. The ACM Education Board members and DPMA management submitted significant suggestions for revision of IS'95. The upgraded materials were presented in 1995 at IACIS (International Association for Computer Information Systems), ISECON, DSI, and IAIM, and in 1996 at SIGCSE in Philadelphia.

IS'97 and its predecessor IS'90 differed from other approaches in several fundamental ways.

1. Development was based on a methodology that can be replicated as the knowledge base evolves.
2. Course content is determined in a functional manner rather than topically. For example, an integrated course in systems development replaces the necessity for separate courses in database, analysis, and design. These topics have always been strongly coupled and, therefore, can be taught together.
3. The depth of coverage of elements of the body of knowledge within the objectives is progressive. This allows all related topics to be covered in an integrated fashion with repetition and increasing depth until the required exit competence is achieved.
4. Measurable educational outcome objectives are identified and used uniformly throughout the methodology. Depth of knowledge is defined in a manner consistent with Bloom (1956). This allows for learning of the body of knowledge to a specified competence as well as continuous assessment and feedback (Argyris, 1976, 1977). Topics are revisited several times within the context of given goals of instruction (Gagne, Briggs, and Wager, 1988).
5. The learning units provide small units for curriculum design. They support tailoring of courses and are not as prescriptive as courses used in previous models. This allows flexibility by individual academic units, yet with the ability to remain focused on overall objectives of the curriculum. This approach will help ensure the quality of graduates (Denning, 1992; Bemowski, 1991a, 1991b; Cherkasky, 1992).

IS 2002 Extensions

IS'97 experienced a wide degree of success. It became the initial basis for IS accreditation. Yet, the document was prepared largely in 1995, and was modified to keep it up-to-date until its publication in

1997. It was five years old at the time of the development of IS 2002. Survey research conducted by the co-chairs indicated that there was still a wide agreement of practitioners and academicians regarding the relevance of the spiral approach, the exit objectives, and most of the detailed learning objectives, but there was a clear need to update the model curriculum because of rapid contextual and technological change. The body of knowledge was expanded based on available materials from the ISCC'99 curriculum and from the EC Institute body of knowledge documents. The co-chairs added a new course in e-commerce, and made edits in the balance of the course descriptions to reflect current attitudes, surveyed skill elements, and feedback from six national presentations at AIS, ISECON, and IAIM to Information Systems faculty.

APPENDIX 2 — DETAILS OF THE DEVELOPMENT OF IS 2010

The joint AIS/ACM task force was launched in January of 2007, and it is submitting the final version of the curriculum recommendation for approval in November 2009. The co-chairs are Heikki Topi (Bentley University) and Joe Valacich (Washington State University). Other members of the committee include Kate Kaiser (Marquette University), Jay Nunamaker (University of Arizona), Janice Sipior (Villanova University), Gert-Jan de Vreede (University of Nebraska-Omaha), and Ryan Wright (University of San Francisco). This curriculum version is the first major revision since the IS '97 report (Davis *et al.,* 1997), for which most of the work was done in the mid-1990s.

Past curriculum projects have been largely based on the work of a small task force that has shared its work at a variety of conferences and incorporated the feedback from the sessions to the model curriculum. Written drafts had been shared widely and comments solicited. Surveys had been used to gather industry input. A few individuals with little input from the academy as a whole drove typical processes. In an effort to create an open and transparent process to the IS community, the IS 2010 model curriculum committee used Web-based collaboration technologies in addition to several traditional approaches described above to include and hopefully engage the global IS community.

As with previous curriculum projects, the IS 2010 task force presented the development process at several conferences. We published reports at different stages of the project. We created a wiki to support collaboration and to make it easier for the community to give feedback. The AIS e-mail listserv was used several times to solicit feedback and direct users to the wiki Web site. Table A2.1 details the timeline for this effort.

Table A2.1: Details of the IS 2010 Task Force interactions with the community

Date	Committee Interactions	Means
August 2007	Initial proposal for IS 2010 process	AMCIS Panel
August 2007	Introduction of the IS Curriculum Wiki	ISWorld list
November 2007	Summary of the AMCIS 2007 panel and further developments	Communications of the AIS Volume 20(45)
November 2007	Invitation to review the committee's progress on the IS Curriculum Wiki	ISWorld list
December 2007	IS 2010 status review	Panel at AIS SIG-ED IAIM 2007
June 2008	The role of IS 2010 as a global curriculum	Panel at ECIS 2008
August 2008	IS 2010 status review	Panel at AMCIS 2008
November 2008	Invitation to review the course descriptions	IS World list
December 2008	Summary of the AMCIS 2008 panel and further developments	Communications of the AIS Volume 23(32)
December 2008	Current state of the IS 2010 project	Panel at IAIM SIG-ED (Special Interest Group on Education)
May 2009	Publication of the first comprehensive draft of IS 2010 and an invitation to review and comment	ISWorld list
September 2009	Publication of a revised draft and comprehensive responses to the community	IS curriculum wiki; ACM Ed Council, AIS Council
November 2009	Submission of the final version for approval to ACM and AIS	
December 2009	Changing the Course for IT Model Curricula	Panel at ICIS 2009

APPENDIX 3 – DEPTH OF KNOWLEDGE METRICS AND RELATED PEDAGOGY

A key ingredient and accomplishment of IS'97 and IS 2002 was a competency or depth of knowledge metric with five levels (with four levels specified in the curriculum). This metric is based on but not identical to the work of Bloom (1956), which describes a six-level metric. The metric makes it possible to communicate specifications and expectations.

Depth of Knowledge Metric

Table A3.1 is a summary of the depth of knowledge metric. Note that there are conceptually five levels for depth of knowledge but only the first four are used for an undergraduate program. The IS model curriculum levels differ from Bloom levels in that Bloom's level 1 is divided into IS curriculum levels 1 and 2, and Bloom levels 4, 5, and 6 are mapped to IS curriculum level 5.

The characteristics of the metric include

- the definition of the levels of knowledge,
- the behavior to be demonstrated by those who have completed the learning units of the curriculum,
- how goals and objectives are developed compatible with each knowledge level,
- how to determine the level of knowledge from previously defined goal and objective statements (reverse engineer knowledge levels from existing documentation),
- how material at a given level can be delivered to students, and
- how learning at given level can be assessed.

