

manipulation of energy, materials, and space at the organismal level of organization.

***141. Biology II**

Fall, Spring. 3(2-3) 140; Not open to students with credit in B S 211.

Maintenance and manipulation of materials, energy, space and information at the cellular and tissue level of organization.

150. Physics—Elementary Concepts

Fall. 1(2-0) MTH 108 or 109 or LBC 111 and LBC 151 concurrently.

Elementary concepts of mechanics, electricity, magnetism and optics.

151. Introduction to Chemistry and Physics I

Fall. 4(4-3) MTH 108 or 109 or LBC 111 concurrently; high school physics or 150 concurrently.

Fundamental techniques of quantitative scientific investigation; gas laws, kinetic theory and thermodynamics.

152. Introduction to Chemistry and Physics II

Winter. 4(4-3) 151.

Topics in modern physics: photons, electrons, atoms and nuclei; radioactivity, nuclear reactions; Bohr theory of the hydrogen atom; special theory of relativity.

153. Introduction to Chemistry and Physics III

Spring. 4(4-3) 152.

Topics in modern chemistry: atomic structure, chemical bonding, molecular orbitals; stoichiometry, chemical dynamics and equilibria, fundamentals of organic chemistry.

214. Calculus III

Fall, Winter, Spring. 5(5-0) 113. Not open to students with credit in MTH 215.

Topics covered include infinite series, power series, and introduction to differential equations; first order, second order linear with constant coefficients, first order systems; numerical methods, power series solutions, and applications.

215. Calculus IV

Fall, Winter, Spring. 5(5-0) 214. Not open to students with credit in MTH 214. Introduction to the calculus of several variables.

***242. Biology III**

Fall, Winter. 4(3-3) 141.

Organismal growth and development from molecular genetics through life cycles of selected plant and animal species.

251. Introduction to Chemistry and Physics IV

Fall. 4(4-3) 153.

Classical physics; kinematics and dynamics of particles and rigid bodies; electricity; magnetism, electromagnetism, wave motion and wave optics.

252. Introduction to Chemistry and Physics V

Winter. 4(4-3) 251.

Chemistry of non-metals, transitional elements and coordination compounds, organic chemistry.

253. Introduction to Chemistry and Physics VI

Spring. 4(4-3) 252.

Relativity; atomic, molecular, and solid-state physics, quantum-mechanical effects and devices, nuclear models and nuclear energy levels.

*For prerequisite purposes, this introductory biology sequence may be used in place of Biological Science 210, 211, 212.

256. Energy Consumption and Environmental Quality

Spring. 3(3-0) Sophomores. Interdepartmental with the Physics Department.

The role of energy as a fundamental pollutant will be discussed along with the availability of fossil energy sources. Limitations on the safe utilization of both fossil and nuclear energy will also be considered.

290. Special Problems

Fall, Winter, Spring. 1 or 2 credits. May re-enroll for a maximum of 6 credits. Approval of college.

295. Independent Study

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 12 credits. Approval of college.

Independent study for qualified students under direction of a faculty member.

331. Modern Fiction

Fall. 3(3-0) 132.

The study of recent short stories and novels, particularly those which might have a special value for the student of science. Student may submit original work of a fictional nature in partial fulfillment of course requirements. Selected students may meet course requirements through independent study.

332. Modern Drama

Winter. 3(3-0) 132.

The study of recent plays which have social or literary significance. Student may submit original work of a dramatic nature in partial fulfillment of course requirements. Selected students may meet course requirements through independent study.

333. Modern Poetry

Spring. 3(3-0) 132.

The study of recent verse of a literary or provocative nature. Student may submit original poetry in partial fulfillment of course requirements. Selected students may meet course requirements through independent study.

372. Introduction to Symbolic Logic

Fall, Winter. 4(4-0) Sophomores or approval of college.

Concepts, notation and application of truth-functional and quantificational logic. Special topics may include axiomatics, meta-theory, modal logic, fallacies, paradoxes, inductive argument, the justification of logic.

