DEVELOPMENTS IN INFORMATION SCIENCE EDUCATION
AT THE SCHOOL OF COMMUNICATION & INFORMATION,
NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE

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Abstract

This paper provides an update of information science education at Nanyang Technological University through its Master of Science programme in Information Studies (IS). The program, which started in 1993, has undergone four curriculum revisions to keep it abreast with the demands of IS which is facing constant changes as a result of rapid evolution of Internet and multimedia technologies, pervasive and exponential growth and use of digital information on the Web, and the demands to equip IS graduates with increasingly diverse interdisciplinary skills to function effectively in today’s information landscape. The paper also outlines typical challenges faced and explores some ideas and trends that are likely to prevail in IS education in a networked information society of today and the future.

INTRODUCTION

Established in 1993, the Division of Information Studies (hereafter referred to as the “Division”) has seen the substantive growth from a modest pioneer intake of 22 students in 1993 for its flagship part time Master of Science programme in Information Studies (MSc(IS)) to an annual intake of around 215 full time and part time students in her current offering of three Master of Science programmes in Information Studies, Knowledge Management (MSc(KM) - introduced in 2002), and Information Systems (MSIS - introduced in 2005).

The Division originated from the School of Applied Science that was established in 1998. The School was subsequently re-organized into two schools with the Division being part of the new School of Computer Engineering in 2000. The Division was subsequently incorporated into the School of Communication Studies in 2001 as part of a university
restructuring exercise. The School subsequently changed its name to the School of Communication and Information in 2002.

The original programme in 1993 is part of a concerted effort to spearhead the Singapore economy into the information age and is therefore a part of the "manpower infrastructure" development programme to transform Singapore into an Intelligent Island. The programme complements the last 15-year emphasis on the technological infrastructure in Singapore by concentrating on the information content and its organisation, storage and retrieval, and the delivery and management of user-oriented information products, systems and services. The 1993 curriculum attempted to provide a generic degree enabling graduates to work in a wide range of information intensive environments but more specifically in a library environment, albeit a fast changing library environment. Specifically, it was the de-facto programme to prepare professional librarians for the transformation of the Singapore library system through the formation of a new statutory board, National Library Board of Singapore as outlined in the Library 2000 Report (1994). Since the inception of the programme, an estimated total of 750 MSc(IS) graduates have been trained.

The evolving information and knowledge-based economy, with an increasing emphasis on the important roles of information and knowledge, resulted in a situation of constant change that posed a significant challenge to educators to ensure that the curriculum and training is constantly reviewed, and kept abreast of developments and needs of the industry. In a span of a decade or so from 1993 to 2004, the information studies (IS) curriculum at Nanyang Technological University (NTU) has undergone four revisions, including a significant one in 2000.

This paper outlines the key developments and changes in the IS curriculum from its conception to date, identifies some challenges faced and solutions adopted by the Division, and finally, trends and possibilities for the future.

INFORMATIONS STUDIES CURRICULUM: 1994 - 2006

Key Curriculum Developments

Table 1 shows a summary of the evolution of the IS curriculum since its introduction in 1993. Appendices 1 to 5 outline the curriculum structure over the years. As can be seen, the curriculum has constantly evolved to meet the changing environment and needs of industry. Commencing from a more structured and highly prescribed 6 core and 2 elective subjects plus dissertation in the beginning, the first curriculum revision in 1998 introduced flexibility by changing this mix to 4 core and 4 elective subjects plus dissertation.

The 2000 revision was a major one that changed the existing two-tier structure into a three-tier structure of foundation, basic competency and specialized subjects, and the introduction of an additional subject as a new requirement. With an expanded range of
revised and new subjects, areas of concentration with specialization were also introduced to help streamline students into areas of different vocation where they can opt to select. This is to ensure that students in these areas are given a collective mix of related subjects to enable them to function effectively upon graduation in their respective vocations. Technology and its application were also further integrated in all the subjects in the curriculum. It is noted that some of these areas of concentrations are stand-alone Masters programmes in other parts of the world. The small demand of placements in Singapore and the limited manpower resources in the Division necessitate this form of offering at that point in time, whilst attempting to serve the various information industries.