The template shown in column 3 of Table A3.1 was consulted when writing behavioral objective and goal statements for the IS 2010 courses; these statements allow authors and faculty to be more precise in communicating expectations for both students and teachers.

Identifying Expectations

The statements of characteristics of graduates contain "keywords" that can be detected using the template of the metric. For example, if the expectation is to "apply problem solving techniques in configuring a local area network," this is the equivalent of a level 4 objective. To a large extent, the knowledge levels specified within IS 2010 are compatible with the definitions of Table A3.1. The exit objectives of the goals and objectives have been checked and verified to assure consistency with the expectations of industry and academics.

Content Analysis of Statements of Expectation

The knowledge levels of IS 2010 are designed to give guidance to educators in planning as well as in the analysis of outcomes. Column 3 of Table A3.1 describes a template for writing objectives. This template was originally defined in IS'90 and has been expanded in the present context. The language used in writing behavioral objectives was derived from the Bloom taxonomy. The template may be used prescriptively in writing presentation goals and student performance objectives to ensure that the implied level of difficulty is presented. Likewise, given the objective, the student's behavior can be observed and compared with the objective statement to ensure that the students achieve the desired results of the presentation goal statements.

Learning Techniques for Different Levels

Learning techniques often differ for different levels. Level 1 knowledge in IS 2010 (awareness) is knowledge that is immediately apparent. Given an appropriate stimulus, it is knowledge that is recalled. IS

2010 level 2 knowledge (literacy) requires not only recognition, but recognition of the context of the knowledge; that is, the knowledge element and its parents and descendants should be familiar to the learner. Classroom activity or participative learning strategies are sufficient in transferring this level of knowledge, although level 2 activity can be enhanced in the lab. Although knowledge at levels 1 and 2 is relatively low, these levels should be mastered before higher levels can be achieved. It is the "revisiting" of previously presented and learned knowledge that is implied in the organization of learning units.

The more complex IS 2010 level 3 (usage/comprehension) requires considerable practice and creative repetition. Level 4 (application) requires unsupervised practice. Team work, project work, and other participative learning facilitate achieving these levels. Proper sequencing is an important factor in achieving student success. Project laboratories are ideal for this level of student activity. In fact, these laboratories are beneficial at all levels of instruction (Doran, Longenecker, and Pardu, 1994; Dutt, 1994). Some institutions have been successful with total participatory project environments (Holland College 1993).

The cooperative paradigm (Litchfield, 1996; Johnson, Johnson, and Houlubec, 1993) offers many advantages to learners, although it requires considerable change on the part of faculty. The cooperative paradigm greatly increases student motivation and better simulates the work environment in which graduates are expected to perform. The cooperative paradigm supports well the development of application level competencies.

Table A3.1. Knowledge Levels, Templates for Objective Writing, and Meaning of the Depth Levels with Associated Learning Activities

IS'90,'94,'95, 2002, 2010 Depth of Knowledge	**Bloom Levels of Knowledge**	**Template for Writing Behavioral Objectives Students completing ... will be able to**	**Meaning of Depth of Knowledge Level and Activities Associated with Attaining that Level**
0 No Knowledge			
1 Awareness	1 Knowledge Recognition	Define ... List characteristics of ... Name components of ... Diagram ... List advantages/disadvantages of ...	Introductory Recall and Recognition Class presentations, discussion groups, reading, watching videos, structured laboratories. Involves only recognition, but with little ability to differentiate. Does not involve use.
2 Literacy Strong Knowledge	1 Differentiation in context	Compare and contrast ... Explain ... Write/execute simple ... Define functional capabilities that are ... Describe interrelations of ... to related objects	Knowledge of Framework and Contents, Differential Knowledge Continued lecture and participative discussion, reading, team work and projects, structured labs. Requires recognition knowledge as a prerequisite. Requires practice. Does not involve use.
3 Concept/Use Skill	2 Comprehension Translation/ Extrapolation Use of Knowledge	Use ... Communicate the idea of ... Form and relate the abstraction of ... as ... Given a set of ..., interpolate/extrapolate to ... List concepts/major steps in ...	Comprehension and Ability to Use Knowledge *when Asked/Prompted* Requires continued lab and project participation, presentation involving giving explanations and demonstrations, accepting criticism; may require developing skills in directed labs.
4 Detailed Understanding, Application Ability	3 Application Knowledge	Search for correct solution to ... and apply it to ... Design and implement a ... for ... Write syntactically correct ... and/or debug ... Apply the principles of ... to ... Implement a ... and maintain it	Selection of the Right Thing and Using It *without Hints* Semi-structured team-oriented labs where students generate their own solutions, make their own decisions, commit to and complete assignments, and present and explain solutions.
5 Advanced	4 Analysis 5 Synthesis 6 Evaluation	Develop/originate/institute ... Construct/adapt ... Generate novel solutions to ... Come up with new knowledge regarding ... Evaluate/judge the relative value of ... with respect to ...	Identification, Use and Evaluation of New Knowledge An advanced level of knowledge for those very capable of applying existing knowledge in which *denovo* solutions are found and used in solving and evaluating the proposed new knowledge.

APPENDIX 4 — IS BODY OF KNOWLEDGE

Many significant aspects of an academic discipline are defined by its associated body of knowledge (BoK). In this version of the model curriculum, the Information Systems body of knowledge has been thoroughly re-architected to highlight the unique contributions that the discipline of Information Systems makes to computing, to benefit from the work that has been done in other computing disciplines, and to recognize the major role that various domain knowledge areas play in Information Systems.

This version of the Information Systems Body of Knowledge is based on a number of streams of work in computing.

1. It builds on and is closely associated with IS 2002/IS'97 and the body of knowledge presented in these documents. The current BoK is not, however, a direct extension of the prior versions.

2. The IS 2010 body of knowledge has significantly benefited from the work done in the context of the computing ontology project (see Cassel *et al.*, 2008), which has brought together representatives from all computing disciplines to develop a comprehensive concept structure for the entire field.

3. In addition to the ontology project, IS 2010 directly uses, as described above, the work that has been done in other computing disciplines to specify their bodies of knowledge.

4. The body of knowledge was also strongly influenced by the new high-level undergraduate IS program learning objectives that were specified in this project and articulated in Section 10.

This version of the Information Systems Body of Knowledge is divided into four categories (See Figure A4.1):

1. General Computing Knowledge Areas, which are defined at a detailed level in the curriculum documents for the other computing disciplines (primarily CS 2008).

