Business Specialization Track
Masters of Software Engineering (MSE) Program

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March 1, 1995
CMU-CS-95-124

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This report is a revision of an internal report written and distributed within the CMU community by Carol L. Hoover in August, 1994.

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Abstract

MSE students who aspire to obtain business management positions within a computer-related technology company, to specialize in the development of software to support production and operations, and/or to start their own technical companies will need fundamental business skills and expertise. The MSE Program offers the Business Specialization Track to help students acquire appropriate business skills while completing their master's degree in software engineering. The track is flexible in that it allows students to choose their own set of track courses from a list of approved business-related courses and, therefore, to match their career objectives with suitable courses. For instance, students can select courses to help them prepare for careers as executive-level managers of computer technology companies, as designers of information systems, as developers of software systems to support production and operations, and/or as founders of high technology companies. This report describes the track rationale and requirements, provides educational guidelines to help students select courses, lists the approved courses, and presents brief synopses of the approved courses. The report is based on the author's work in developing specialization tracks for the MSE program. The author started this work during the spring of 1993.

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1 Rationale

Master of Software Engineering (MSE) students whose career goals include business management within a computer-related technology company, developing software to support production and operations, and/or starting a technical company need fundamental business skills. The MSE Program offers the Business Specialization Track to help students acquire these skills. The completion of this track is similar to the completion of a minor in business and is appropriate for students who do not intend to pursue the Masters in Business Management and Software Engineering (MBMSE) program or the Master of Science in Industrial Administration and Master of Software Engineering (MSIA/MSE) program.

All students who complete a business management specialization track will be able to read and interpret primary financial statements such as the balance sheet, the income statement, and the cash flow statement. They will understand the basic cost and budgeting concepts used to analyze and report the performance of business operations and to make intelligent financial decisions regarding these operations. Other knowledge and skills that they will acquire depend on the courses that they select to match their educational objectives.

Students whose career aspirations include executive-level leadership within a computer-related technology company need leadership and decision-making skills. Students can become knowledgeable about ways to effectively formulate and communicate the objectives of a project, department, or company. They can explore methods for motivating others to accomplish these objectives and can gain an understanding of basic marketing strategy. They can develop skill in analyzing the profitability of capital ventures and become aware of political, social, and legal issues that affect the ways firms do business.

Students can also acquire skills to manage the information infrastructure within a company, to manage an information systems department, to manage a computing facilities department, to serve as a Chief Information Officer, and/or to be an information technology consultant. Students can acquire an understanding of basic financial, political, social, and ethical concepts important to the management of technical companies. They can become knowledgeable about the design and implementation of information and telecommunication systems. Students can learn how to effectively communicate their ideas. They can also study how humans interact within an organization.

Students who want to lead the design/selection of computer systems that automatically control production and operations can learn how material, technological processes, and people are related in the manufacture of goods and can learn about the operations manager's role in managing these resources. They can develop skill in analyzing the quality of goods and the cost associated with producing these goods. Most importantly, they can become knowledgeable about state-of-the-art computer technology for controlling production; and they can explore the role of telecommunications in connecting business planning and production operations.

Students who want to found a high technology start-up company can develop a thorough understanding of the relationship between the following elements needed to start a high technology company: product idea, potential market demand for the product, technology required to implement the product, business plan, and funding for product development. They can select courses to become knowledgeable about the way in which example companies in the computer industry were started and about important factors which contribute to the evolution of profitable companies. In addition, they can learn about financial, marketing, and organizational concepts important to the successful launch of a start-up company.

Students should note that the *Business Specialization Track* is intended to help them acquire fundamental knowledge and skills required for a business-oriented career in a high technology company. They should consult professionals who have obtained positions similar to their career objectives to determine additional education and/or experience that they will need to successfully reach their career goals.

2 Track Requirements

Students pursuing a Business Specialization Track will complete **eight or more half-semester (**6-unit) approved courses including *Financial Accounting* (45-700) and *Managerial Accounting* (45-701). The reader should refer to *Section 3: Approved Courses* for the list of approved courses and to *Section 4: Course Descriptions* for brief course descriptions. Students who want to take courses which are not on the approved list to satisfy the eight-course requirement must seek his/her advisor's permission.

Students should note that half-semester courses are offered during the following time periods.

- Fall 1 - first half of the Fall semester
- Fall 2 - second half of the Fall semester
- Spring 3 - first half of the Spring semester
- Spring 4 - second half of the Spring semester
- Summer 5 - first mini-session in the Summer
- Summer 6 - second mini-session in the Summer

One full-semester (9-12 unit) course counts as two half-semester courses.

