

# **AC 2000-271: A Graduate Course on Computer Applications in Technology**

**Duane D. Dunlap,**

**Niaz Latif, Purdue University - Calumet**

## **A Graduate Course on Computer Applications in Technology**

**Dr. Niaz Latif, Dr. Duane D. Dunlap  
Purdue University, West Lafayette, Indiana**

### **Abstract**

This paper discusses a course on Computer Applications as a part of a graduate curriculum in Technology. Purdue University and Northern Kentucky University developed and offered two such courses. Both institutions offer Master of Science degrees in Technology. This paper discusses the curriculum need and the development of such courses: program objectives, applied nature of the curriculum, students' demography, classroom experiences by faculty, types of class projects, and students' feedback. The courses are designed to address common issues and applications related to computer technology. The topics covered in the courses include multimedia processes and products, the Internet, automatic data capture technology, and networking.

### **Introduction**

A Master of Science in Technology (MST) program corresponding with the university's mission at Northern Kentucky University (NKU) was developed three years ago. The graduate course work consists of core courses as well as courses in specialty areas. One of these core courses is *Computer Applications Technology*. A similar course, *Microcomputer Applications in Industry and Technology*, is offered as one of the core courses in the Weekend Master's program degree program in Technology at Purdue University in West Lafayette, Indiana.

This paper focuses on justifying the use of such courses in the core requirements in the Technology graduate program. It will discuss the graduate program objectives in Technology, prospective students' demography, undergraduate preparation, and preparation for graduate course work in core and specialty areas. This paper presents results from offering such courses at NKU and Purdue in terms of students' expectations, nature of the course, and the course's content. It is expected that the institutions developing a master's degree program in Technology of any nature will benefit from developing a course in computer applications.

### **Master's program objectives and students in the program**

Students' learning goals and objectives for graduate courses should meet the program goals and objectives. As an example, the objectives of the programs at Northern Kentucky University and Purdue University are studied.

The four program objectives for the Master of Science in Technology at Northern Kentucky University<sup>1</sup> are:

- 1) *To enhance the ability of graduates to move into technical management.*

- 2) *To enhance the ability of graduates to design and implement modern industrial and engineering systems for increasing productivity and product quality.*
- 3) *To promote cooperative learning with businesses and industries.*
- 4) *To provide evening programming primarily focused on serving and/or attracting part-time students.*

The Weekend Master's Degree program at Purdue was developed with the following program objectives:

- 1) *To enhance the learning and the professional development of employees in businesses and industries who have responsibilities in manufacturing, distribution, and information technology.*
- 2) *To serve the needs of non-traditional graduate students by promoting on-campus and Internet-based instruction for learners throughout Indiana and North America who have full-time employment and/or family responsibilities.*
- 3) *To provide learning experiences that use more than one evaluation criterion and that draw from numerous problem-solving activities, including videos, audio instruction, textbooks, case studies, and team activities using the World Wide Web.*
- 4) *To provide students with unique learning experiences and with applications in technology that cannot be obtained elsewhere.*
- 5) *To allow students to gain a better insight into the actions, the changes, and the responsibilities of professionals within manufacturing, distribution, and information technology departments.*
- 6) *To promote student interaction through various media resources, through the exchange of technology experiences, and through ethics in the workplace.*

The program objectives in both institutions are of an applied problem-solving nature and are designed to serve individuals from the industrial world. In most cases, these individuals work full-time; and they are interested in cooperative learning with businesses and with industries. The programs mainly target individuals holding supervisory and/or managerial positions in businesses and industries, who work in a technical environment. Therefore, students in the program have varied background in mathematics and in computer-related courses. Many of them begin graduate programs several years after graduating from college. These students are willing to acquire advanced knowledge in the technology area for their career growth. The graduate enrollment figures for two academic years at NKU and Purdue shows that the MST program attracted many students having undergraduate degrees in areas other than technology or technology-related fields (Table 1).

### **Course need and justification**

“Core courses were designed to emphasize fundamental skills and knowledge deemed important by regional industrial employers and technology managers while program tracks provide depth in students’ area of specialization<sup>1</sup>.” The course goals, objectives, and related course topics are selected to meet the program objectives and to serve the students in the program. The course goals are:

- To investigate and to identify industry standard software in a chosen field.
- To identify hardware requirements and configurations for software applications.
- To learn and to apply the software for specific projects in a chosen industry.
- To learn data analysis and decision making through software applications.
- To learn data acquisition techniques (only at NKU) \*.