2. Information Systems Specific Knowledge Areas, which include the content to which IS contributes in a unique way that distinguishes it from other computing disciplines. It has been developed only for the core of the curriculum, as specified in Figure A4.2.

3. Foundational Knowledge Areas, primarily focusing on Leadership and Communication, and Individual and Organizational Knowledge Work capabilities. These are very important areas that form an essential part of the curriculum, but as discussed in Section 10, the foundational knowledge and skills are included in a number of different degree programs in different academic fields and therefore, not included as Information Systems Specific Knowledge Areas.

4. Domain-specific Knowledge Areas, describing the domain content required for a specific type of a Information Systems degree. As discussed earlier, all Information Systems degree programs are associated with an application domain, but the domains and the relevant portions of their bodies of knowledge vary depending on the program.

General Computing Knowledge Areas (details from CS 2008)	
	Programming Fundamentals Algorithms and Complexity Architecture and Organization Operating Systems Net Centric Computing Programming Languages Graphics and Visual Computing Intelligent Systems
Information Systems Specific Knowledge Areas	
	IS Management and Leadership Data and Information Management Systems Analysis & Design IS Project Management Enterprise Architecture User Experience Professional Issues in Information Systems
Foundational Knowledge Areas	
	Leadership and Communication Individual and Organizational Knowledge Work Capabilities
Domain-related Knowledge Areas	
	General models of the domain Key specializations within the domain Evaluation of performance within the domain

Figure A4.1: Overview of the Information Systems Body of Knowledge

Information Systems Specific Knowledge Areas

- IS Management and Leadership
  - Information Systems Strategy
  - Information Systems Management
  - Information Systems Sourcing and Acquisition
  - Strategic Alignment
  - Impact of Information Systems on Organizational Structure and Processes
  - Information Systems Planning
  - Role of IT in Defining and Shaping Competition
  - Managing the Information Systems Function
  - Financing and Evaluating the Performance of Information Technology Investments and Operations
  - Acquiring Information Technology Resources and Capabilities
  - Using IT Governance Frameworks
  - IT Risk Management
  - Information Systems Economics
- Data and Information Management
  - Basic File Processing Concepts
  - Data Structures
  - Data Management Approaches
  - Database Management Systems
  - Data and Information Modeling at Conceptual and Logical Levels
  - Physical Database Implementation
  - Data Retrieval and Manipulation with Database Languages
  - Data Management and Transaction Processing
  - Distributed Databases
  - Business Intelligence and Decision Support
  - Security and Privacy
  - Policies and Compliance
  - Data Integrity and Quality
  - Data and Database Administration
- Systems Analysis & Design
  - Systems Analysis & Design Philosophies and Approaches
  - Business Process Design and Management
  - Analysis of Business Requirements
  - Analysis and Specification of System Requirements
  - Configuration and Change Management
  - Different Approaches to Implementing Information Systems
  - High-level System Design Issues
  - Identification of Opportunities for IT-enabled Organizational Change
  - Realization of IT-based Opportunities with Systems Development Projects
  - System Deployment and Implementation
  - System Verification and Validation
- IS Project Management
  - Project Management Fundamentals
  - Managing Project Teams
  - Managing Project Communication
  - Project Initiation and Planning
  - Project Execution & Control
  - Project Closure
  - Project Quality
  - Project Risk
  - Project Management Standards

Figure A4.2a: Information Systems Specific Knowledge Areas, Part I

Information Systems Specific Knowledge Areas -- continued

- Enterprise Architecture
  - Enterprise Architecture Frameworks
  - Component Architectures
  - Enterprise Application Service Delivery
  - Systems Integration
  - Content Management
  - Interorganizational Architectures
  - Processes for Developing Enterprise Architecture
  - Architecture Change Management
  - Implementing Enterprise Architecture
  - Enterprise Architecture and Management Controls
- User Experience
  - Usability Goals and Assessment
  - Design Processes
  - Design Theories and Tradeoffs
  - Interaction Styles
  - Interaction Devices
  - Information Search
  - Information Visualization
  - User Documentation and Online Help
  - Error Reporting and Recovery
- Professional Issues in Information Systems
  - Societal Context of Computing
  - Legal Issues
  - Ethical Issues
  - Intellectual Property
  - Privacy
  - IS as a Profession

Figure A4.2b: Information Systems Specific Knowledge Areas, Part II

APPENDIX 5 — REFERENCES FOR THE APPENDICES

ACM Curriculum Committee on Computer Science. 1968. "Curriculum 68: Recommendations for the Undergraduate Program in Computer Science." *Communications of the ACM*, (11:3), March 1968, pp. 151-197.

ACM Curriculum Committee on Computer Science. 1979. "Curriculum 78: Recommendations for the Undergraduate Program in Computer Science." *Communications of the ACM*, (22:3), March 1979, pp. 147-166.

ACM. 1983. "ACM Recommendations for Information Systems, Volume II," New York: ACM Committee on Computer Curricula of ACM Education Board.

Aggarwal, A. K. and B. Rollier. "Globalization and the Information Systems Curriculum," *ISECON'94 Proceedings*, 1994, pp. 70-74.

Argyris, C. "Single Loop and Double Loop Models in Research Design on Decision Making," *Administrative Science Quarterly*, (21:3), September 1976, pp. 363-375.

Argyris, C. "Double Loop Learning in Organizations," *Harvard Business Review*, (55: 5), September/October 1977, pp. 115-125.

Ashenhurst, R. L. (Ed.). "A Report of the ACM Curriculum Committee on Computer Education for Management." Association for Computing Machinery, Inc., 1972.

Bemowski, K. "America 2000," *Quality Progress*, (24:10), October 1991, pp. 45-48.

Bemowski, K. "Restoring the Pillars of Higher Education," *Quality Progress*, (24:10), October 1991, p. 37.

Bloom, B. S. (Ed.) *The Taxonomy of Educational Objectives: Classification of Educational Goals. Handbook 1: The Cognitive Domain*. New York: McKay Press, 1956.

Burn, J. M., E. M. W. Ng Tye, L. C. K. Ma, and R. S. K. Poon. "Are IS Graduates Prepared for the Real World?" *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 95-110.

Cale, E. G., Jr. "Teaching Information Systems in a Functionally Integrated MBA Program," *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 87-94.