The subsequent 2002 revision attempted to better streamline the areas of concentrations to better focus and serve the needs of these industries that are now better identified and cultivated.

Table 1: Evolution of NTU MSc(IS) Curriculum since 1994

<table>
<thead>
<tr>
<th>Year</th>
<th>Key Features</th>
<th>Remarks</th>
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| 1994 | Two tier structure with 6 core subjects and 2 elective subjects (chosen from a list of elective subjects) plus Dissertation | Original curriculum designed to primarily train library professionals for Singapore  
  Majority of subjects are prescribed with limited choice of electives by students |
|      | Total number of Academic Units (AUs) = 30 (equivalent to 30 credit hours) |         |
| 1998 | Two tier structure with 4 core subjects and 4 elective subjects (chosen from a list of expanded elective subjects) plus Dissertation | Revision of current subjects and introduction of IT subjects and orientation to cater to developments in Internet (search engines) and Web (hypertext) technologies.  
  Reduced core subject requirements and expanded elective choices for students  
  Electives allow specialization in three major areas of (1) Information products and systems development; (2) Information service management; and (3) Knowledge management in corporate organizations.  
  More emphasis placed in the electronic environment for information seeking and use (products and services) |
|      | Total number of AUs = 30 (unchanged) |         |
| 2000 | Three tier structure with 3 core subjects, 2 electives (Group A) and 4 electives (Group B) (chosen from a list of elective subjects) plus Dissertation | Significant revision to introduce a new 3 tier structure of foundation subjects, basic competency subjects and specialization subjects  
  Introduction of new policy to allow electives (Group B) to be chosen from other Masters programmes at NTU.  
  Additional subject to keep abreast with international 33 credit hours for IS curricula.  
  Introduction of two major areas of |
<p>|      | Total number of AUs = 33 (increased by 3 AUs from 1998) |         |</p>
<table>
<thead>
<tr>
<th>Year</th>
<th>Changes</th>
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<tbody>
<tr>
<td>2002</td>
<td>- No change in curriculum structure or AUs – maintenance of a three tier structure with 3 core subjects, 2 electives (Group A) and 4 electives (Group B) (chosen from a list of elective subjects) plus Dissertation, and 33 AUs.</td>
</tr>
</tbody>
</table>
|      | ➢ Curriculum streamlined in terms of subject offerings.  
➢ Revamped areas of concentration to provide better focus and training. A total of five areas of concentration are offered: Archival informatics, Information management, Information systems, Library and information science (LIS), and School media resource management. As before, for each area of concentration, students are guided with a choice of prescribed electives (Groups A and B).  
➢ The Division introduced a new part time MSc programme in Knowledge Management (which was spawned from the 1998 knowledge management specialization). The MSc(KM) program is also one of the pioneer programmes in KM education in the world. |
| 2004 | - No change in curriculum structure but with introduction of Coursework and Dissertation option, and Coursework Only option. For the latter, students do another 2 electives (Group B) in lieu of Dissertation including a compulsory subject Critical Inquiry in Information Studies.  
- Total number of AUs remained at 33. |
|      | ➢ Minor revamp in subject offerings. A new subject Professional Seminar is offered in place of Information Users & Society. A new subject “Critical Inquiry in Information Studies” is offered to cater to the coursework only option.  
➢ No change to the five areas of concentration. |
| 2005 | ➢ The Division introduced a new part time MSc programme in Information Systems (MSIS - which was spawned from the 1998 and 2002 information systems specialization). The program is jointly offered with the School of Computer Engineering, NTU. |
| 2006 | ? |
|      | ➢ The Division is working on the introduction of a new undergraduate programme in |
Information Studies in future

- The Division intends to offer the full time programme for both MSc(KM) and MSIS in the near future.
- Cross listing of subjects in the IS curriculum with other Masters curriculum (such as MSc(KM) and MSIS) to encourage students to broaden their scope of learning and take subjects of relevance to their needs across the university.