373. Introduction to the Philosophy of Science

Winter, Spring. 4(4-0) 372. Juniors or approval of college.

Philosophical problems about the character and justification of scientific knowledge. Possible topics: concept formation, theory construction, scientific explanation, confirmation theory, "logic" of discovery, philosophical implications of physical theories.

374. Historical Problems in the Biological Sciences

Fall, Winter. 4(4-0) Juniors or approval of college.

Various themes or periods in the biological sciences. The course may emphasize the pattern of theoretical development, changes in explanatory ideals, the interaction of external factors and scientific ideas, etc.

375. Historical Problems in the Physical Sciences

Spring. 4(4-0) Juniors or approval of college.

Various themes or periods in the physical sciences. The course may emphasize the pat-

tern of theoretical development, changes in explanatory ideals, the interaction of external factors and scientific ideas, etc.

376. Historical Problems in Technical Change

Fall, Spring. 4(4-0) Juniors or approval of college.

Factors which influence technical change. Exploration of both historical and contemporary problems of technology and technical change.

483. Philosophy of Physical Science

Fall, Spring. 4(4-0) Nine credits in physical science or approval of department. Interdepartmental with the Department of Philosophy.

Philosophical problems of the physical sciences. The topics will be taken from such areas as: quantum mechanics, space-time, classical mechanics, relativity.

484. Philosophy of Biological Sciences

Winter, Spring. 4(4-0) Nine credits in science or approval of department. Interdepartmental with the Department of Philosophy.

Methodological notions and problems of the biological sciences such as: observation and measurement, classification, teleological and functional explanation, teleological systems, emergentism, vitalism, value neutrality.

490. Special Problems

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 6 credits. Approval of department.

491. Senior Seminar I

Fall, Winter, Spring. 3(3-0) Seniors or approval of college.

Selected interdisciplinary problems concerned with the interface between science and society or science and man are identified and formulated. A bibliography is generated and an outline for a thesis prepared.

492. Senior Seminar II

Fall, Winter, Spring. 3(3-0) 491.

The thesis planned in 491 is written and evaluated.

495. Independent Study

Fall, Winter, Spring, Summer. 1 to 12 credits. May re-enroll for a maximum of 12 credits. Juniors.

MANAGEMENT

MGT

College of Business

101. Introduction to Business

Fall, Winter, Spring. 4(4-0) Under-graduate students or approval of department.

Functions performed by business and the role of administration in our economy as a whole and in the operation of a specific business. Four major objectives: to aid students in choosing a vocation, to help Business majors select a field of concentration, to show the place of specialized techniques presented in more advanced business courses, and to give some familiarity with common business practices and terminology.

300. Production Management

Fall, Winter. 4(4-0) CPS 110, STT 315, AFA 202.

Production management in manufacturing, service and distributive firms. Operations processes, analyses and decisions. Coordination of inventories, operations and quality. Work layout, methods and standards.

302. Organization and Administration
Fall, Winter, Spring, Summer. 4(4-0)
Junior Business majors; EC 201 and AFA 201.
 Analysis of the internal organization structure and of executive roles and functions in the business enterprise and other goal-directed institutions. Examines administrative and managerial concepts in the context of behavioral research in business. Cases and outside research reports are used for specific analyses.

305. Materials and Purchasing Management
Fall, Winter. 4(4-0) 302 or MTA 300 or Juniors; non-majors.

Planning, organizing and controlling materials; acquisition in industrial enterprises, institutions, and government. Management of purchasing, materials movement, storage and control. Value analysis, purchasing research, vendor relations and purchase forecasting.

306. Analysis of Processes and Systems
Fall, Winter, Spring. 4(4-0) CPS 110, STT 316.

Analysis of some fundamental systems and process concepts which are basic to industrial management. The course is oriented toward computer model building, acquainting the student with the use of the computer as an instrument for analysis of complex problems in industry. Course includes consideration of criteria for efficiency and optimization, and program planning.

310. Fundamentals of Personnel Administration
(303.) Fall, Winter, Spring, Summer. 4(4-0) Juniors.

Organization, functions, and policy administration of employee relations activities in the business enterprise; consideration of new techniques of employment, training, wage payment, morale-building, and employee security.