Cassel, L., Clements, A., Davies, G., Guzdial, M., McCauley, R., McGettrick, A., Sloan, B., Snyder, L., Tymann, P., and Weide, B.W. Computer Science Curriculum 2008: An Interim Revision of CS 2001. ACM / IEEE, 2008.

Cherkasky, S. M. "Total Quality for a Sustainable Advantage," *Quality*, (31:8), 1992, pp. 4-8.

Chow, J., Dick, G. and Edmundson, B. "Industry Satisfaction with IS Graduates in the 1990 s: An Empirical Study," *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 153-174.

Cohen, E. B. "Can Interactive-Audio Televised Introduction Be Effective? A Review of the Literature." *ISECON'93 Proceedings*, 1993, pp. 205-218.

Cohen, E. B. "Tips for Teaching." *ISECON'94 Proceedings*, 1994, p. 129.

Couger, J. (Ed.) "Curriculum Recommendations for Undergraduate Programs in Information Systems," *Communications of the ACM*, (16:12), December 1973, pp. 727-749.

Couger, J. D. 1996 *Creativity and Innovation in Information Systems Organizations*. Danvers, Massachusetts: Boyd and Fraser Publishing Company, 1996.

Daigle, R. J. and Kemp, J.J. "Managing Applications Development: Introducing Project Management Into the Applications Development Cluster," *ISECON'93 Proceedings*, 1993, pp. 5-12.

Daigle, R. J. and Kemp, J.J. "The Applications Development Cluster of IS'90: Introducing Database Concepts," *ISECON'94 Proceedings*, 1994, pp. 207-214.

Daniels, R., Hayes, G. Longenecker, H. E. Jr. and Daigle, R. J. "Implementation of the DPMA IS'90 Curriculum for Information Systems," *Proceedings of the 1992 International Academy for Information Management Conference*, 1992.

Davis, G. B., Gorgone, J.T., Couger, J.D., Feinstein, D.L. and Longenecker, H. E. Jr. "IS '97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," ACM, New York, NY and AITP (formerly DPMA), Park Ridge, IL, 1997.

Denison, B. "Integrating Quality Management into the MIS Curriculum." *ISECON'93 Proceedings,* 1993*,* pp. 128-133.

Denning, P. "Educating a New Engineer," *Communications of the ACM*, (35: 12), December 1992, pp. 82-97.

Doran, M. V., Longenecker, H.E. Jr. and Pardu, J.H. "A Systems Approach to a Data Structures Course for IS Students Consistent with DPMA IS'90," *ISECON'94 Proceedings*, 1994, pp. 236-243.

DPMA. *DPMA Model Curriculum, 1981*. Park Ridge, Illinois: Data Processing Management Association, 1981.

DPMA. *DPMA Model Curriculum, 1986.* Park Ridge, Illinois: Data Processing Management Association, 1986.

Engel, G. and Roberts, E. (Eds). *Computing Curricula 2001 – Computer Science*. IEEE Computer Society and Association for Computing Machinery, 2001.

Gagne, R. M., Briggs, L.J. and Wager, W.W. *Principles of Instructional Design*, Third Edition. New York: Holt, Rinehart, and Winston, 1998.

Gorgone, J., Davis, G., Valacich, J.S., Topi, H., Feinstein, D., and Longenecker, H.E. "IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," *The DATA BASE for Advances in Information Systems* (34:1), SIG-MIS Association for Computing Machinery 2003.

Gorgone, John T., Couger, J.D., Davis, G.B., Feinstein, D.L., Kasper, G., and Longenecker, H.E. 1994. "Information Systems '95," *The DATA BASE for Advances in Information Systems,*25: 4), SIG-MIS Association for Computing Machinery, November 1994, pp. 5-8.

Granger, M. J. and Schroeder, D.L. "Enhancing Existing Undergraduate Information Systems Courses with an International Emphasis," *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 75-86.

Haney, J. D. "Affiliations with Industry." *ISECON'94 Proceedings*, 1994, p. 215.

Holland College. “Learning Guides for Business Information Processing.” Holland College, Prince Edward Island, Canada, 1993.

Johnson, D. W., Johnson, R.T. and Houlubec, E.J. “The New Circles of Learning: Cooperation in the Classroom and School.”, Interaction Book Co., 1993.

Klein, R. D., Stephens, C.S., and Bohannon, J.L. “A Comparative Analysis of Information Systems Curricula in Collegiate Business Programs,” *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 3-12.

Lim, B. L. “A Project-Intensive Introductory Object-Oriented Programming Course.” *ISECON’93 Proceedings*, 1993, pp. 157-161.

Litchfield, B. “Cooperative Learning Seminar,” University of South Alabama, Mobile, January 19, 1996.

Longenecker, H. E., Jr., Clark, J.D., Couger, J.D., Feinstein, D.L., and Clark, J.T., “Development of IS’95: A Joint Activity of DPMA, ACM, ICIS, AIS,” *ISECON’94 Proceedings*. 1994, p. 1.

Longenecker, H.E., Davis, G.B., Gorgone, J.T., Couger, J.D. and Feinstein, D.L. 1997. “IS’97: A Co-Chairs Report and Panel Discussion of the Joint ACM/AIS/DPMA Information Systems Curriculum for Four Year Undergraduate Programs.” *Proceedings of the SIGCSE Conference*, 1997.

Longenecker, H. E., Jr., and Feinstein, D.L. “A Comprehensive Survey of USA and Canadian Undergraduate Programs in Information Systems,” *Journal of Information Systems Education*, Volume 3, Number 1, Spring 1991, pp. 8-13.

Longenecker, H.E., Jr., and Feinstein, D.L. 1991b. “On Establishing Excellence in Information Systems,” *Journal of Information Systems Education*, (3:1), Spring 1991, pp. 26-31.

Longenecker, H.E., Jr., and Feinstein, D.L. (Eds.). *IS’90: The DPMA Model Curriculum for Information Systems for 4 Year Undergraduates.* Park Ridge, Illinois: Data Processing Management Association, 1991.

Longenecker, H.E., Jr., Feinstein, D.L., Couger, J.D., Davis, G.B. and Gorgone, J.T. “Information Systems ’95: A Summary of the Collaborative IS Curriculum Specification of the Joint DPMA, ACM, AIS Task Force,” *Journal of Information Systems Education,* (6:4), 1995, pp. 174-187.