Student Intakes and Growth

The intake for the MSc(IS) started with modest rises in the formative years of the programme but gathered momentum with the substantial growth from 1998 to 2001 as shown in Figure 1. The highest number of applications peaked in 2001 with 720 applicants vying for the 100 places that were offered that year. It is likely that the 2000 curriculum revision and active marketing of it played an important contributory role in achieving this renewed interest in the programme. This intake number of 100 for IS students was increased by 10% in 2002 and thereafter and capped at the new level of around 110 subsequently, while the two new Masters programmes in Knowledge Management and Information Systems were introduced in 2002 and 2005 respectively. The Knowledge Management programme has an annual intake that average 45 part time students, and the Information System programme started with a first intake of 46 part time students. In the last NTU academic year commencing in July 2005, there was a total of 776 applicants, with 215 places being offered (114 for Information Studies, 55 for Knowledge Management and 46 for Information Systems). There are plans to introduce full time programmes for Knowledge Management and Information Systems in the near future.
Some Challenges

Appended in this section are some challenges in IS education noted over the years. They are by no means exhaustive and some are probably similar and experienced by other institutions as well.

Typical information science education departments are small. This is also true of NTU. The Division started in 1993 with 1 Masters programme, 6 full time faculty, 2 support staff and 22 students. Now, it has 3 Masters programmes, an annual intake of 215 students, and about 350 active students at any one time. This is a result of the 3 Masters programmes that are offered on a two-year part time basis. This work is currently managed by 13 full time faculty, 2 adjunct faculty, around 10 part time lecturers on a semester basis, and 4 support staff, including a Graduate Programmes Manager. Even with these numbers, it has always been a challenge to carefully plan the subject offerings every semester and ensure that as many subjects are feasibility offered according to the curriculum structure.

The full time faculty workload is heavy, with each faculty typically teaching two subjects per semester. Besides teaching, there is substantial work associated with dissertation supervision and faculty’s own research. On top of that, faculty is often involved with institutional building activities (or administrative duties) and other Division and School initiatives. The appointment of adjunct faculty and part time lecturers were both
strategic and necessary. Such staff provided much of the industrial experience to make the subjects more relevant and form part of the manpower resource management to support the programmes. They would have a minimum of a Masters degree and worked for several years in the relevant area prior to being appointed. They may also be involved with co-supervision of students’ dissertations with full time faculty. Full time faculty acts as “buddies” to these staff when they first join the Division, and would co-teach with them for at least one semester before they manage the classes on their own.

Likewise, the introduction of the coursework-only option in the 2004 revision is strategic and aligns with some other existing IS programs. Students are now able to opt for this option and replace Dissertation (Project) with two other subjects. One of these subjects, namely, “Critical Inquiry in Information Studies”, is compulsory and the other can be chosen from the list of electives. This subject can be thought of as a variation of the Dissertation (Project) but with more instructional and time structure, and done in a group. In this subject, students are given an overview of how to design and conduct a simple research study (project) for practical application on a selected topic in the areas of information services and systems. It covers study design, preparation of proposals, intellectual property and ethics. Students are introduced to the main types of research methods, with a more in-depth examination of a few useful methods, to address information service/system problems. The introduction of this option has provided more flexibility to students, better matches their academic ability and interests, and at the same time, helped reduce faculty dissertation supervision workload.