401. Planning and Control of Production
Winter. 4(4-0) 300, 306; Seniors.

Production planning. Inventory control, machine loading, scheduling, expediting and critical path scheduling.

405. Manufacturing Policy
Spring. 4(4-0) 300, 302; Seniors.

Policy formulation in production management. Coordinating staff functions and integrating production with other activities in the firm.

409. Business Policy
Fall, Winter, Spring, Summer. 4(4-0)
Seniors in business administration and 302; AFA 391; MTA 300.

Problems, methods, and analytical frameworks for building and maintaining consistent and effective policy frameworks in the business enterprise. Written and oral analyses are made of comprehensive cases cutting across the major functions within business organizations. Team and individual reports are required.

411. Personnel Selection and Development
Winter. 4(4-0) 310; MTA 317.

Manpower input problems of business organizations — manpower planning, recruitment, selection, placement, training and development at all levels. Focus is on policy issues, research findings, and advanced techniques.

412. Compensation and Motivation
Spring. 4(4-0) 310.

Manpower motivation and compensation problems in business organizations — performance appraisal, job evaluation, wage and salary administration, non-financial incentives and the impact of job content and job context factors on performance.

413. Safety, Health and Employee Benefits
(403.) Fall, Winter. 4(4-0) Juniors; 302 for majors.

Manpower maintenance problems in business organizations — organization and operation of safety and health programs, practices and trends in employee benefit plans. Focus is on issues and relevant research and techniques.

414. Human Relations in Business
(404.) Fall, Winter, Summer. 4(4-0) 302; approval of department.

Human problems in business administration: examination of the empirical research dealing with organizational and administrative problems in business, including morale, motivation, authority, power, centralization, commitment, and mobility.

415. Managerial Approaches to Collective Bargaining
(307.) Winter, Spring. 4(4-0) 302 or Junior non-business majors.

Union-management problems and managerial strategy and tactics in collective bargaining — the union challenge, legal constraints, negotiations and operating under the contract, dimensions of cooperation and conflict.

420. Problems of Small Business Enterprise

Fall. 4(4-0) Approval of department. For College of Business Seniors, or non-business majors enrolled in AFA 315 concurrently. For students participating in Lansing Entrepreneurial Assistance Service (LEASE).

Analysis of problems of establishing, financing, and managing a small business enterprise. Emphasis on minority entrepreneurship. Students will prepare a proposal for establishing a small business enterprise.

421. Small Business Counseling
Winter, Spring. 1 to 3 credits. May re-enroll for a maximum of 6 credits. 420, and approval of department.

Planned program of business counseling with small businesses in the Lansing area in need of management assistance. Students will meet bi-weekly to share experiences and discuss problems.

468. Field Studies
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 8 credits. Business administration majors and approval of department.

Planned program of observation, study, and work in selected business firms. Designed to supplement classroom study in such a way as to make maximum contribution to students' total educational experience. Field work may be arranged in finance, insurance, marketing, personnel management, production management, purchasing, real estate, retailing, transportation and banking.

499. Senior Seminar
Spring. 4(4-0) Senior majors; approval of department.

Directed reading and student research in contemporary management problems.

801. Work Design and Administration
Fall. 4(4-0)

Design, improvement, and problems in the administration of work systems with emphasis on repetitive operations. Criteria for evaluating systems. Tools for developing, analyzing, and improving procedures. Cases and projects.

802. Materials Management
Spring. 4(4-0)

Advanced study of the policies, practices and problems relating to the procurement and control of materials in business organizations.

803. Seminar in Industrial Relations
For course description, see Interdisciplinary Courses.

806. Organization and Administration
Fall, Winter, Spring, Summer. 4(4-0) 830.

Dynamics of organization: the organization seen as an open system interacting with a rapidly changing environment, as a structure of organized human cooperation, as an instrument of managerial strategy; current theory and research applied to organizational process and design.