Longenecker, H.E., Feinstein, D.L. and Gorgone, J.T. “Development and Review of IS’95 — A Joint Curriculum of DPMA, ICIS/AIS, and ACM for Four Year Information Systems Programs.” *Proceedings of the International Academy for Information Management*, 1994, p. 1.

Longenecker, H.E., Feinstein, D.L., Gorgone, J.T., Davis, G.B., Couger, J.D. and Williams, R.L. “A Shared ‘CORE’ Curriculum for Information Systems (IS), Software Engineering (SE), and Computer Science (CS) Based on a 1995 National Survey.” *ISECON’96 Proceedings*, 1996.

Longenecker, H.E., Jr., Feinstein, D.L., Gorgone, J.T., and Jenkins, M.S. “Development and Review of IS’95: A Joint Curriculum of DPMA, ICIS/AIS, and ACM for Four Year Information Systems Programs,” *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 1, 2.

Lorents, A. C. and Neal, G. “Information Engineering, IEF, and the CIS Curriculum.” *ISECON’93 Proceedings*, 1993, pp. 109-115.

Mawhinney, C. H., Morrell, J.S., and Morris, G.J. “The IS Curriculum: Closing the Gap,” *ISECON’94 Proceedings*, 1994, pp. 249-256.

McKinney, A.L., Agarwal, K. K. and Sanati, R. “Integrating Graphics into Data Structures and Algorithms in the DPMA Model Curriculum,” *ISECON’94 Proceedings*. 1994, pp. 96-101.

Nunamaker, J. F., Couger, J.D., and Davis, G.B. "Information Systems Curriculum Recommendations for the 80s: Undergraduate and Graduate Programs," *Communications of the ACM*, (25: 11), November 1982, pp. 781-805.

Pick, J.B., Baty, R. and Phoenix, M. "Teaching Geographical Information Systems," *ISECON'94 Proceedings*. 1994, pp. 35-42.

Pick, J. B. and Schenk, K. D. "Development of and Information Systems Curriculum for Non-traditional Students," *ISECON'93 Proceedings,* 1993, pp. 148-155.

Sanati, R., McKinney, A.L. and Agarwal, K.K. "Teaching Computer Graphics Applications in the DPMA Model Curriculum," *ISECON'94 Proceedings*, 1994, pp. 143-148.

Smith, D.C. "Information Systems Curricula in South Africa," *Proceedings of the 1994 International Academy for Information Management Conference*, 1994, pp. 175-178.

Tucker, A. "Computing Curricula 1991" *Communications of the ACM*, (34: 6), pp. 68-84, June 1991.

Waguespack, L. "Domain Analysis is an Essential Skill of the OO Analyst," *ISECON'94 Proceedings*, 1994, pp. 186-193.

INTERNAL REGULATION ON

"EUC"s PROCEDURES FOR SUPPORTING STUDENTS WITH LOW GRADE POINT AVERAGE (GPA)"

71st Senate Decision: 7 February 2020

Aiming to develop a proposal/framework on the process and actions to be taken, in order to address and reduce the phenomenon of students' low G.P.A. and its effects, the actions to be taken in order to help reduce the phenomenon, are:

- the provision of correct information to all students, namely undergraduate, postgraduate, Conventional and Distance Learning;
- ensure that students are aware of the role of GPA and the impact of low GPA on the progress of their studies;
- increase of the support provided at the Program, Department and School level;
- proper implementation of procedures by the Student Advising Centre.

These actions are additional to the efforts/support that each individual instructor provides to each student and aim for a timely and early enough diagnosis of the phenomenon in order to facilitate an effective, early intervention.

The following steps will be followed for all students (both conventional and distance education):

1. **The Department of Enrollment** provides the Schools at the beginning of each academic semester (e.g. third week of October and February, respectively) with a list of their students with a low GPA (for undergraduate courses: below 1.80 except for the School of Medicine where the threshold has been set to 2.0; for postgraduate courses: below 2.5; for Ph.D. courses the issues concern late progress in completing the Ph.D-see sample letter attached).

2. **The School** (this concerns all undergraduate and postgraduate Conventional and Distance Learning Programs of Study)**:**
   (1) ***For first year students at the end of the 1st semester of their studies or for students included in the list for the first time****:*
   Each affected student is called by the Program Coordinator, in order to ensure that, students are aware of the concern of the Department and School, and that students are indeed properly informed that the Department is available to provide support (e.g. Specifically, students are informed about the role and

importance of the GPA, the possible reasons and causes of the low GPA, and ways for improvement of the situation, which may either involve the student (e.g. further effort) or the Department and School).

(2) ***For new students, which continue to be in the same situation at the end of the second semester of their studies or for students appearing in the list for a second time***:
The process presented in Item 1 above is repeated in the presence of the Chairperson of the Department, for further discussion and enhancement of the process, aiming at the most tangible academic targets and the procedures involved. If needed, the Chairperson of the Department and the Program Coordinator will request the presence of the Dean.

(3) ***For students who exhibit the phenomenon on a continuous basis****:*
The possibility of sending a letter from the Dean to the student (registered, in the home address) is considered (see attached "Sample" letters).

For the School of Medicine (undergraduate degrees) in more specific: The students with a GPA lower than 2.0 receive a “Letter of Probation” before the beginning of the second academic year of their studies (September). Students who received a “Letter of Probation” and still maintain an unacceptably low GPA will be given only one last opportunity to correct their GPA during the coming semester (Spring). At the end of the Spring semester of their second year of studies,, these students (e.g. those who have already received a letter of warning in the past), and continue to maintain a very low GPA will receive a “Letter of Dismissal”, with the option to either change their program of study (e.g. transfer to biology) or to withdraw from the School. Those students who, on the other hand, have not yet received a “Letter of Probation” in the past, but perform unsatisfactorily, will receive a “Letter of Probation” at the end of the Spring semester of their second year of studies, with subsequent consequences should their performance not improve. This option will be provided this one and only time to those students with failures; no other opportunity will be provided to improve “F” grades. Each student will be notified accordingly, depending on their status.

3. The Department of Enrollment:

Each Student Advisor:

(1) Contacts/communicates with students and ensures that each student is well informed and advised about the University’s grading system and the role of GPA ;

(2) In the case of students not passing a course, the advisor re-registers them to the same course in order to immediately delete the received F, and thus avoid accumulation of F's. This takes places in the exact following semester in case the affected course is a prerequisite to other courses, in order to avoid accumulation of F’s;

(3) Student advisors are in constant communication with the Program Coordinators in order to secure this process.