Students should select approved courses that correspond to their career and educational objectives. *Tables 1-4* are guides to help students select approved courses which enable them to acquire knowledge and skills important to their career objectives. First, the student should select the career goal which best matches his/her interests. Next, the student should review the list of knowledge and skills which correspond to his/her selected career goal.

Then the student should use the corresponding table to select his/her track courses. The student should refer to *Tables 1-4* and the course descriptions in *Sections 4.1-4.35*. They may also choose courses listed in *Sections 3.1-3.4*.

The prerequisite for *Finance* (45-710) is *Probability and Statistics I* (45-733). Students who have not take an equivalent course or acquired equivalent knowledge in probability and statistics will take *Probability and Statistics I*.

Career Goal 1: *Executive-Level Management in a Computer Technology Company*

Knowledge and skills involving:

- Leadership and decision-making.
- Formulation and communication of business objectives.
- Employee motivation and achievement of company objectives.
- Basic marketing strategy.
- Profitability of capital ventures.
- Political, social, and legal issues that affect company policy.

Table 1: Executive-Level Management in a Computer Technology Company

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
Financial Accounting (45-700)	Managerial Environment (45-740)
Managerial Accounting (45-701)	Business, Government and Strategy (45-742)
Finance (45-710)	Managerial Economics (45-749)
Marketing Management (45-740)	The Changing Global Environment and the Wealth of Nations (45-753)
	Business Communications (45-790)
	Human Behavior in Organizations (45-792)
	Technology Development, Manufacturing, and Marketing in the Computer Industry (45-846)
	Organizational Structure, Strategy, and Innovation in the Computer Industry (45-847)
	Ethical Issues in Business (45-849)
	Interpersonal Negotiation (45-904)
	Organizational Management: Theory and Practice (90-800)
	Leadership: Innovation and Organizational Change (90-810)

Table 1: Executive-Level Management in a Computer Technology Company

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
	Advanced Topics in Leadership (90-845)

Career Goal 2: *Information Management*

Knowledge and skills involving:

- Information infrastructure of a company.
- Information systems or computing facilities department management.
- Role of a Chief Information Officer.
- Generation, processing, storage, and communication of data.
- Important financial, political, social, and ethical concepts.
- Information and telecommunication systems development.
- Technical and business communications.
- Social interactions and their impact on company operations.

Table 2: Information Management

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
Financial Accounting (45-700)	Marketing Management (45-720)
Managerial Accounting (45-701)	Business Communications (45-790)
Finance (45-710)	Human Behavior in Organizations (45-792)
Management of Information Systems (45-970)	Technology Development, Manufacturing, and Marketing in the Computer Industry (45-846)
	Organizational Structure, Strategy, and Innovation in the Computer Industry (45-847)
	Ethical Issues in Business (45-849)

Table 2: Information Management

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
	Information and Communications Technologies in Management (45-870)
	Telecommunications for Business (45-871)
	Information Resources Management (45-872)
	Information Systems Project Course (45-874)
	Information Systems Development (45-878)
	Expert Systems (45-963)
	Information Network Implementation (45-966)
	Human Interface to Business Computer Systems (45-975)

Career Goal 3: *Production and Operations*

Knowledge and skills involving:

- Relationship between material, technological processes, and people in the manufacture of goods.
- Production and operations computing technology.
  (selection, application, and/or design)
- Production and operational resource management.
- Quality assurance.
- Manufacturing costs analysis.
- Telecommunications technology.
  (connection between business planning and production operations)

Table 3: Production and Operations

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
Financial Accounting (45-700)	Introduction to Operations Research (45-761)
Managerial Accounting (45-701)	Industrial Marketing (45-820)
Quantitative Methods for Management Science (45-760)	Technology Development, Manufacturing, and Marketing in the Computer Industry (45-846)
Production/Operations Management (45-765)	Organizational Structure, Strategy, and Innovation in the Computer Industry (45-847)
	Computer Integrated Manufacturing I (45-862)
	Telecommunications for Business (45-871)
	Computer Integrated Manufacturing II (45-962)
	Expert Systems (45-963)
	Information Network Implementation (45-966)
	Human Interface to Business Computer Systems (45-975)
	Computer-Aided Design Tools (39-743)
	Knowledge-Based Systems for Manufacturing (16-751)

Career Goal 4: *Entrepreneurship*

Knowledge and skills involving:

- Relationship between: product idea, potential market demand, required technology, business plan, and funding.
- Creditable business plan.
- Factors that contribute to the success of a start-up company.

- Financial aspects of founding a start-up company.
- Marketing principles.
- Organizational, ethical and legal issues.

