



LSC Use Only
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Submission Date: _____
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UWUCC USE Only
Number: 96-24
Submission Date: _____
Action-Date: App 3/18/97
Senate App 4/1/97

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Dr. Charles J. Shubra Phone 357-7917
Department Computer Science

II. PROPOSAL TYPE (Check All Appropriate Lines)

COURSE Prod. Tools & 4GL
Suggested 20 character title

New Course* CO 444 Productivity Tools and 4th Generation Languages
Course Number and Full Title

Course Revision _____
Course Number and Full Title

Liberal Studies Approval + _____
for new or existing course Course Number and Full Title

Course Deletion _____
Course Number and Full Title

Number and/or Title Change _____
Old Number and/or Full Old Title

New Number and/or Full New Title

Course or Catalog Description Change _____
Course Number and Full Title

PROGRAM: Major Minor Track

New Program* _____
Program Name

Program Revision* _____
Program Name

Program Deletion* _____
Program Name

Title Change _____
Old Program Name

New Program Name

III. Approvals (signatures and date)

[Signature]
Department Curriculum Committee

[Signature]
Department Chair

[Signature]
College Curriculum Committee

[Signature]
College Dean

+ Director of Liberal Studies (where applicable)

*Provost (where applicable)

II. Description of the Curriculum Change

1. New Syllabi of Record

I. Catalog description:

CO 444 Productivity Tools and 4th Generation Languages 3 credits
3 lecture hours
Prerequisites: CO 441 or IM 450 (3c-0l-3sh)

Develop an understanding of productivity issues and how Fourth Generation Languages (4GL) improve productivity as contrasted with 3GLs. Advances in the programming paradigm such as event driven programming, objects, reusability, graphical user interface (GUI) design and development, information systems based on relational databases, and client/server technology are addressed. Students will gain a practical experience with these concepts through an in-depth study of a fourth generation programming language such as Visual Basic and the development of a GUI interface to a relational database using a fourth generation language such as Visual Basic.

II. Course Objectives:

1. Develop a precise definition of the essential characteristics common in fourth generation programming languages.
2. Understand the motivation for using fourth generation programming languages.
3. Develop an understanding of the components present in the latest technology for developing systems, including event driven programming, objects, methods, attributes, reusability, client/server, GUI design.
4. Gain in-depth practical experience with systems development using the latest technology contained in fourth generation programming languages by implementing an information system using a fourth generation language such as Visual Basic to create a GUI interface to a relational database.
5. Understand and gain in-depth experience using a fourth generation language such as Visual Basic programming environment to create and debug programs.
6. Understand objects, property lists and methods present in an existing fourth generation language such as Visual Basic.

III. Course Outline:

Recommended Course Text:

Wright, Peter, *The Beginner's Guide to Visual Basic 4.0*, Wrox Press Ltd., Chicago Il. (1996).

Other materials will either be provided or placed on reserve at the library or in Str. 107.

A. Programming Language Generations. (4 hours)

1. Characteristics of generations 1 through 4.
2. Essential characteristics of fourth generation languages.
3. Categorization of existing languages and tools.

B. New Programming Models. (2 hours)

1. Event driven programming.
2. Object oriented programming.
3. Visual Basic as an object oriented language/event driven language.

C. 4GL Programming Environments and Applications Development. (4 hours)

1. Components of a graphical programming environment.
2. Design and development of a graphical user interface (GUI).
3. Properties and Events.
4. GUI design concepts and standards.
5. Project (.VBP) organization and management.

D. Reusable Objects (Controls). (6.5 hours)

1. Forms, Properties, Event Procedures and Methods.
2. Standard Toolbox controls.

E. Interfacing with a Database Using the Data Control. (6.5 hours)

1. The Data Control.
2. Data aware controls and binding.
3. Programming with the Data Control methods.

F. Debugging and Error Handling. (2 hours)

1. Run time debugging tools.
2. Error trapping and handling.

G. Additional Controls. (6 hours)

1. Container controls.
2. Report controls.
3. Grid controls.
4. List controls.

H. Accessing the Database without the Data Control. (4 hours)

1. Structure of the Data Access Object (DAO).
2. Mapping the DAO.

I. Algorithm Design for 4GL's. (3 hours)

1. Online transaction processing.
2. Embedded SQL.

J. Multiple Document Interfaces. (2 hours)

1. Single Document Interfaces vs. Multiple Document Interfaces.
2. Custom menus.
3. Tool bars.

IV Evaluation Methods:

Instrument	Points
Exam 1	100
Exam 2	100
Final	100
Technical Review	10
Technique Project	100
Course Project	150
Total	560

The examinations will consist of completion, short essay and matching. The paper will be a technical review of a recent article on the topic of fourth generation languages. Projects will be graded according to good design, good style and functionality included in the project.

All earned points will be totaled with grades assigned as described in the following table:

Percent of the total possible points:	Letter Grade Assigned:
100%-90%	A
89%-80%	B
79%-70	C
69%-60%	D
59% and lower	F

Note that evaluation methods may differ slightly under different instructors and chapter reading assignments may change should a different text book be selected.

V. Required Textbooks, Supplemental Books and Readings.

Textbook: Wright, P., *The Beginner's Guide to Visual Basic 4.0*, Wrox Press Ltd., Chicago Il. (1996).

Non-text: Programmer's Guide to Visual Basic 4, Microsoft Corp., Redmond, WA. Chapter 20.

Guide to DAO, Microsoft Corp., Redmond, WA.

VI. Special Resource Requirements.

Currently, sufficient copies of Visual Basic Professional 4.0, MS Access 2.0 and MS SQL Server are available to service 30 students.

VII. Bibliography.

Adam, G. "The Client/Server Paradigm." Data Management Review, March 1993, 30-34.

Appleman, D. "Design True Event-Driven Code." Visual Basic Programmer's Journal, August/September 1994, 36-56.

Bochenski, B. "Client/Server Computing: A New Approach." Data Management Review, March 1993, 8-14.

Bright, M.W., A.R. Hurson and S.H. Pakzad. "A Taxonomy and Current Issues in Multidatabase Systems." Computer, March 1992, 50-60.

Brust, A.J. "Tuning VB's Jet Engine." Visual Basic's Programmer's Journal, August/September 1994, 20-31.

Celko, J. "An Introduction to Concurrency Control." DBMS, September 1992, 70-83.

Celko, J. "The 4GL/SQL Manifesto." Database Programming and Design, July 1991, 23-25.

Cobb, R. "In Praise of 4GLs." Datamation, July 15, 1985, 90-96.

VII. Bibliography (continued).

Dale, R. "Client-Server Database: Architecture of the Future." Database Programming and Design, August 1990, 28-37.

Darling, C. "Intelligent 4GLs: Smarter Applications and Programming Tools." PC AI, November/December 1990, 22-26.

Gold-Bernstein, B. "Does Client-Server Equal Distributed Database." Database Programming and Design, September 1990, 52-62.

Linthicum, D. "Client/Server Protocols: Choosing the Right Connection." DBMS, January 1994, 60-71.

Naver, M. "Running on NT." CompuServe Magazine, November 1993, 26-29.

Necco, C.R. and Nancy W. Tsai. "Use of 4GLs: Application Development and Documentation Problems." Journal of Systems Management, August 1988, 26-33.

Parson, J.C. "Shifting Gears From 3GL to 4GL." Database Programming and Design, January 1990, 58-64.

Probst, R. "A Software Model for the 21st Century." Object Magazine, September/October 1993, 65-67.

Rodgers, V. "DBMS-Independent 4GLs." Database Programming and Design, May 1991, 58-65.

Roussopoulos, N. and A. Delis. "Modern Client-Server." Sigmond Record, September 1991, 52-62.

Sambar, T. "Database Gateways: The Challenge of Interoperability." Database Programming and Design, September 1991, 29-58.

Schur, S.G. "An Idea Whose Time Has Come." Database Programming and Design, August 1990, 66-72.

Sibley, E.H. "An Experimental Analysis of the Performance of Fourth Generation Tools on PCs." Communications of the ACM, November 1989, 1340-1353.