Encl.: (1) Sample Letters (Greek and English version)
(2) Sample Letter of Probation (School of Medicine)
(3) Sample Letter of Dismissal (School of Medicine)
(4) Sample Letter for Ph.D. Students (Department of Enrollement)

..... 2020

Προς
.....

Θέμα: Χαμηλός Μέσος Όρος Βαθμολογίας (G.P.A.)

Αγαπητή/έ.....,

Σε συνέχεια της αναφοράς του/της Προέδρου του Τμήματος και του/της Συντονιστή/τριας του Προγράμματος που παρακολουθείτε κατά το περασμένο ακαδημαϊκό εξάμηνο, παρακαλώ σημειώστε ότι ο μέχρι τώρα μέσος όρος της βαθμολογίας σας (G.P.A.) είναι .....

Θα ήθελα να σας υπενθυμίσω, επί του προκειμένου, τους κανονισμούς του Πανεπιστημίου μας αναφορικά με τις προϋποθέσεις απόκτησης πτυχίου, οι οποίοι προβλέπουν μέσο όρο βαθμολογίας (G.P.A.) 2.00 και άνω.

Ο/η Πρόεδρος του Τμήματος και ο/η Συντονιστής/τρια του Προγράμματος που παρακολουθείτε μπορούν να σας δώσουν περισσότερες πληροφορίες και σχετική υποστήριξη.

Ελπίζω ότι, κυρίως με την αναβάθμιση των δικών σας προσπαθειών, θα καταστεί δυνατή τόσο μια ποιοτική συνέχιση των σπουδών σας, όσο και η τελική επίτευξη των στόχων σας.

Με εκτίμηση,

.....
Κοσμήτορας,
Σχολή .....

Κοιν.:
-Συντονιστής/τρια Προγράμματος Σπουδών
-Πρόεδρος Τμήματος

European University Cyprus
6 Diogenous str, 2404 Engomi,
P.O.Box 22006, 1516 Nicosia, Cyprus
Telephone: +35722559514
Fax: +357 22559515

Date XXX

Student's Name: xxxxx
ID: xxxx
Program: Doctor of Medicine, MD

Re: Letter of Probation for G.P.A. of less than 2.0

Dear [Name of Student],

I regret to inform you that, due to your low cumulative Grade Point Average (GPA), you are being placed on academic probation. You will remain on probation and will be subject to dismissal until your cumulative GPA reaches or exceeds 2.00.

Academic Probation status is serious. You must raise your cumulative GPA to 2.00 to return to good standing and to receive your degree. According to European University Cyprus bylaws and the decision outlined by the EUC 48th Senate, students with a GPA lower than 1.7 at the end of their second year (year 2) are subject to dismissal (termination).

The School of Medicine is committed to helping you improve your academic performance so that you can return to good standing and make progress toward your degree. We will provide you with the services and activities to help you achieve academic success. In return, you must commit yourself to work diligently. It is my sincere hope that you will be successful next semester.

Sincerely,

Professor Elizabeth O. Johnson
Acting Dean
School of Medicine
European University Cyprus

CC: Professor Ioannis Patrikios, Chair, Department of Medicine
Professor Loizos Symeou,Vice-Rector of Academic Affairs
Dr. Christos Tsiappas, Director of Enrollment

European University Cyprus
6 Diogenous str, 2404 Engomi,
P.O.Box 22006, 1516 Nicosia, Cyprus
Telephone: +35722559514
Fax: +357 22559515

Date XXX

Student's Name: xxxxx
ID: xxxx
Program: Doctor of Medicine, MD

Re: Letter of Dismissal
Dear [Name of Student],

As you are aware, on [date of probation letter] you were placed on academic probation because your cumulative Grade Point Average (GPA) was below 2.00.

After careful review of your academic performance, the School of Medicine must regrettably inform the Rectorate and Director of Admissions that you have not made satisfactory progress and are recommended for dismissal from the Doctor of Medicine, MD, program.

According to European University Cyprus bylaws and the decision outlined by the EUC 48th Senate, students with a GPA lower than 2.0 will not be eligible for graduation.

While you are being dismissed from the program of Doctor of Medicine, you may wish to explore your options of transferring to another program in Life Sciences, such as Biology, offered by European University Cyprus. We will be happy to assist you in this process. We wish you the best in your future endeavors.

Sincerely,

Professor Elizabeth O. Johnson
Acting Dean
School of Medicine
European University Cyprus

CC: Professor Ioannis Patrikios, Chair, Department of Medicine
Professor Loizos Symeou,Vice-Rector of Academic Affairs
Dr. Christos Tsiappas, Director of Enrollment

..... 2020

Προς
.....

Αγαπητή κα,

Με την παρούσα επιστολή θα ήθελα να σας ενημερώσουμε για τα παρακάτω:

Η διάρκεια των διδακτορικών σπουδών του Πανεπιστημίου είναι 3-6 χρόνια με τη δυνατότητα χορήγησης αναστολής φοίτησης μέχρι και ένα (1) ακαδημαϊκό έτος.

Είστε εγγεγραμμένη στο πρόγραμμα διδακτορικών σπουδών στις …… από το Φθινοπωρινό Εξάμηνο 201…., και συνεπώς αναμένεται να ολοκληρώσετε τις σπουδές σας μέχρι το τέλος του Εαρινού Εξαμήνου 202….. Αυτό σας δίνει περιθώριο ακόμη τεσσάρων (4) εξαμήνων φοίτησης. Δείτε αναλυτικά τη σχετική αναλυτική σας βαθμολογία στο συνημμένα.

Επιπρόσθετα, θα ήθελα να σημειώσω ότι είστε εγγεγραμμένη στάδιο υποστήριξης πρότασης διατριβής (PHD801) για έξι (6) συνεχή εξάμηνα (από το S20….).

Με βάση τα πιο πάνω δεδομένα, και επειδή μας προβληματίζει η καθυστέρηση που παρατηρείται στην πρόοδό σας στο Πρόγραμμα, σας ενημερώνω ότι για την εντός του εναπομείναντα χρόνου ολοκλήρωση των διδακτορικών σας σπουδών, απομένουν οι εξής επιλογές:

(α) Μέχρι το επίσημο τέλος του τρέχοντος εξαμήνου (Φθινοπωρινό 20…), θα πρέπει να ολοκληρώσετε επιτυχώς το μάθημα PHD801. Στη συνέχεια θα έχετε στη διάθεσή σας ακόμη τρία (3) εξάμηνα για να ολοκληρώσετε το στάδιο συλλογή και ανάλυση δεδομένων (PHD802) και συγγραφή και υποστήριξη διδακτορικής διατριβής (PHD803).