807. Administrative Policy
Fall, Winter, Spring, Summer. 4(4-0) 833; MTA 804; AFA 889; plus 30 credits in the MBA core program.

Application of administrative theory and techniques to business situations through cases cutting across major functions within business organization. Cases viewed from standpoint of general management with consideration of social and physical environmental forces surrounding the firm.

808. Seminar in Management, Organization, and Administration
Fall, Winter, Spring, Summer. 4(4-0) May re-enroll for a maximum of 12 credits.

Philosophy, practice, research, and current problems in management, organization, and administration. Historical and current literature, lectures, discussion, individual research, cases and plant visits are methods of study used in various terms.

HISTORY OF MANAGEMENT THOUGHT. *Fall.*
 Development of management concepts as evidenced in the writings of major contributors. Environment factors and relation of early ideas to current thought.

CONTEMPORARY ISSUES IN ADMINISTRATION. *Spring.*

Recent and current developments in the administration of business enterprises. Examination of theory and practice.

ORGANIZATION THEORY. *Winter, Summer.*
 Critical and comparative consideration of organization theory with special reference to industrial organizations. Problems of organization structure and administrative practice in the management of business concerns are analyzed in the light of objectives, environment, and current theories.

810. Personnel Management
Fall, Winter, Summer. 4(4-0) 806.

Principles and methods of recruiting, selecting, training, evaluating, motivating, and rewarding personnel. Fringe benefits, retirement, absenteeism, and other employee benefit problems.

811. Advanced Problems in Personnel Management
Fall, Spring, Summer. 4(4-0) May re-enroll for a maximum of 8 credits. 810.

Advanced studies in selected administrative and technical policies and practices in employee relations, with individual and group project work and research.

813. Human Relations in Management
Fall, Spring. 4(4-0) 830 or approval of department.

The executive role: Theories and techniques of leadership, communications, conflict management, morale, motivation, authority, power, examined by means of cases, role playing, laboratory exercises, and study of behavioral science research findings.

818. Supervisory and Executive Development
Fall, Spring, Summer. 4(4-0) 806 or

808.
Theory and research of developmental stages of executive careers. Special emphasis on: impact of organization on executive potentiality; forces influencing development of executive skills and abilities; studies of antecedents of executive role performance; role of training programs.

821. Production Control
Winter. 4(4-0) 801.

Planning and control of production operations. Inventory management, production and work force smoothing, job shop scheduling and project scheduling.

830. Fundamentals of Management
Fall, Winter. 4(4-0) Open only to selected MBA candidates.

The managerial process: planning, organization, measurement, and control of work and work flow; recruitment, placement, motivation, development, and assessment of organizational manpower. Management theory and practice illuminated by managerial and behavioral science research.

831. Computers and Systems Analysis for Business

Fall, Spring. 4(4-0) 832 or concurrently; MTH 111 and STT 121 or concurrently or 12 credits of college mathematics. Open only to selected MBA candidates.

Computer programming and systems analysis in business administration. of tangible and intangible values and in the control of elements of business enterprise.

832. Statistical Methods for Business
Fall, Spring. 4(4-0) 831 or concurrently; MTH 111 and STT 121 or concurrently or 12 credits of college mathematics. Open only to selected MBA candidates.

Statistics for analysis and research in business.

833. Decision Making Models
Fall, Winter, Spring, Summer. 4(4-0) 831, 832; AFA 840 or concurrently.

Normative decision analysis in business under different assumptions of information availability.

834. Linear Optimization Models
Fall, Spring, Summer. 4(4-0) 833, MTH 228, STT 423.

Formulation and solution of linear optimization models in business administration under conditions of certainty.

835. Nonlinear Optimization Models
Winter, Summer. 4(4-0) 834.

Continuation of 834.

836. Stochastic Programming Models
Spring. 4(4-0) 835.

Formulation and optimization of stochastic programming models in business administration.

860. Corporation Management and Society
Spring. 4(4-0) 806.

Analysis of the emerging character of administrative structure of the large corporation. Administrative autocracy, corporate government, stockholder and director relationships. Examination of ethics of decision-making, strategic values and priorities basic to resource allocation decisions.