Table 4: Entrepreneurship

Required Business Track Courses	Suggested Business Track Courses *(Choose 4 or more courses from this list or from the approved list in Sections 3.1-3.4.)*
Financial Accounting (45-700)	Finance (45-710)
Managerial Accounting (45-701)	Marketing Management (45-720)
Entrepreneurship I (45-880)	Managerial Economics (45-749)
Entrepreneurship II (45-979)	The Changing Global Environment and the Wealth of Nations (45-753)
	Business Communications (45-790)
	Human Behavior in Organizations (45-792)
	Technology Development, Manufacturing, and Marketing in the Computer Industry (45-846)
	Organizational Structure, Strategy, and Innovation in the Computer Industry (45-847)
	Ethical Issues in Business (45-849)
	Interpersonal Negotiation (45-904)
	Organizational Management: Theory and Practice (90-800)
	Leadership: Innovation and Organizational Change (90-810)

3 Approved Courses

The student will select the equivalent of 8 or more half-semester (6 unit) courses from those listed in *Sections 3.1-3.4* including *Financial Accounting* (45-700) and *Managerial Accounting* (45-701).

3.1 School of Computer Science: Robotics

16-751 Spring 2	*Knowledge-Based Systems for Manufacturing*	(6 units)

3.2 CIT Interdisciplinary

39-743 Fall	*Computer-Aided Design Tools*	(6 units)

3.3 Graduate School of Industrial Administration

45-700 Fall 1/ Summer 5	*Financial Accounting*	(6 units)
45-701 Fall 2/ Summer 6	*Managerial Accounting* Prerequisite: 45-700 *Financial Accounting* (Fall 1/Summer 5).	(6 units)
45-710 Fall 2	*Finance* Prerequisite: 45-733 *Probability and Statistics I* (Fall 1) or equivalent knowledge.	(6 units)
45-720 Fall 2/ Spring 3	*Marketing Management*	(6 units)
45-733 Fall 1	*Probability and Statistics I*	(6 units)
45-740 Spring 3/ Summer 6	*Managerial Environment*	(6 units)
45-742 Spring 4	*Business, Government and Strategy* Prerequisite: 45-749 *Managerial Economics* (Fall 1).	(6 units)

45-749 Fall 1	*Managerial Economics*	(6 units)
45-753 Spring 4	*The Changing Global Environment and* *The Wealth of Nations* Prerequisite: 45-749 *Managerial Economics* (Fall 1).	(6 units)
45-760 Fall 1/ Summer 5	*Quantitative Methods for Management Science*	(6 units)
45-761 Fall 2/ Summer 6	*Introduction to Operations Research* Prerequisite: 45-760 *Quantitative Methods for Management Science* (Fall 1/Summer 5).	(6 units)
45-765 Fall 2	*Production/Operations Management* Prerequisites: 45-760 *Quantitative Methods for Management Science* (Fall 1/Summer 5) and 45-761 *Introduction to Operations Research* (Fall 2/Summer 6)	(6 units)
45-790 Fall 1/ Summer 5	*Business Communications*	(6 units)
45-792 Fall 2	*Human Behavior in Organizations*	(6 units)
45-846 Spring 3	*Technology Development, Manufacturing, and* *Marketing in the Computer Industry*	(6 units)
45-847 Spring 4	*Organizational Structure, Strategy and* *Innovation in the Computer Industry*	(6 units)
45-849 Spring 4/ Summer 6	*Ethical Issues in Business*	(6 units)
45-862 Spring 3	*Computer Integrated Manufacturing I*	(6 units)
45-870 Fall/ Spring	*Information and Communications Technologies* *in Management*	(6 units)

45-871 Fall 2	*Telecommunications for Business*	(6 units)
45-872 Spring 2	*Information Resources Management*	(6 units)
45-874 TBD	*Information Systems Project Course*	(12 units)
45-878 Spring 2	*Information Systems Development* Prerequisite: 45-970 *Management of Information Systems* (Fall 1).	(6 units)
45-880 Fall 1	*Entrepreneurship I*	(6 units)
45-904 Spring 4	*Interpersonal Negotiation*	(6 units)
45-962 Spring 4	*Computer Integrated Manufacturing II*	(6 units)
45-963 TBD	*Expert Systems* Prerequisite: Programming experience.	(6 units)
45-966 TBD	*Information Network Implementation*	(6 units)
45-970 Fall 1	*Management of Information Systems*	(6 units)
45-975 Spring 2	*Human Interface to Business Computer Systems*	(6 units)
45-979 Fall 2	*Entrepreneurship II* Prerequisite: 45-880 *Entrepreneurship I* (Fall 1)	(6 units)

3.4 H. John Heinz III School of Public Policy and Management

90-800 Spring/ Summer	*Organizational Management:* *Theory and Practice*	(12 units)

90-810 Fall 1/ Spring 3/ Summer 5	*Leadership: Innovation and Organizational Change*	(6 units)
90-845 Fall 2/ Spring 4/ Summer 6	*Advanced Topics in Leadership* Prerequisite: 90-810 *Leadership: Innovation and Organizational Change* (Fall 1/Spring 3/Summer 5)	(6 units)

4 Course Descriptions

4.1 Knowledge-Based Systems for Manufacturing (16-751)

The objective of this courses to introduce students to basic principles, techniques and tools of Knowledge-Based technology and provide a realistic assessment of how this technology can contribute to Computer Integrated Manufacturing. Concepts introduced in the course will be illustrated through discussion of applications in areas such as product design and configuration, process planning, quality control, diagnosis, production planning, scheduling and control, distribution, etc.