β) Εάν τυχόν δεν ολοκληρώσετε επιτυχώς το μάθημα PHD801 μέχρι το τέλους του Φθινοπωρινού Εξαμήνου 20…, το Πανεπιστήμιο θα προχωρήσει στην καταχώρηση βαθμολογίας F. Θα μπορείτε να επανεγγραφείτε στον ίδιο κωδικό μαθήματος το επόμενο εξάμηνο με επιπρόσθετο κόστος 1.500 ευρώ. Στη συνέχεια θα έχετε ακόμη τρία (3) εξάμηνα για να ολοκληρώσετε τα μαθήματα PHD801, PHD802, PHD803.

Τέλος, σε περίπτωση που τα πιο πάνω δεν μπορούν να εφαρμοστούν, θα σας δοθεί η δυνατότητα, μετά από υποβολή αίτησης στο Τμήμα Εγγραφών και κοινοποίηση στο/την Πρόεδρο του Τμήματος ……., να επιλέξετε να μετεγγραφείτε από το διδακτορικό στο οποίο φοιτάτε σε ένα μεταπτυχιακό του Ευρωπαϊκού Πανεπιστημίου Κύπρου με αντιστοίχιση μαθημάτων που έχετε ήδη παρακολουθήσει και παρακολούθηση των μαθημάτων που υπολείπονται.

Βασική επιδίωξη του Πανεπιστημίου είναι η στήριξη των φοιτητών και φοιτητριών μας με απώτερο σκοπό την ακαδημαϊκή τους πρόοδο και επιτυχή αποπεράτωση των σπουδών τους.

Τόσο εγώ, όσο και η επόπτριά σας, ο συντονιστής του διδακτορικού προγράμματος και ο/η Πρόεδρος του Τμήματος ….. παραμένουμε στη διάθεσή σας για οτιδήποτε περαιτέρω.

Χρίστος Τσιάππας

Διευθυντής Τμήματος Εγγραφών

European University Cyprus

APPENDIX VII

Questionnaire

"STUDENTS' FEEDBACK ON THEIR LEARNING EXPERIENCE"

(Conventional Programs of Study)

Dear Students,

The main goal of European University Cyprus is to offer quality academic programs tailored to your needs so that we meet all conditions for acquiring the necessary knowledge and skills, as set out in each program. In this context, we ask for your help and cooperation in evaluating your whole experience in relation to the course you are taking during the current academic semester.

Completing this confidential questionnaire is very important as it gathers useful information for the best possible course design and delivery. Of particular value are the comments that you can include at the end of the questionnaire. Therefore, please take a few minutes to answer the open-ended questions in the last section.

It takes no more than 15 minutes to complete the questionnaire.

Thank you for your participation.

Section Q

Please indicate your answer by ticking (√) the relevant box:

Q1: What is the mode with which you attend this course F2020 semester:

1. Fully online □
2. Blended (some sessions online and some face-to-face on campus) □
3. Fully face-to-face on-campus □
4. Mixed modalities according to the COVID-19 conditions (i.e. it started in one way and during the semester it changed) □

Thinking of your overall educational experience at European University Cyprus during Fall 2020 Semester:

Q2: How satisfied are you in **general**?

Very Dissatisfied 1	Rather Dissatisfied 2	Neutral 3	Quite Satisfied 4	Very Satisfied 5

European University Cyprus

Q3: a. To what extend do the following statements apply to you on a scale of 0 to 10 (0= Not at all satisfied at All and 10= Completely Satisfied)? OR tick (√) the last column in case it did not apply to you.

	0 =Not at All Satisfied				10 = Completely Satisfied	I DID NOT NEED TO COMMUNICATE WITH
1. I am satisfied with my communication with the administrative personnel of my School						.....
2. I am satisfied with my communication with the course coordinator of my program of studies						.....
3. I am satisfied with my communication with my Student Advisor						.....
4. I am satisfied with the support that I receive from the MIS department (IT Support) of the University						.....

b. And to what extend do the following statements apply to you on a scale of 0 to 10 (0= Not at all satisfied and 10= Applies Completely)?

	0 =Not at All Satisfied				10 = Completely Satisfied
5. I am satisfied with the operation of the Blackboard learning platform (for those who had their classes on Blackboard Learn)					
6. I am satisfied with the operation of the Moodle Learning platform (for those who had their classes on Moodle)					
7. I am satisfied with the tools of the Blackboard learning platform (for those who had their classes on Blackboard Learn)					
8. I am satisfied with the tools of the Moodle Learning platform (for those who had their classes on Moodle)					
9. I am satisfied with the teleconferencing system Blackboard Collaborate					

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Thinking of this particular course:

Q4: How satisfied are you in relation to **the information** that was provided to you by the University regarding **the mode of delivering of <u>this course</u>** during Fall Semester 2020?

Very Dissatisfied 1	Rather Dissatisfied 2	Neutral 3	Quite Satisfied 4	Very Satisfied 5

Q5: How satisfied are you in relation to **guidance** provided by your instructor regarding the **delivery of <u>this course</u>** during Fall Semester 2020?

Very Dissatisfied 1	Rather Dissatisfied 2	Neutral 3	Quite Satisfied 4	Very Satisfied 5

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Section A. To what extend do the following statements apply to you on a scale of 0 to 10 (0= Does Not Apply at All and 10= Applies Completely)					
	0 =Does Not Apply at All				10 = Applies Completely
1. The instructor clearly explains the course outline at the beginning of the course (e.g. learning outcomes, weekly material, examinations, grading)					
2. The instructor prepares and organizes the class in a way that facilitates learning					
3. The instructor teaches the course material/content in a clear way					
4. The instructor teaches the course in an interesting way					
5. The instructor is prepared for every class					
6. The instructor seems enthusiastic and enjoys teaching this course					
7. The course learning outcomes and objectives (as stated in the course outline) are met					
8. The course reading materials (books, articles, handouts) are useful					
9. The instructor uses a variety of teaching methods (e.g. group discussions, student presentations, case studies, etc.) to support the learning process					
10. The material and means of teaching (e.g. books, lecture notes, PowerPoint, videos, etc.) are suitable, useful, supportive and up-to-date					
11. The instructor often makes use of technology in his/her teaching					
12. The activities I participated in, were suitable in meeting the course objectives					
13. The instructor encourages students to ask questions and participate in discussion					
14. The assignments I completed, were suitable for the course objectives					
15. The instructor is available and willing to support students (e.g. during office hours, via email, etc.)					
16. The instructor keeps control of the class during the teaching session					
17. The assessment of course assignments and activities is conducted by the instructor in an objective manner					
18. The feedback provided by the instructor (e.g. corrections, comments, etc.) is constructive and helps me to improve my learning process					