*\*Data acquisition techniques are covered extensively in a separate graduate course at Purdue*

Table 1. Undergraduate majors of students enrolled in master's program

Undergraduate major of graduate students (1997-98, 1998-99)	NKU	PURDUE
Engineering	1	2
Engineering Technology	3	12
Industrial Technology	3	2
Industrial Labor Relations	3	0
Mathematics	1	0
Information System Technology	2	5
Office system technology	1	0
Graphic Design	1	0
Chemistry	1	0
General Science	1	0
Business	0	8
Computer Science	1	2
Other	6*	3**

\*One student each from, Anthropology, International Studies, Political Science, Political Economics; two students from History

\*\*Psychology, Education, and Liberal Arts

Course topics (Table 2) are selected based on learning goals. Each student in the course (at NKU) is required to complete a project that is applied in nature and within one of the topic areas covered in the course. Students are encouraged to take a project that can be applied directly in their work; thus, they have meaningful experiences in the course by applying knowledge and learned skills to solve problems in their workplace. Each student is also required to present the project in front of the entire class and the faculty from the department. The students and the faculty evaluate the presentation and the project. One condition of presentation is that each student must use computer-based presentation techniques. This allows the student to develop and practice professional presentation skills in both visual and oral communication.

Table 2. Topics covered in the courses

Computer Applications in Technology (NKU)	Microcomputer Applications in Industry and Technology (PURDUE)
Web based data gathering	Meta-search engines
Research tool software (statistics, production and operation management)	E-commerce
Process and products-multimedia (web page design, text, image, audio, video integration)	Process and products-multimedia (web page design, text, image, audio, video integration)
Automatic data capture technology	Advanced micro device (AMD) review
PC networking	Mobile computing devices
Project	ISP's, cookies, and e-mail

## Students, their expectations, and course assignments

Purdue University's Weekend Master's Degree program is designed for full-time professionals seeking an advanced degree with limited on-campus instruction. They rely on distance education technologies. Presently there are 40 students in the program, ranging in age from 27 to 55. Northern Kentucky University's program, is an on-campus evening program also designed for full-time professionals. Students in both programs were asked to respond to a questionnaire related to their undergraduate major, math preparation, and experiences with computer hardware and software. They were also asked to list *three goals* they would like to accomplish in the course. Their responses varied depending on their academic background, nature of their job and tasks performed, and on their familiarity with the hardware and the software (Table 3). In general, their expectations were mainly to learn software, Internet use, web page design, computer-based presentation, and data acquisition.

Most assignments (Table 4a and Table 4b) in the course emphasize practice and skill development in topic areas showed in Table 2. Many students develop an additional interest in certain areas, which they can readily use at their workplace. In several cases, project work in the course may lead to a master's project (Table 5), a requirement for graduation at NKU.

Table 3. Students' expectations in the course

Knowledge of Internet and its use to locate resources
Multimedia-based web page development
Learn project management software
Web page design including understanding of HTML
Select and learn software for management decision
Learn and develop skill in computer-based presentation
Learn computer-based training and development
Computer-based data acquisition system

Table 4a. Typical assignments in the course (NKU)

Computer Applications in Technology	Software used
Learn and create a web-based survey form and conduct survey through Internet	Microsoft FrontPage
Learn and create a web page that would include frames, navigations, e-mail, hyperlinks	Microsoft FrontPage
Learn the basics of statistics and use statistical software to solve problems	STATS by Decision Analyst Inc.
Learn the basics of linear programming and use software for solving problems on maximizing profit and minimizing cost	POM software by Prentice Hall
Learn and understand barcode technology, symbology, and coding standards, and use software to generate 1D and 2D barcode labels	Label View software by Graftek
Identify an AIDC technology, including scanning of data and process of data that can be implemented in the students' workplace (business and industry). All information related to hardware and software (justification, applicability, vendors name, cost, etc.) are required)	Netscape to search for AIDC-related websites
Learn basics of PC networking and network computers in the PC lab	Windows 95

Table 4b. Typical assignments in the course (PURDUE)