Learning with the aid of new technology has brought about another challenge. Many educational institutions are using education tools in the form of e-learning in course delivery. Kumar (2004) argued that online teaching and learning would become more effective through incorporating multimodality in content delivery which involves presentation of information in different modes of representation (e.g. visual, textual, audio). Multimodal presentations are known to stimulate and utilize the whole human brain (Thomas, Kellogg & Erickson, 2001) allowing more opportunities for erudition, creativity and the generation of ideas. We now see a trend from lecturer-centered to student-centered learning approaches (Stansfield, McLellan & Connolly, 2004). With the lecturer’s role becoming that of a facilitator in the learning process, students actively participate and contribute to their own learning (Lee & Tan, 2004). As a result, students view things differently, more critically and creatively (Pan, 1999). The characteristics and attributes of online learning make it an ideal learning mode that can complement traditional learning modes. In this respect, the Division has been using NTU’s Blackboard e-education environment since its introduction in 2000 to support delivery and management of courses. In a short span of time of 4 to 5 years since its introduction, NTU has witnessed quantum growth in the adoption of e-learning with over 90% of the courses heavily using it (Lee & Tan, 2004).

Known as edveNTUre, this customized environment is used by faculty to allow dynamic content to be delivered digitally through the University wired and wireless networks to all students anytime, anywhere on a variety of devices. It complements the traditional lectures through several e-learning tools including discussion forums for collaborative
knowledge sharing, personalized learning, dynamic content delivery and other automated teaching tools, including a plug-in tool to detect plagiarism in students’ work. As such, a multimodal approach, comprising face-to-face instruction and the use of e-learning tools for content delivery and collaboration, has been adopted for teaching courses in the IS curriculum. This has posed a challenge to less IT savvy faculty resulting in spectrum of differing adoption time and facilities offered by the new environment. Nonetheless, these systems are constantly being improved and made more user-friendly so that we can expect the learning time to be reduced, and the tool to be used more productively and effectively to enhance the educational experience and learning by students.

Differing class sizes continue to pose a challenge to faculty resource management and teaching assignments. Due to the structure of the curriculum that encompasses both core and elective subjects, class sizes can range from the whole cohort of 110 students for core subjects to as few as 10 students or lower for specialized elective subjects. In the academic year of 2005, the Division offered a total of 34 subjects across two different semesters. This number of subjects excludes those offered in the Knowledge Management and Information Systems programmes. While small classes are typically cancelled if they fall below a threshold value, some of these are still conducted on an exception basis since these are still needed to support the key courses in the various areas of concentrations. A solution that the Division is currently exploring to overcome this challenge is to form strategic alliances and partnerships with other IS educational institutions to support the conduct of small classes through the use of online learning or short term faculty exchanges. The earlier is probably more practical for courses that are non-laboratory based.

TRENDS AND FUTURE POSSIBILITIES

Students and industries will continue to expect and demand more. Existing technologies will continue to evolve and improve and new technologies will emerge that have the potential to change the education landscape further. In such a climate of constant change, IS educators are in for an exciting future. We share some ideas in this section and envisage a number of possibilities.

An even more broad-based interdisciplinary programme will be demanded in future. Market forces will dictate flexibility to allow students (our customers) to tailor a curriculum of their choice to meet their needs, so that the traditional structured curriculum will subsequently have to co-exist with a student customized one. At a recent strategic retreat of the National Library Board of Singapore (in which the author is a Board Member), it became clear that there will be future demands for hybrid digital librarians who have skills that covers areas of library and information science, digital media and technologies, information systems and knowledge management. An opportunity presents itself to the Division to offer a new generic Master of Science programme in Information where students can customize their curriculum from the existing 3 Masters programmes that are currently now on offer.
A networked information society presents natural opportunities for virtual collaboration, and opens up many avenues of potential cooperation for educational institutions to leverage on individual strengths, and to make collective resources available for students across such collaborative possibilities. The Division is already working with a number of partner institutions in United States, New Zealand, Mauritius and Thailand to explore avenues of cooperation in online learning, joint degree programs and other forms of educational training and exchanges. As with the formation of consortia among the library communities, consortia among universities and IS schools will emerge and grow. A current example of such a collaborative network is Universitas 21. Established in 1997, Universitas 21 currently has 18 member universities from 10 countries. Its purpose is to “facilitate collaboration and cooperation between these universities and to create entrepreneurial opportunities for them on a scale that none of them would be able to achieve operating independently or through traditional bilateral alliances” (http://www.universitas21.com/). Among its many objectives, three are of particular relevance to the context of this paper. First is the facilitation of a framework within which the transfer of information, good practice and expertise contributes to programmes of institutional self-improvement. Second is the encouragement of individual member universities to internationalise the student experience and facilitation of collaborative efforts to support this aspiration. Third is in the form of collaboration in leading global e-learning operations.