Spencer, K.L. "Visual Basic: A New Development in Productivity." DEC Professional, June 1994, 48-55.

VII. Bibliography (continued).

Spenser, P.M. "Client/Server Computing: Issues and Benefits." Data Management Review, March 1993, 32-36.

Stodder, D. "4GLs: One-Stop Shopping?." Database Programming and Design, March 1989, 7-8.

Stodder, D. "Slouching Toward Middleware." Database Programming and Design, September 1994, 7-8.

Strehlo, K. and Brian Butler. "Making SQL Server Scream." DBMS, November 1991, 63-79.

Tharp, A.L. "The Impact of Fourth Generation Programming Languages." SIGCSE Bulletin, 16 June 1984, 37-47.

Udell, J. "Componentware." Byte, May 1994, 46-56.

"Window NT: Can Microsoft Make the Jump from the Desktop to Distributed Computing." Data Communications, April 1993, 68-77.

Winsberg, P. "Comparing Apples and Apples." Database Programming and Design, September 1994, 25-28.

Winter, R. and J. Dave. "Age of the Information Server." Database Programming and Design, June 1991, 48-55.

COURSE ANALYSIS QUESTIONNAIRE

Section A: Details of the Course.

A1. This course provides computer science majors and other majors (e.g., Management Information Systems majors or minors and Geography majors) with an interest in designing and developing computer systems with an in-depth study of the latest technology being used to develop systems. Within the computer science curriculum it will serve as a Upper Level Electives course to follow the CO 441 Introduction to Database Management Systems course which is required in the Applied Computer Science track and an elective in the other two tracks.

A2. No.

A3. This course has been offered in its present form twice at IUP as a CO 481 special topics course. While the syllabus and the assignments have been slightly refined the above syllabus accurately reflects the course as taught previously. The course has been attended by MIS majors, Geography majors as well as faculty or university professionals from those departments and other university administrative areas.

A4. No.

A5. N/A.

A6. Similar courses are currently being offered at University of Massachusetts- Boston, University of Northern Colorado and The College of Redwoods.

A7. The course content and the skill set included was developed with the guidance and at the urging of the Corporate Advisory Board of the Computer Science Department. The members of the board and the companies they represent are:

Mr. Steve Brehm Manager of Technical Support & Operations for PHICO Insurance,
Mr. Dave Currance Director of Information Systems for WESCO Distribution, Inc.,
Mr. Barry Day Manager of Global SAP Leveraged Services for E.I.DuPont De Nemours,
Ms. Debbie Luckasevic Office Products Support Manager for Mellon Bank,
Mr. Chuck Moll Manager of Computer Services Corp. Information for PPG Industries,
Mrs. Wendy Scott Sr. Systems Analyst for Alcoa,
Ms. Carol Young Career Counselor at Carnegie Mellon University.

A version of this course has been taught by Dr. Shubra as a module in the PPG Industries Inc., Information Systems Management Development curriculum for the past two years.

The course content represents a new approach to systems development which graduates wishing to pursue systems development careers need to understand. The existing approaches and languages have not gone away nor have the billions of lines of code

developed using the traditional technology. This subject matter represents an expansion of the material a graduate is expected to understand.

Section B: Interdisciplinary Implications.

B1. This course will be taught by one instructor.

B2. No other department currently has offered this course. In casual discussions with a faculty member from the College of Business who was attending this course when offered as a special topics, he indicated an interest in the content and the need to determine the participation of Business students in this course.

B3. Seats will be made available to students in the School of Continuing Education depending on enrollments.

Section C: Implementation.

C1. No additional faculty resources are required to teach this course. It has been offered as a special topics course twice in it's current form and once in an earlier form.

C2. Currently, adequate resources are in place to teach one section of the course. These resources have been purchased with corporate grants and gifts and through the use of departmental equipment funds. The future (2-5 years) probably will require an upgrade in the software used to teach the course. These upgrades will be purchased in a like manner.

C3. The Computer Science Department has for more than five years received generous grants from alumni and corporations. This has provided approximately \$15,000 per year for the department to use in upgrading equipment and software. We expect this level of giving to continue.