4.2 Computer-Aided Design Tools (39-743)

This course is a survey of state-of-the-art software tools for computer-aided design of products and manufacturing processes with emphasis on concurrent engineering and life-cycle engineering. Students will participate in design exercises using CAD tools on engineering workstations. This course will draw on the resources of the Engineering Design Research Center, a Nation Science Foundation Engineering Research Center, and several courses throughout the engineering college that cover various aspects of CAD.

4.3 Financial Accounting (45-700)

The purpose of this course is to teach the student how to interpret published financial statements. The course introduces the student to double-entry bookkeeping and to the preparation of primary financial statements such as the balance sheet, the income statement, and the cash flow statement. There is a brief overview of the financial statements of manufacturing companies and construction companies. Selected items on the balance sheet examined in detail are inventories, plant assets, intangible assets, bonds payable, deferred income taxes, pension liabilities, contingent liabilities, etc. Students also study related technical issues such as asset valuation, inflation accounting, depreciation practice, and interest formulas. To develop an international perspective of accounting, they view sample financial statements in foreign countries and examine a technical issue in foreign currency translation. Whereas developing skills in bookkeeping and accounting are important, the course stresses a managerial perspective and the skills of reconstructing, analyzing and interpreting economic events from actual financial statements.

Prerequisite: Read *Essentials of Accounting* by Robert N. Anthony, Addison-Wesley, Publisher.

4.4 Managerial Accounting (45-701)

In this course, students learn how to use accounting controls to operate a firm successfully. The topics covered in the course include basic cost concepts, short and long-run decisions and capital budgeting, the behavior of costs, full costs and their uses, standard costs, joint costs, variable costing, cost variances, programming and budgeting, differential accounting, responsibility accounting, analyzing and reporting performance. The student will also learn about financial modeling by completing exercises using computer worksheets.

Prerequisite: 45-700 *Financial Accounting*.

4.5 Finance (45-710)

This course provides an introduction to the financial problems faced by firms and the models used to address them. Topics include: time value of money and compounding; capital budgeting; portfolio theory and diversification; risk and return; capital structure and dividend policy; and the term structure of interest rates.

Prerequisite: 45-733 *Probability and Statistics I* or equivalent knowledge.

4.6 Marketing Management (45-720)

This course provides an introduction to the field of marketing and experience in analyzing situations that marketing managers encounter. The course emphasizes marketing principles, analysis, and strategy. Topics include marketing management, buyer behavior, product policy, pricing, distribution, advertising and promotion, and competitive strategy.

4.7 Probability and Statistics I (45-733)

This course provides the theoretical base for statistical analysis. The fundamentals covered include discrete and continuous random variables, distributions and density functions, distributions of transformed variables and expectation. Specific distributions such as the Binomial, Poisson, and Normal distributions are presented and illustrated with business applications. Estimation of unknown population parameters is introduced using data from the business environment.

4.8 Managerial Environment (45-740)

This course examines the external political, social and legal environment of the firm and its managers. The historical development as well as the economic and social implications of these constraints are analyzed. Problems dealing with legal and regulatory matters will be considered, including labor negotiations, antitrust, acquisitions and mergers, licensing, patents and warranties, officers' and directors' responsibilities and liabilities, manufacturers' and suppliers' product liability, securities regulations, equal opportunity, pollution and safety. The political, social and technological role of managers as a group will also be considered. Particular consideration will be given to the role managers play in relation to governments.

4.9 Business, Government and Strategy (45-742)

This course provides a framework for understanding the interactions between government and business and the way that strategic advantage is generated. The framework is built from a dozen and a half models, some mathematical and some qualitative, taken from political science, political economy, and microeconomics. This course aims to integrate these models into strategic thinking.

The first half of the course emphasizes the analytical foundations. The second half applies the models to current controversies, from disposing of toxic wastes to deciding whether a product is safe. Classes are conducted in a lecture-discussion format. The goals for the classes are to simulate thinking about the fundamental issues and to develop problem solving approaches to the issues. The course has three homework assignments, a case, a midterm and a final exam.

Prerequisite: 45-749 *Managerial Economics*.