Another area of development to monitor and engage in is the evolution of new e-learning initiatives. In NTU itself, new features are constantly being introduced to ‘humanize’ edveNTUre by making the e-learning more interesting, interactive and engaging for the students. Here, the goal is to add more human elements for effective “high tech – high touch” delivery of online contents (Lee, Tan & Goh, 2005). Some of the recent e-learning initiatives introduced by the NTU include the following (Majid, Foo & Chaudhry, 2005):

- **Distance Education:** NTU is seriously considering implementing distance education for certain academic programmes. It currently houses a highly interactive state-of-the-art distance learning facility known as the Smart Classroom with facilities for high-end video conferencing and a suite of collaborative tools. This facility has been successfully used in NTU to support the distance learning SMA (Singapore-MIT Alliance) programme in conjunction with the National University of Singapore (NUS) and the Massachusetts Institute of Technology (MIT) (refer to http://web.mit.edu/SMA/ for more information). The Division is currently exploring with the University of Mauritius and other universities in the Asia-Pacific region to offer selected courses in the Masters program via its distance education facilities. While distance learning is nothing new but an established and accepted mode of learning in many countries, it is still at the infancy stage in Singapore due to its small land area that have resulted in traditional face-to-face instruction in almost all institutions.

- **PresseNTUr:** This facility allows faculty to interlace a video presentation and synchronize it with a set of presentation slides. It enables faculty to quickly and
easily create their teaching contents either by using a talking head or their own face through using a digital camera. The end result is an interactive digital media product. The utilization of the product is entirely in the control of students who can vary the pace and replay sections so as to tailor to their own learning preferences and abilities. Another advantage of this system is the live delivery of presentations onto PDAs which students can view on the campus or anywhere through the Internet.

- **Breeze:** This Macromedia content creation tool allows converting PowerPoint slides into a low bandwidth format of the Macromedia Flash animation. It also allows voice narration to be synchronized with the PowerPoint slide delivery.

- **Reusable Learning Objects (RLOs):** The Centre for Educational Development in NTU in collaboration with the School of Communication and Information is in the process of implementing a taxonomy system aimed at building a better course management system. This system will enable staff to deposit learning objects in a repository organized to facilitate use and reuse for constructing lessons, presentations, and other documents. This system is expected to improve the use, reuse, and profuse of learning objects. Research is also being actively pursued by the Division’s faculty in this research area of RLOs. It is currently developing a prototype reusable learning objects management system known as ReLOMS to address the problem of usability and reusability of learning objects in e-learning systems (Theng et. al., 2006).

**CONCLUSIONS**

An update of IS education at the School of Communication and Information is given in terms of curriculum revisions, challenges faced, trends and possibilities for the future. Improvements and innovations in technologies, industry needs and more sophisticated and demanding students’ and employers’ expectations will no doubt keep IS educators on their toes, propelling them to explore new ventures and create new opportunities and solutions to this gradually shrinking networked world. The key to continued success hinges on being proactive, and constantly adapting, collaborating and innovating.