Microcomputer applications in Industry and Technology	Software used
Financial data analysis	Microsoft Excel
Boolean expressions	Copernic Plus
Multimedia presentations of technical reports	Microsoft Power Point
Distributed databases	Label View by Graftek
Technical debriefing tidbits	Microsoft Word
Class web page	Microsoft Front Page
Process mapping and flow charting	Visio Technical

Table 5. Some examples of applied projects completed by students in the course during 1997-98 and 1998-99 academic years

Projects done by students in Computer Applications in Technology course (NKU)
Automatic Data Capture for inventory control
Create code 39 labels via Microsoft Access DDE and ODBC
Corporate web pages
Barcode applications in construction -warehouse
Interactive, English as a second language (ESL) class on the Internet
Web-based survey of industrial quality systems
Electronic data interchange
Video-audio conferencing using Microsoft net meeting software
Bar coding of production tooling
Human resources software and its application

### Students' Feedback

In the latter part of the semester, students were asked to complete questionnaires to evaluate the course. They were told to provide input so that course materials could be selected and/or improved. They were asked about the things they learned in the course, topics they would like to include, and topics they would like to exclude. More importantly, they were asked how participation in the course helped them to solve their problems at work. Most students attested to the fact that learning in the course helped them apply the knowledge and the skill in their work. Their responses regarding the retention or the exclusion of certain topics were apparently influenced by their familiarity, interest, or preparation in these areas (Table 6a and Table 6b).

### Summary

This paper demonstrated the attributes of two courses in microcomputer applications at two different universities. Both courses have learning goals that satisfy the master's degree program goals and are targeted for full-time professionals from varied academic backgrounds. Course topics are current, and assignments are relevant and

applied in nature in students' interest areas. The learning outcomes were substantial in each program. Students and sponsoring organizations alike were extremely satisfied with the course content and learning.

Integrating a microcomputer applications course in master's degree level programs in Technology has both practical and academic applications. At the graduate level, learning is associated and demonstrated by through exhaustive literature searches, research papers, projects, and presentations. Reading materials in the course required analysis, synthesis, and evaluation of information. The students then apply those ideas in research-based assignments and projects that are both rewarding to the student and to the sponsoring company.

Table 6a. Student responses related to course topics at Purdue

1997-98 academic year

1998-99 academic year

<i>Things that you have learned in this class</i>	
<ul style="list-style-type: none"> <li>• Information security</li> <li>• Web cookies</li> <li>• FrontPage basics</li> <li>• Sorting out Ink Jet printing technologies</li> <li>• Installing software</li> <li>• AIAG label guidelines</li> <li>• Evaluating proper PC technology</li> </ul>	<ul style="list-style-type: none"> <li>• Meta-search engine techniques</li> <li>• Paper-based distributed databases</li> <li>• Mobile computer solutions</li> <li>• Battery technologies</li> <li>• Writing macros in Excel</li> <li>• Privacy on the Internet</li> <li>• Sorting out ISP's and e-mail etiquette</li> </ul>
<i>How do you see the learning in this class to be applicable to your profession?</i>	
<ul style="list-style-type: none"> <li>• Bar coding</li> <li>• Wireless data communication</li> <li>• Problem-solving</li> <li>• Having more choices to complete and refine tasks</li> <li>• Looking forward to using newer versions of software</li> <li>• Utilizing on-line e-tailers</li> </ul>	<ul style="list-style-type: none"> <li>• Creating more effective presentations</li> <li>• Gather better information from the web</li> <li>• More comfortable installing software</li> <li>• Utilizing Microsoft office features</li> <li>• Being a more informed computer user</li> </ul>
<i>If you were instructor of this course, name one topic that you would include</i>	
<ul style="list-style-type: none"> <li>• Visual Basic Programming</li> <li>• Pearl scripting</li> <li>• Simulation</li> <li>• Data mining</li> <li>• Help Desk evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• Windows 98 configuration</li> <li>• NT Workstation</li> <li>• Modem setup</li> <li>• Software development project management</li> <li>• Palm pilot programming</li> </ul>
<i>One course topic that you would exclude</i>	
<ul style="list-style-type: none"> <li>• The text book, "The Transparent Society"</li> <li>• Microsoft project</li> <li>• Using WinZip</li> <li>• E-mail etiquette</li> </ul>	<ul style="list-style-type: none"> <li>• Excel activities</li> <li>• Some of the Power Point</li> <li>• Leave everything alone</li> </ul>