C4. One section of this course will be offered per year unless the demand exists for an additional section. Should an additional section be needed one fewer section of an existing course will be taught.

C5. Only one section of this course will be offered in a single semester.

C6. The section can accommodate thirty students which is the number of students which can be accommodated by the available hardware and software facilities.

C7. N/A.

III. Letters of Support.

Letters of support have been solicited from Mr. Ken Shildt chairman MIS and Decision Sciences Department, Mr. Blake McCully Systems Analyst IUP Undergraduate

**Admissions, Dr. Robert Sechrist Director of Spatial Sciences Research Center and the
Corporate Advisory Board of the Computer Science Department.**

Spatial Sciences Research Center
Indiana University of Pennsylvania
43 Robertshaw Building
Indiana, Pennsylvania 15705-1087

(412) 357-2251



August 26, 1996

Dr. Charles J. Shubra
Professor
Department of Computer Science
319 Stright Hall

Dear Charlie:

I am very pleased to support the new course, CO 444 Productivity Tools and Fourth Generation Languages, you are proposing. The course is an important advance in the Computer Science curriculum because it keeps your program current with advances in your field. Two of my students took this course when it was offered on an experimental basis. They found the skills they learned in it extremely valuable when job hunting.

Sincerely,

A handwritten signature in black ink, appearing to read 'Robert P. Sechrist', with a long, sweeping underline.

Robert P. Sechrist



Date: September 18, 1996

Subject: CO 444 Productivity Tools and 4th Generation Languages

To: Dr. Charles Shubra, Chairperson
Computer Science Curriculum Committee

From: Kenneth L. Shildt, Chairperson
MIS and Decision Sciences Department

Your course proposal appears to be an appropriate elective for students majoring in MIS or Computer Science. The major subject matter relative to visual and object programming skills is certainly appropriate for students entering careers in information systems. Microsoft's Visual Basic is one of the major languages being used for the professional development of application software and should be made available to our students.

The Management Information Systems and Decision Sciences Department supports your proposal and will list it as an appropriate elective for our majors. Our support does not preclude that our department would be prevented from offering advanced business application electives which include database, client server, and graphical visual languages like Visual Basic in the future. We have already acquired a grant from Microsoft for the installation of Visual Basic on 50 of our ECOB workstations.

In addition, it is our intention to feature Visual Basic concepts in an introductory course, Foundations of Information Systems, which will acquaint our students with an overview of their major. This course will replace CO 110 as revised within your curriculum. The Visual Basic content will be much more elementary than the course which you are proposing. The basic language will be introduced as a procedural language in lieu of C++ which you are now teaching in CO 110.

Therefore, our support is conditional in that it should not be implied that the MIS and Decision Sciences Department would not be able to teach courses involving Visual Basic or other similar languages in the future after this course is approved.

Office of Admission
Indiana University of Pennsylvania
216 Pratt Hall
Indiana, Pennsylvania 15705-1088

(412) 357-2230 or 1-800-442-6830
FAX: (412) 357-6281
E-Mail: Admissions_Inquiry@grove.iup.edu



September 30, 1996

Chair
University-Wide Curriculum Committee

To whom it may concern:

I am pleased to write this letter of support for Dr. Charles Shubra regarding the curriculum proposal for the course in Productivity Tools and Fourth Generation Languages. Because of the proliferation of systems, stand alone and client/server, using a graphical user interface, this course reflects the 'state of the art' in programming languages. I feel that it brings together the concepts and procedures that computer science, and MIS students learn into a cohesive mix to give them the necessary tools to be immediately productive within the GUI environment.

Again, I give my whole-hearted support to Dr. Shubra's efforts to bring the creation of this class into fruition.

Sincerely,

A handwritten signature in black ink that reads "Philip B. McCully". The signature is written in a cursive, flowing style.