**REFERENCES**


Appendix 1

MSc (IS) Curriculum – 1993 (Original)

Core Subjects (Compulsory)

H6101 The Information Society
H6102 Applications of Information Technology
H6103 Management of Information Agencies
H6105 Services to Users
H6108 Information Sources and Services
H6109 Organisation of Information

Electives (Two to be selected)

H6126 Organisation of Information in Automated Environments
H6127 Conservation Management
H6128 Electronic Database Evaluation
H6129 Electronic Database Use
H6130 Design of Information Systems and User Interfaces
H6131 Management of Information Systems
H6132 Records Management
H6133 School Librarianship
H6134 Literatureship for Children and Young Adults
H6135 Information Needs, Sources and Services in Business and Economics
H6136 Information Needs, Sources and Services in Arts and Humanities
H6137 Information Needs, Sources and Services in Science and Technology
H6138 Management of Academic Library Services
H6139 Development of Services & Products for the Internet
H6151 Special Topic

Project/Dissertation (Compulsory)

Note:
1. Each subject is equivalent to three academic units (credit hours).
2. Not all electives are offered in any given semester.
3. Dissertation is equivalent to six academic units.
5. Total number of equivalent academic units is 30.
Appendix 2

MSc (IS) Curriculum – 1998 Revision

Core Subjects (Compulsory)
H6301 The Information Society
H6302 Information Sources and Searching
H6303 Information Storage and Retrieval
H6304 Design and Delivery of Information Services and Products

Electives (Four to be selected)
H6321 Bibliographic Organisation
H6322 Developing Corporate Information Systems
H6323 Computer Programming for Information Professionals
H6324 System Analysis and Interface Design
H6325 Management of Information Agencies
H6326 Collection Development and Management
H6327 Client-Centred Library Services
H6328 Database Management Systems
H6329 Business Information Sources and Services
H6330 Children’s Information Sources and Services
H6331 Development of Internet Services and Products
H6332 Evaluation of Information Services and Products
H6333 Information Retrieval Systems
H6334 Intelligent Information Systems
H6335 Conservation of Information
H6336 Research Methods in Information Studies
H6337 Data Communication and Networking

Project/Dissertation (Compulsory)
H6399 Project

Note:
1. Curriculum comprise 4 core subjects, 4 electives, and Dissertation
2. Total number of equivalent academic units remains unchanged at 30.
Appendix 3

MSc (IS) Curriculum – 2000 Revision

Core Subjects (Compulsory)
H6501 Information Users and Society
H6502 Information Sources and Searching
H6503 Information Storage and Retrieval

Electives (Group A) (2 to be selected)
H6511 Human Computer Interaction
H6512 Information Management
H6513 Information Organisation
H6514 Internet and Web Technologies

Electives (Group B) (4 to be selected)
H6521 Academic and Research Libraries
H6522 Archives and Records Management
H6523 Cataloguing and Classification
H6524 Library Services for Children and Young Adults
H6525 Collection Development and Management
H6526 Digital Libraries
H6527 Public Libraries
H6528 School Media Resource Centres
H6529 Business Information Systems, Services and Sources
H6530 Electronic Commerce
H6531 Imaging and Document Management
H6532 Information Mining and Analysis
H6533 Knowledge-Based Organisations
H6534 Knowledge Management
H6535 Computer Programming for Information Professionals
H6536 Data Communication and Networking
H6537 Database Management Systems
H6538 Web-Based Information Systems
H6539 Information Retrieval Systems
H6540 Intelligent Information Systems
H6541 Multimedia Information Systems
H6542 Systems Analysis and Design
H6543 Investigative Methods for Information Studies
H6544 Special Topic 1
H6545 Special Topic 2

Project (Compulsory)
H6599 Project

Apart from selecting from the list of subjects in Electives (Group B), students may register up to a maximum of two subjects offered by other Master level programmes in other Schools of NTU.