Table 6a. Student responses related to course topics at NKU

1997-98 academic year

1998-99 academic year

<i>Things that you have learned in this class</i>	
<ul style="list-style-type: none"> <li>• Automatic Data Capture technology</li> <li>• Web page development</li> <li>• Searching through Internet</li> <li>• Surveying/data gathering through Internet</li> <li>• Use of linear programming software</li> <li>• Use of statistics software</li> </ul>	<ul style="list-style-type: none"> <li>• Web page design</li> <li>• WEB based data collection</li> <li>• Bar-coding technology</li> <li>• Linear programming</li> <li>• Internet navigation</li> <li>• Website creation</li> <li>• Use of statistics software</li> </ul>
<i>How do you see the learning in this class to be applicable to your profession?</i>	
<ul style="list-style-type: none"> <li>• Bar coding for product tooling</li> <li>• Finding information through Internet</li> <li>• Linear programming on manufacturing process</li> <li>• Adding UPC codes to EDI documents</li> <li>• Applications in the area of information system support</li> <li>• Project related to cost saving in telecommunication industry</li> <li>• Gathering data in timely and efficient manner</li> <li>• To become a web page developer</li> <li>• Inventory control</li> </ul>	<ul style="list-style-type: none"> <li>• ADC in shipping and receiving operation in my industry</li> <li>• Web-based survey in our career development center</li> <li>• At present not applicable to my profession</li> <li>• Bar-coding to track products</li> <li>• Provides larger knowledge base to draw ideas for programming application</li> <li>• Software (WebPages development, statistics, linear programming) useful in the profession</li> <li>• Electronically gathering information</li> <li>• Learning new software</li> <li>• New ideas helped develop innovative problem solving methods.</li> </ul>
<i>If you were instructor of this course, name one topic that you would include.</i>	
<ul style="list-style-type: none"> <li>• Increased UPC programming</li> <li>• Net surfing</li> <li>• Project management software</li> <li>• Operating system and its trouble shooting</li> <li>• Electronic commerce</li> <li>• Virus-related information and its remedy</li> <li>• Statistics fundamentals</li> <li>• Assignment on new software applicable to individuals profession</li> </ul>	<ul style="list-style-type: none"> <li>• Multimedia</li> <li>• Voice recognition software</li> <li>• Biometrics and its applications</li> <li>• More time devoted for use of software</li> <li>• Production and operation software</li> <li>• Industry use/application related to each course topic</li> <li>• More applications directed towards manufacturing processes and process control</li> <li>• Database application software</li> <li>• Information on Java</li> </ul>
<i>One course topic that you would exclude</i>	
<ul style="list-style-type: none"> <li>• Linear programming (1)</li> <li>• Topic related to computer hardware and systems (1)</li> <li>• 2D bar-coding (1)</li> <li>• None (9)</li> </ul>	<ul style="list-style-type: none"> <li>• Web pages</li> <li>• Stats software (4)</li> <li>• Linear programming</li> <li>• Topic related to computing facilities</li> <li>• 2D bar-coding (PDF417)</li> <li>• None (2)</li> </ul>



## Bibliography

1. Curtis, K, and N. Latif. "Design, Development, and Implementation of a Graduate Program in Technology." *Journal of Engineering Technology* 16, no. 1 (1999): 18-22.

## NIAZ LATIF

Niaz Latif is a Professor and the Head of the Department of Industrial Technology at Purdue University in West Lafayette, Indiana. Before joining Purdue, he was a faculty member and coordinator of Engineering Technology programs at Northern Kentucky University (NKU). He developed two graduate courses for the master's program in Technology at NKU: *Computer Applications in Technology* and *Computer Aided Industrial and Engineering Design*. Dr. Latif is member of the American Society for Engineering Education (ASEE) and currently involved in the Engineering Technology Division

## DUANE D. DUNLAP

Duane D. Dunlap is an Associate Professor of Industrial Technology at Purdue University in West Lafayette, Indiana and Director of the Weekend Master's Degree Program in Technology. He is an authority in Automatic Identification and Data Capture (AIDC) Technology and has developed undergraduate and graduate level courses in AIDC. Dr. Dunlap is a past President of the Society of Manufacturing Engineers.