Philip B. McCully
Systems Analyst
IUP Office of Admissions

Computer Science Department
Corporate Advisory Committee

October 3, 1996

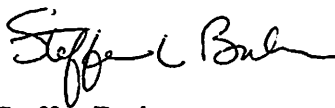
University Wide Curriculum Committee
Indiana University of Pa.
Indiana, Pa. 15705

Dear Chairperson:

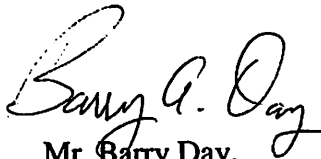
This is a letter of recommendation for the Computer Science Department's CO 444 - Productivity Tools and Fourth Generation Languages course. The tools and languages used to develop production computer systems are undergoing a revolution. Methods, languages and procedures which have been in use for years are rapidly giving way to personal computer based, graphical user interface systems. Therefore, the needs of industry are rapidly changing along the same lines.

The Corporate Advisory Committee has participated in the design of the CO 444 course and has tracked it's progress during the three offerings as a special topics course. This committee has encouraged the Computer Science Department to move in this direction. To be productive in today's and tomorrow's programming environment, graduates will need to understand the topics presented in this course. We, therefore, enthusiastically endorse the approval of the CO 444 course proposal.

Sincerely,



Mr. Steffen Brehm,
Manager of Technical Support and Operations
PHICO Insurance Corp.



Mr. Barry Day,
Manager of Global SAP Leveraged Services
DuPont Information Systems.

96-24



DATE: February 18, 1997

TO: Dr. John Orife, Screening Committee of University Curriculum Committee

FROM: Dr. Charles Shubra *Charles Shubra*

RE: Your Concerns with the Proposed CO 444 Course

CC: Dr. Jodell Kuzneski, Chairperson University Curriculum Committee

This memo is prompted by the telephone conversations which you and I have had concerning your screening of the proposed CO 444 course and your recommendations and concerns with the proposal.

The discipline of software development is undergoing a major evolution from mainframe, traditional third generation languages to a host of end user, high productivity tools and languages which are collectively referred to as "Fourth Generation Languages" (4GL). The current proposal is meant to address this rapid evolution. The CO 444 proposal has grown out of one offering of CO 481 which dealt with productivity tools, and three offerings of CO 481 which have had Visual Basic as the vehicle providing an in-depth experience with a 4GL.

This course, as with many of the courses offered by the Computer Science department, seeks to develop a solid conceptual foundation which embodies principles and theory which are likely to be immune from the rapid changes which are occurring. This foundation serves as the basis for students to assimilate and understand various products which populate the area each more or less incorporating the concepts, principles and theory present in the foundation.

Further, many of our courses provide an in-depth practical experience with current products (e.g., programming languages, utilities, development environments and tools) which illustrate the conceptual foundation. With this in mind, the CO 444 course introduces the many aspects attributed to 4GL products ending with a matrix used to characterize individual products.

Now the major sticking point between you and me. The course provides an in-depth experience with a 4GL in the form of Visual Basic. The course will continue to provide this in-depth experience using Visual Basic for the near term future (2-3 years at a minimum). It is possible after this period of time that another 4GL might emerge which for pedagogical reasons provides a better in-depth experience.

It was at the direction of the Computer Science Departmental curriculum committee that I attempted to minimize specific references to Visual Basic in the syllabus of record, thinking that something in a few years might make more sense and there would be no need to submit a course change at that time. I wrote the syllabus of record in generic terms, but attempted to convey that it would provide a Visual Basic experience by frequent reference to Visual Basic. To characterize this course as one in which we expect frequent (at the

option of the instructor) changes in the software selected to provide the in-depth experience is not correct. Your suggestion to "remove references to Visual Basic" would in my judgment paint the course as one which surveys many 4GL's or one in which the in-depth experience is likely to frequently change. I think either of the above outcomes would not be correct. Failure to identify Visual Basic as the current software being employed could also confuse the students.

I then offered to provide a Visual Basic specific proposal which would remove all doubt as to the focus of the course, but that also did not meet with your approval.

I will as you suggested provide additional references in the bibliography. I will review the proposal and attempt to remove any ambiguity concerning the software to be used. In the future, should a change in the software be deemed appropriate by the Computer Science faculty, we will submit a course change form.

I would request that after the above changes are made that this proposal be forwarded to the University Curriculum Committee. I will be available to the committee should a hearing be needed.

Thank you for your time and efforts.