4.10 Managerial Economics (45-749)

This course presents the basic concepts of microeconomic theory with an emphasis on business applications. The approach of microeconomics is to solve an economic problem by modeling it as an optimization problem; the solution to the optimization problem is then interpreted in terms of the original economic problem. This approach will be used to answer such problems as input selection, pricing and project selection. The format of the class is to present theory common to a general class of applied problems and then to apply the theory by solving actual problems. The goal of the class is for students to be capable of applying the basic concepts to problems faced in both future classes (e.g., finance, macroeconomics) and careers.

4.11 The Changing Global Environment and The Wealth of Nations (45-753)

Strategic business decisions are continually influenced by international trade and regulation and by business cycles. Macroeconomic outcomes can often determine the success or failure of business decisions, so decisions must be based on assumptions about business cycles and growth. A new product launched in a recession may appear unprofitable merely because of poor timing.

This class uses basic economic principles applied to aggregate economic activity to develop analytical models that are presented in a lecture format, and are then followed by applications and case studies. The emphasis is on the applications. We will address such issues as the role of the Federal Reserve and its impact on interest rates, the causes and consequences of the devaluation of the dollar, the effects of the capital gains tax on saving and interest rates, the effects of changes in the distribution of income on consumer purchasing decisions, the sources of changes in productivity and economic growth, the prospects for future inflation, and the quality of economic forecasts.

Prerequisite: 45-749 *Managerial Economics*.

4.12 Quantitative Methods for Management Science (45-760)

A review of techniques useful for quantitative analysis in economics and the management sciences. Topics include the algebra of vectors and matrices, the solution of linear systems of equations; unconstrained optimization of functions of one or several variables (first and second order conditions for optimality, biSection search, golden section search); constrained optimization (Lagrange multipliers, Kuhn-Tucker conditions); linear programming (problem formulation, solution by the simplex method).

4.13 Introduction to Operations Research (45-761)

Topics covered in this course include integer programming, network models, nonlinear programming and dynamic programming. These OR models are discussed in the context of applications to management. The software used in the course is LINDO for integer programming and for quadratic programming, and GINO for nonlinear programming. Two case studies are assigned in the course as well as weekly homework exercises.

Prerequisite: 45-760 *Quantitative Methods for Management Science*.

4.14 Production/Operations Management (45-765)

The production of a manufactured good is a complex task involving the management of material, technological processes and people. Responsibility for these three resources is the province of the operations manager. When properly utilized by the operations manager, these three resources can result in high quality goods produced at minimum total cost. Learning the basic tools for properly utilizing these resources at the plant level is the primary objective of this course. Topics include: materials management, production planning and control; productivity improvements; quality control; and resource planning. Current issues like Just-In-Time, Kanban, Flexible Manufacturing, etc. are discussed. Cases and a plant trip also supplement the lectures.

Prerequisites: 45-760 *Quantitative Methods for Management Science* and 45-761 *Introduction to Operations Research*.

4.15 Business Communications (45-790)

This course focuses on managerial communication, looking in detail at the audiences (peers, subordinates, upper management) with whom managers communicate, the purposes for which they communicate, and the strategies they use to achieve their communication goals. The emphasis is on the kinds of writing managers do and how they can do it efficiently. Techniques for analyzing both the subject and the reader provide you with analytic models that you can use in any given communication situation. In class sessions we cover the following topics (among others): supplying evidence to support your argument, the difference between convincing and persuading a reader, the effect of language and style on a reader, and organizing a business document. Although this is primarily a writing course, we look carefully at oral and electronic communication channels as well.

4.16 Human Behavior in Organizations (45-792)

This course has two purposes. The first is to develop your understanding of human behavior in organizations so that you can become a more effective manager, and the second is to provide you a foundation of knowledge about organizational behavior for other GSIA courses here. This course is designed to develop your appreciation of the complexities of managing and working with people. The course will familiarize you with the concrete, recurrent problems managers face in managing human organizations. We attempt to develop both your ability to diagnose the causes of organizational problems and your judgment in dealing with them.

The course focuses on the dynamics of individual and group behavior in organizations. Example questions that we set out to understand in this course are: How do people perceive others? How are work and personal attitudes and motives formed, changed and constrained by individual and organizational characteristics? How do people make decisions? What are the consequences of individual bounded rationality on the quality of decision making? How does the design of jobs and work groups affect performance, job attitudes and individual well-being? How can leaders operate most effectively in organizations, and use the power potentially available to them? How do motivational systems "control" behavior? Such questions are posed and discussed in the context of current organizational practices both in the United States and overseas.

4.17 Technology Development, Manufacturing and Marketing in the Computer Industry (45-846)

This course will undertake to study and analyze the computer industry in its different segments and as a whole. The analysis will involve studies of representative companies manufacturing and marketing computers and computer components. It will also involve the study of the market structure of the computer industry, nationally and internationally.