880. Organization and Control in the Political Economy: Institutions and Theory

Winter. 4(4-0) Interdepartmental with and administered by the Economics Department. Organization and technique in choice and implementation of economic, especially planning and programming, functions of political authority.

881. Organization and Control in the Political Economy: Selected Problems

Spring. 4(4-0) Approval of instructor. Interdepartmental with the Department of Economics.

Analysis of role and tasks, appropriate techniques and organizational structures of political agencies in planning and management of complex programs.

890. Special Problems
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

906. Behavioral Research: Organization

Winter. 3 credits. MTA 905.

Concepts and methods of behavioral science research that are applicable to the study of organization as a strategic device in the development

907. Behavioral Research: Business Executive

Spring. 3 credits. 906.

Concepts and methods of behavioral science research in the study of the agents of enterprise decision-making and action. Attention is focused on the way in which decisions are made in business organizations and the multiple influences operating on the executive. Modes of adjustment to the decision environment are examined.

908. Seminar in Organization Theory
Winter. 4(4-0) 806; doctoral candidates; master's candidates with approval of department.

Directed reading and research on issues in contemporary organization theory.

911. Seminar in Personnel Research
Spring. 4(4-0) 810; doctoral candidates; master's candidates with approval of department.

Directed reading and research on issues in contemporary personnel administration theory and practice.

937. Systems Simulation
Fall, Summer. 4(4-0) 836, STT 423, MTH 228.

Formulation and application of advanced simulation models to study the behavior and design of complex business and industrial systems.

938. History of Management Science
Winter. 4(4-0) 836, MTH 334, 426, STT 863.

History of important theoretical developments and applications in the field of management science.

939. Contemporary Issues in Management Science
(910.) Spring. 4(4-0) 937, 938.

Detailed treatment of selected recent research applications, and developments in the field of management science.

999. Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

MARKETING AND
TRANSPORTATION
ADMINISTRATION MTA

College of Business

300. Consumption and Marketing Organization
Fall, Winter, Spring, Summer. 4(2-2) EC 200.

Adjustment of the firm to its market environment with emphasis on competitive strategy. Assessment of market forces and opportunities with reference to social, political, economic and technological forces affecting distribution methods and institutions. Structural organization of marketing system-functions involved in effective market performance. Small group problems involving analysis of costs and efficiency.

301. Management of Marketing Effort
Fall, Winter, Spring. 4(2-2) 300.

Market management in relation to total enterprise. Problems, analytical tools and approaches to decisions concerning allocation of funds to various means of market cultivation. Development of promotional strategy, price policy and management of field selling effort. Particular attention to role of marketing research, forecasting, budgets, organization arrangements and control techniques. Use of cases in small groups.

311. Principles of Selling
Fall, Winter, Spring, Summer. 3(2-1)

Nature of personal selling and its requirements. Functional relationships of selling in marketing mix. Buyer motivations and selling theories, with application to various buyer-seller situations.

313. Sales Management
Fall, Winter, Spring, Summer. 4(4-0) 300.

Techniques and policies in the administration of the personal sales organization with respect to the marketing strategies involved. Emphasis on the sales management problems of manufacturers.

316. Fundamentals of Statistical Inference
Fall, Winter, Spring, Summer. 4(5-0) STT 121. Primarily for students in the College of Business. Interdepartmental with and administered by the Statistics and Probability Department.

Description of sample data, applications of probability theory, sampling, estimation, tests of hypotheses.

317. Quantitative Business Research Methods
Fall, Winter, Spring, Summer. 4(3-2) STT 316. Interdepartmental with the Statistics and Probability Department.

Application of statistical techniques to business decision-making. Topics covered include applications of linear regression and correlation, analysis of variance, selected non-parametric tests, time series, and index numbers.

335. Food Processing and Distribution Management
(435.) Winter. 3(3-0) 300 or FSM 200. Interdepartmental with Food Systems Economics and Management.

Analysis of problems faced in the food processing and distribution system. Includes functional interrelationships, consumer orientation and future development.