19. The instructor is on time for the beginning and the ending of the class					
20. I find the Instructor's attitude towards students respectful and polite					
21. I find that the instructor demonstrated professionalism in interactions with me and/ or other students					
22. I find that the instructor shows genuine concern for my learning					
23. I would take classes from this instructor again					
Section B. To what extend do the following statements apply to you on a scale of 0 to 10 (0= Does not Apply at All and 10= Applies Completely)					
	0 =Does Not Apply at All				**10 = Applies Completely**
1. The course content meets my expectations					
2. The course contributed to the development of my ability to think critically					
3. The course provides guidance on how I can develop professional competencies					
4. The course helped me develop abilities and skills related to my program of study and/or my broader education					
The following two questions should be answered only for the practical/lab courses:					
5. The practical/lab sessions correspond to the theoretical content of the course					
6. Students are often provided with the opportunity to work on practical/lab activities throughout the course					

European University Cyprus

Section C. Please respond to the following open-ended questions:
1. Write down one or two positive characteristics of the course
2. Suggest one or two changes for the improvement of the specific course
3. Write down one or two positive characteristics of the instructor of this course
4. Suggest one or two ways that the instructor of this course can improve his/her teaching
5. General comments-suggestions-observations (here you can mention anything you consider important about the course that, in your opinion, the questionnaire does not sufficiently cover)
The following two questions must be answered only for courses with <u>practical/lab sessions</u>
6. In your opinion, is the duration of the practical/lab sessions and the number of instructors sufficient/adequate?
7. In your opinion, is the equipment available for the practical/lab sessions sufficient/adequate?

European University Cyprus

APPENDIX VIII

Procedures on 'Student Feedback on their Learning Experience'.

Evaluation of learning and teaching processes and practices is essential to enable the European University Cyprus to continuously improve student learning outcomes and learning experience. The University has developed a questionnaire titled *Student Feedback on their Learning Experience (SFLE)* as a source of information for receiving feedback by students on their overall learning experiences, per course and per academic semester. The *SFLE* takes place during the two last weeks prior the final examination period according to the semester's schedule.

The Scope of SFLE: The *SFLE* procedure applies to all EUC students attending undergraduate and master programmes of study (both conventional and distance learning). The procedure provides the basis for the collection and analysis of the *SFLE* data and the reporting of these results to Faculty members themselves, the respective Chairpersons and Deans, and the Rectorate Office, to enable improvement and amendment of teaching practices.

The Strategic View of SFLE: The *SFLE* process is part of the University's Strategic Plan and is designed to offer students' perspective on the way courses are being taught as an essential element of internal quality assurance processes. As with most universities worldwide, at EUC students are considered key stakeholders.

The *SFLE* provides valid, reliable information/data on the impact and resource effectiveness of learning and teaching, as well as on instructor-related issues, thus contributing to the continuous improvement of academic programmes. The survey questions assess not only the course and the instructor, but also the unique features of particular forms of learning and teaching (such as digital enhanced learning, clinical/practical/laboratory teaching methodologies, the use of technology), as well the interaction and communication with all support services provided by the University and the overall EUC culture and structures for supporting students' learning experience.

The findings from the analysis of the questionnaire survey are utilized in various ways, including:

a. the Programme Evaluation Review (PER) process of programmes of study, which aims at programmes' ongoing monitoring and evaluation (*for further information please see Appendix 5; Internal Regulation on EUC's Programme Evaluation Review*). The *SFLE* findings complement other data sources gathered during the PER process, such as programme and Department relevant documents and Minutes, reflective documents, expert/peer reviews, student assessment results, teaching portfolios, etc. which all provide valuable information in reviewing EUC programmes of study.

b. In addition to the use of the *SFLE* findings in the process of changes and development of EUC programmes of study, the *SFLE* provides a key component in academic staff's professional

development leading to enhanced quality of learning and teaching at EUC. More specifically the findings from the individual reports are discussed between the instructors, the Chairperson of the Department and if needed with the Dean of the School in a constructive peer review manner, thus feedback, support and guidance are provided to the involved instructors. It must be noted here that the contract renewal of part-time academic staff each semester takes into serious consideration students' feedback by the *SFLE.* In this way, there is a continuous improvement of teaching quality in the Department.

c. Moreover, *SFLE* findings are used to guide faculty support through the EUC Faculty Professional Development programme. More specifically selected findings from the *SFLE* findings are taken into consideration when new seminars and training sessions are scheduled by the Office of the Vice-Rector of Academic Affairs, as well during the panning of in-School/Department academic staff professional development activities.

The Management of Information/Data of SFLE: The design, conduct and reporting of *SFLE* respect the rights, privacy and confidentiality of all parties involved. Student responses are anonymous.

The Monitoring of SFLE: The *SFLE* process is monitored by the Office of Vice-Rector of Academic Affairs, which informs the Rectorate Committee, as well as the University's Internal Quality Committee, to ensure it enhances the quality of learning experience and culture at the University.

Responsibilities of stakeholders involved in the implementation of SFLE:

a. The Office of the Vice-Rector of Academic Affairs is responsible for the management of *SFLE*.

b. The Dean of each School and the Chairpersons of each School's Departments communicate the outcomes of the *SFLE* to all instructors and discuss with them critical issues concerning overall findings.

c. Each programme coordinator incorporates and presents the *SFLE* results in each programme's PER report.

d. All instructors are responsible for engaging students in filling in the *SFLE*. Additionally, full-time faculty members include the *SFLE* findings in their promotion applications, as well as in their bi-annual self-performance evaluation, as per University Charter guidelines.

e. Students are responsible for providing their feedback on their learning experience for each course they attend by participating in the *SFLE* process.