The analysis will be conducted along the following dimensions: (1) the evolution of the technology and technology trends, (2) the manufacturing, production and marketing of different computer products, and (3) product development cycles of key computer components. The studies will include representative companies that manufacture and/or produce and market hardware and/or software as well as vertically integrated companies. The studies will also undertake an analysis of the intersection and/or convergence of computer technologies with the technologies of communications, television and consumer electronics, and how these intersections influence and affect the industrial structure and organization in the various segments of the computer industry.

4.18 45-847 Organizational Structure, Strategy and Innovation in the Computer Industry

This course will undertake the study and analysis of the computer industry along the following dimensions: (1) corporate organization, management and strategies representative of computer companies, (2) the formation and finance of representative computer companies, and (3) sources of innovation in computer companies and in the computer industry.

4.19 Ethical Issues in Business (45-849)

This course has the ambitious goal of developing capacities for rigorous and responsible reasoning upon the moral dimensions of managerial decisions essential in industrial administration. We shall begin by introducing or clarifying some basic concepts, distinctions, and analytical tools: e.g. What is a moral issue? We shall then look at a few of the fundamental moral philosophy approaches such as Utilitarianism (which directs us to maximize the aggregate good) and alternative theories which direct us to consider the rights of individuals.

After explaining these general theoretical perspectives we shall move to a discussion of a wide variety of ethical issues. Among the issues to be discussed will be such topics as the responsibility of the corporation, self-regulation vs. responsibility to stakeholders including consumers, workers, the community, and the environment; and obligations in accounting, advertising, finance and investment. We shall look into some of the legal issues as well as the ethical dimensions of these topics, and our readings will be from moral philosophers, economists, political scientists, lawyers and judges.

4.20 Computer Integrated Manufacturing I (45-862)

This course is targeted towards business and engineering students who will soon be managing the application and utilization of CIM technologies in the workplace. People who will be choosing technological alternatives, and managing highly automated factory or office operations will find this course especially relevant. The goal is to provide systematic ways of thinking about the range of technological alternatives available, and about the capabilities and limitations of these alternatives. Emphasis is placed on examining whether and how CIM technologies could help in solving operational problems. The course does not provide technical background for designing the components which make up manufacturing systems. Three major areas are covered: (1) automation of design and engineering activities, (2) automation of shop floor processes, and (3) systems for enterprise level and shop floor level control. Recent developments in linking computers and programmable devices together into integrated systems are emphasized.

4.21 Information and Communications Technologies in Management (45-870)

As corporate strategies become more integrated with information and communications technologies, managers in all functional areas are being asked to recognize opportunities for exploiting such technologies. As is often the case, these managers are also being asked to oversee the technology's introduction into customer or firm organizations. Successful accomplishments of such tasks requires awareness of new and existing technologies (e.g., integrated services, digital network, electronic mail), comprehension of the functional characteristics distinguishing various technologies (e.g., LAN versus PBX).

This course provides a managerial (as distinguished from a purely technical) introduction to the various information and communication technologies a manager is likely to encounter. The course focuses on identifying the functional characteristics of current technologies, describing industrial applications of these technologies, and examining the managerial concerns associated with the purchase or use of such technologies.

4.22 Telecommunications for Business (45-871)

In this course, students study the use of telecommunications from a managerial perspective. The purpose of this course is to give a perspective on the choices that managers face in the field of telecommunications, the negative and positive implications of the choices and an approach for choosing from among the alternatives.

We begin at the strategic level and move to the more tactical and operational levels. At one level of analysis, we consider international communications. At other levels we consider national and local area communications. We also focus on functional areas, such as financial and banking networks, manufacturing networks, and purchasing networks. Along another dimension, we look at the evolution of telecommunications from the telephone network to today's sophisticated digital network carrying voice, data, images, etc.

4.23 Information Resources Management (45-872)

The successful management of the data resources of an organization is a critical task for an enterprise. In this course, we look at the information systems resource of organizations with a focus on data management. We will explore the fundamentals of database management systems from technological, managerial and organizational perspectives. Topics covered will include data modeling, logical design, physical sign and optimization, human-computer interfaces, natural language processing, logic-based paradigms, semantic modeling, 4th generation languages and enduser computing as well as issues of security, privacy, and ethics.

4.24 Information Systems Project Course (45-874)

The Information Systems Project course at GSIA is a two-mini-semester elective for masters students designed to accelerate the transition from course work to careers in computer-related fields in business or other organizations. This acceleration is facilitated by providing students the opportunity to apply their knowledge to “real world” information-systems projects faced by organizations in the Pittsburgh community. To receive credit, students must take both minis.