Notes:
1. Curriculum changed to 3 tier structure
2. Curriculum comprise **3 core subjects, 2 Group A electives, 2 Group B electives and Dissertation** (an increase of one subject)
3. Number of academic units increased from 30 to 33 units.
4. Students are allowed to take 2 subjects from other Masters programmes at the University.
Appendix 4

MSc (IS) Curriculum – 2002 Revision

Core Subjects (Compulsory)
H6601  Information & Knowledge Society
H6602  Information Sources & Searching
H6603  Information Storage & Retrieval

Electives (Group A) (2 to be selected)
H6611 Human-Computer Interaction
H6612 Information Management
H6613 Information Organisation
H6614 Internet & Web Technologies
H6615 Archives & Records Management

Electives (Group B) (4 to be selected)
H6631 Collection Development & Management
H6632 Cataloguing & Classification
H6633 Client-Centred Information Services
H6634 Business Information Sources & Services
H6635 Management of Information Organisations
H6636 Automated Systems & Services for Libraries
H6637 Digital Libraries and Information Portals
H6638 Evaluation of Library and Information Services
H6651 Instructional Role of School Media Specialists
H6652 Information Sources & Services for Children & Young Adults
H6661 Conservation & Preservation
H6662 Digital Preservation
H6663 Archiving of Multimedia Information
H6664 Heritage & Cultural Informatics
H6671 Database Management Systems
H6672 Web-Based Information Systems
H6673 Multimedia Information Systems
H6674 Intelligent Information Retrieval Systems
H6675 Systems Analysis & Design
H6676 Computer Programming for Information Professionals
H6677 Information Mining & Analysis
H6678 Data Communication & Networking
H6695 Special Topic 1
H6696 Special Topic 2

Project (Compulsory)

Apart from selecting from the list of subjects in Electives (Group B), students may register up to a maximum of two subjects offered by other Master level programmes in other Schools of NTU.

Notes:
1. No change from 3 tier structure and total number of academic units.
2. Curriculum expanded to cater to various areas of concentration.
Appendix 5

MSc (IS) Curriculum – 2004 Revision

Core Subjects (Compulsory)
H6602 Information Sources & Searching
H6603 Information Storage & Retrieval
H6604 Professional Seminar

Electives (Group A) (2 to be selected)
H6611 Human-Computer Interaction
H6612 Information Management
H6613 Information Organisation
H6614 Internet & Web Technologies
H6615 Archives & Records Management

Electives (Group B) (4 to be selected for Coursework and Dissertation students) (6 to be selected for Coursework students, one of which is H6699 Critical Inquiry)
H6631 Collection Development & Management
H6632 Cataloguing & Classification
H6633 Client-Centred Information Services
H6634 Business Information Sources & Services
H6635 Management of Information Organisations
H6636 Automated Systems & Services for Libraries
H6637 Digital Libraries and Information Portals
H6638 Evaluation of Library and Information Services
H6651 Instructional Role of School Media Specialists
H6652 Information Sources & Services for Children & Young Adults
H6661 Conservation & Preservation
H6662 Digital Preservation
H6663 Archiving of Multimedia Information
H6664 Heritage & Cultural Informatics
H6671 Database Management Systems
H6672 Web-Based Information Systems
H6673 Multimedia Information Systems
H6674 Intelligent Information Retrieval Systems
H6675 Systems Analysis & Design
H6676 Computer Programming for Information Professionals
H6677 Information Mining & Analysis
H6678 Data Communication & Networking
H6690 Special Topic: Information Security & Digital Forensics
H6695 Special Topic 1
H6696 Special Topic 2

H6699 Critical Inquiry in Information Studies

Project
Apart from selecting from the list of subjects in Electives (Group B), students may register up to a maximum of **two** subjects offered by other Master level programmes in other Schools of NTU.

Notes:
1. Introduction of H6604 Professional Seminar to replace H6601 Information & Knowledge Society
2. Introduction of optional Dissertation – students doing programme by Coursework only is required to take two subjects in lieu of Project, one of which must be Critical Inquiry.
3. Total number of academic units remained unchanged at 33.
4. Information on the latest curriculum can be found at [http://www.ntu.edu.sg/sci/is/curriis-new.html](http://www.ntu.edu.sg/sci/is/curriis-new.html)