IS projects fall into two basic tracks: a managerial track and a technical track. Student’s preparation will dictate the most appropriate track assignment. Assignments are made by the instructor with consideration of the student’s preparation and the client’s need. Although it is not always possible to predict the exact nature of projects each year, typical projects might include: feasibility assessments, specification of user information requirements, identification and evaluation of off-the-shelf software alternatives, documentation of existing systems, planning for the support user (e.g., information centers), and design and implementation of prototype decision support systems.

Prerequisites: 45-878 *Information Systems Development* and 45-872 *Information Resource Management* for the technical track, 45-870 *Information and Communication Technologies Management*, and 45-970 *Management of Information Systems* for the managerial track.

4.25 Information Systems Development (45-878)

The phenomenal growth of computer-based systems in the last few decades is a testimony to the increasing role of information systems in organizations. Today computers the way in which managers make decisions and the way in which companies compete successfully in the market place. The ability to use information systems effectively and exploit information technology for productive purposes is a prerequisite for success for the managers of tomorrow. The Information Systems (IS) Development course will provide you with the background to be effective in this arena.

In this course, you will learn about the IS development process in a step-by-step manner. First you will learn to identify areas of problems or opportunities for IS development. Based on the life cycle concept of IS development, you will learn to evaluate the feasibility of proposed IS projects and then proceed to determine the information required to make more effective decisions. Using a simple set of tools, you will learn to model an existing system, and then create an improved system. You will also study the use and development of decision support systems for chief executive officers. A mixture of lectures and case discussions will be used to discuss project-management concepts in the context of IS development. Oral and written communication skills will be emphasized in course assignments.

Two distinct trends in recent years have made this course an important requirement for a great majority of students. First, managerial work is becoming increasing information intensive. Second, the onus of developing he right kind of information system for the right person has shifted to functional managers. This course is mandatory not only for students planning their careers in traditionally information intensive areas such as consulting and financial services, but also for those specializing in marketing, manufacturing, and other functional areas. No prior computing background is necessary for this course.

Prerequisite: 45-970 *Management of Information Systems*.

4.26 Entrepreneurship I (45-880) and Entrepreneurship II (45-979)

Entrepreneurship (New Ventures) is a series of two mini-semester courses designed primarily for those students who may wish to start their own businesses at some stage in their careers. The courses are also useful to those who will work in companies which are expanding. The role of the entrepreneur in our economy, the risks and rewards of an entrepreneurial career, and entrepreneurial management are discussed. The courses emphasize the initiation of new businesses, with particular emphasis on significant manufacturing and service businesses. The technological, economic, marketing, and managerial problems associated with new ventures, together with legal, patent, and financing problems will be emphasized. Finding products/services suitable for new ventures, building a management team and risk management is studied. The acquisition of established small businesses is also discussed as well as the special problems of initiating and managing new ventures within a larger corporation.

Entrepreneurship I gives an overview of entrepreneurship, with an emphasis on the role of the entrepreneur, finding products/services suitable for new ventures, financing new ventures, and preparing business plans. *Entrepreneurship II* focuses in further depth on developing a plan for a new business. Class work involves additional topics related to entrepreneurship, including legal, accounting, managerial, and financial aspects of starting new companies.

4.27 Interpersonal Negotiation (45-904)

The purpose of this course is to understand the theory and processes of negotiation as it is practiced in a variety of settings. The course is designed to be relevant to the broad spectrum of negotiation problems that are faced by the professional manager. Thus, the content is relevant to students interested in marketing, real estate, consulting relationships, entrepreneurship, and mergers and acquisitions. In addition, the course will emphasize negotiations that occur in the daily life of the manager.

This course is designed to complement the technical and diagnostic skills learned in other courses at GSIA. A basic premise of the course is that while managers need analytical skills to discover optimal solutions to problems, they also need a broad array of negotiation skills to get these solutions accepted and implemented. The course will allow participants the opportunity to develop these skills experientially and to understand negotiation in useful analytical frameworks. Considerable emphasis will be placed on simulations, role playing, and cases.

Course objectives include: (1) to understand and think about the nature of negotiation, (2) to gain a broad, intellectual understanding of a set of central concepts of negotiation, (3) to develop confidence in the negotiation process, (4) to improve analytical abilities in understanding human behavior in competitive situations, and (5) to provide experience in the negotiation process.

4.28 Computer Integrated Manufacturing II (45-962)

Complete course description is not yet available.

4.29 Expert Systems (45-963)

The primary objective for the course is to familiarize you with the fundamental concepts and programming issues in expert systems (ES) and applied intelligence (AI). No knowledge of AI or expert systems is required. The course involves programming. You will be expected to understand the fundamentals of the systems we will use for the course. We will explore issues in knowledge acquisition and representations, expertise, the main paradigms in ES programming (e.g., rule-base, frame-based, object-oriented) as well as the managerial issues surrounding such projects. There will be a major team programming project for the course.

Prerequisite: Programming experience is helpful.

4.30 Information Network Implementation (45-966)

The course explores the application of a variety of information system/networking technologies in various industrial settings through case study analysis. Topics considered include both technical and business strategy issues, comparison of alternative technical approaches for achieving the strategic objective, the evaluation of design alternatives, and process issues in the implementation of networked technology in organizations.

Prerequisite: this course is required for MSIN students. This course is not available to MSIA students.

4.31 Management of Information Systems (45-970)

The focus of this course is the management of information systems from the strategic, technological, and the economic (bottom-line) points of view. Topics to be covered include: (1) general strategy process in organizations, (2) strategic use of information systems to derive and sustain competitive advantage, (3) the issue of incentives and control with regard to information systems, (4) the evolving definition of an information system, (5) tactical and operational use of information technology in the functional areas, (6) trends in the costs of information systems, (7) economies of scale in information processing, (8) benchmarking of computer systems, (9) leasing versus buying decisions, (10) cost-benefit analysis of investment in information technology, (11) capacity decisions, (12) outsourcing decisions, (13) managing varying loads on the computer system, (14) ensuring a good response time in order to provide quicker information for decision making, and (15) management of end-user computing.

4.32 Organizational Management: Theory and Practice (90-800)

This is an advanced course in concepts and methods of organizational management. The overall course objective is to identify, apply, and evaluate techniques for structuring and resolving managerial problems in government, not-for-profit, and private sector organizations. The course will draw upon the collective experience of the class as well as contemporary management theories and case studies to identify salient problems and apply specific techniques to their resolution. Topics will include: the evolution of managerial thought; management "style" and motivation of employees; leadership and management; the impact of social, political, economic, and technological factors on management; managerial decision-making, planning and problem-solving techniques; the art of negotiation; communication and conflict resolution; staffing, performance appraisal, and career development (for both the employee and the manager); and managing organizational change.

Prerequisite: None. Non-MPM students need special permission from the Associate Dean of Executive Education or the MS/MAM Committee.

4.33 Leadership: Innovation and Organizational Change (90-810)

This course seeks to develop students' understanding of the range and complexity of behavior required in leaders, in both public or private sector settings. Using a combination of theoretical readings, case studies and focused writing and reflection on personal experience, we will attempt to sharpen our awareness of our own potential as leaders and to improve our leadership performance.

Course objectives include: (1) Developing and exercising theoretical models of leadership and change in public and private institutions, (2) understanding the role of the leader in defining and communicating a vision for the institution and developing some generalized rules and "best practices" for constructing the vision, (3) examining the impact of leadership and various types of power in shaping the normative environment of public and private institutions, (4) exploring the challenges and opportunities associated with leadership transitions, and gaining practice with tools designed to facilitate these transitions, (5) understanding the differences between direct and indirect leadership and examining the challenges faced by successful junior leaders making the transition to senior leadership roles, and (6) studying the unique problems faced by leaders attempting major institutional change, and building a set of guidelines to improve the effectiveness of leaders in these situations.

Prerequisite: None. 90-729 *Organizational Design and Implementation* or 90-800 *Organizational Management* preferred.

4.34 Advanced Topics in Leadership (90-845)

Building upon the foundation of 90-810, this course focuses on the emerging requirements facing public and private-sector leaders in the changing world economy. Course readings and case studies focus on the challenges of promoting innovation and creativity in government settings. At the end of the course, students should be able to: (1) explain how the requirements for leadership are changing as organizations become more flexible and information-based; (2) anticipate and move to correct common causes of leadership failure; (3) apply sound principles for leading employees and organizations which place a high premium on creative thought and action; and (4) design and implement effective programs of innovation and organizational change.

Prerequisite: 90-810 *Leadership: Innovation and Organizational Change*.

4.35 Human Interface to Business Computer Systems (45-975)

This course serves as an introduction to the difficulties that individuals and organizations have in interfacing with computerized information systems. On the individual level, students learn how to apply knowledge about human strengths and weaknesses in the design and selection of computer systems for office automation and decision support. On the organization level, the students are introduced to strategies for managing the impact of information technology on work procedures, job roles, and organization structure.

Acknowledgments

The author acknowledge Ilker Baybars for providing us a list of GSIA courses suitable for MSE students and Daniel Jackson for initiating our contact with GSIA.

The author also recognizes with appreciation the members of the MSE Executive Committee (David Garlan, Phyllis Lewis, Nancy Mead, Mary Shaw, and James Tomayko) for their review of this track. She thanks Mary Shaw for ideas about specialization tracks.

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