

**Descriptions — Economics
of
Courses**

878. Statistical Inference in Economics III
Spring, 3(3-0) EC 877 or approval of department. Interdepartmental with the departments of Agricultural Economics, and Statistics and Probability.
Validation and application of dynamic econometric models. Bayesian approach to estimation problems. Recent developments in econometric methods and in applied econometric research.

891. Topics in Applied Econometrics
Spring, 3(3-0) EC 835 or EC 877.
Topics in applied econometrics with particular attention to problems of testing hypotheses in the context of economic models.

895. Graduate Reading in Economics
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits.

900. Special Topics in Economic Theory
Fall, Winter, Spring, 3(3-0) May reenroll for a maximum of 12 credits. EC 812C; EC 813C.
Special topics in economic theory of current interest and importance.

911. Public Program Analysis
Spring, 3(3-0) AEC 863, EC 805A, EC 805B; or approval of department. Interdepartmental with the departments of Agricultural Economics and Resource Development. Administered by the Department of Agricultural Economics.
Policy aspects of nonmarket value estimation, shadow pricing, time preference, and risk analysis applied to systematic choice of agricultural, natural and human resource regulatory and public investment programs.

972. Methodological Approaches to Research
Fall of even-numbered years, Summer of odd-numbered years, 3(3-0) Two terms of graduate study in social science or approval of department. Interdepartmental with and administered by the Department of Agricultural Economics.
Selection, planning and conduct of research. Alternative research approaches. Role of theory, beliefs and valuations. Critical appraisal of research studies.

990C. Mathematical Economics and Econometrics Workshop
Fall, Winter, Spring, 3 to 16 credits. EC 812A, EC 832; or approval of department. Interdepartmental with the Department of Agricultural Economics.
Critical evaluation of research reports by staff and other students. Students writing doctoral dissertations in the appropriate areas are encouraged to enroll in the workshop.

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

EDUCATION

See Counseling, Educational Psychology and Special Education; Educational Administration; Health Education, Counseling Psychology and Human Performance; and Teacher Education.

EDUCATIONAL ADMINISTRATION EAD

(Name changed effective July 1, 1984. Formerly department of Administration and Curriculum.)

College of Education

415A. Leadership Training
(EAD 415.) Fall, Winter, Spring, 2(1-2)
Prepares students for leadership roles and responsibilities through the development of skills and techniques consistent with principles of our democracy.

415B. Topics Leadership Training
Fall, Winter, Spring, 2(1-2) EAD 415A.
Leadership roles and responsibilities with specialized populations. Topics include women, minorities, and fraternal organizations.

805A. Educational Development Planning: Basic Concepts
Winter, 3(3-0) Approval of department.
Basic concepts of economic, social and political development are studied as they place demands upon educational planners to cope with them. The distribution of development benefits is stressed.

805B. Educational Planning and National Development
Spring, 3(3-0) EAD 805A.
Formulation of educational development strategies and plans to deal with crucial national and community development problem areas paying particular attention to meeting the special needs of audiences with special problems.

805C. Higher Education in Developing Countries
Fall, 3(3-0) Approval of department.
National and international development roles of higher educational institutions and personnel. Major focus on science and the appropriate technology for applying scientific knowledge to developmental problems in specific socio-cultural settings.

806. Education Through Cooperative Extension
Winter, 3(3-0) AEE 828 or EAD 860 or approval of department. Interdepartmental with and administered by the Department of Agricultural and Extension Education.
Cooperative extension programs in the United States with emphasis on Michigan model: philosophy, history, scope, organizational structure, programs and methods.

816E. Instructional Simulation
(ED 823, EAC 816E.) Fall, Summer, 3(2-2) Teaching experience. Interdepartmental with and administered by the Department of Teacher Education.
Design and use of simulations and instructional games in the curriculum for development of social skills, values and affects.

816J. Studies in Nonformal Education
(EAC 816J.) Summer, 4(3-2) Approval of department.
International invitational workshop for specialists, project planners, staff trainers and practitioners. Worldwide selection of contemporary case studies of nonformal education. Focus is on out-of-school education for development.

816K. Curriculum for Nonformal Education
Winter, 3(3-0) T E 810A, T E 810C or EAD 860.
Principles of curriculum related to nonformal education programs. Consideration of various fields of out-of-school education and training associated with community level rural and urban human resource development.

839. African Research
(IDC 838, EAC 839.) Fall, Winter, Spring, 2 to 4 credits. May reenroll for a maximum of 8 credits. Graduate standing or approval of instructor. Interdepartmental with African Languages and the departments of Anthropology, Geography, History, Political Science, and Sociology. Administered by the Department of Anthropology.
African-related archival and field research topics and methodologies viewed from perspective of relevant social science and humanistic disciplines associated with the African Studies Center.

851A. Foundations of Administration: Theory and Organization
Fall, Winter, Summer, 3(3-0) Approval of department.
Emphasizes basic administrative theory and research, focuses on current practice and emerging trends in such problems and issues as personnel, plant, finance, community school programs, and instructional improvement. Intended primarily for persons actively preparing for administrative positions in schools and other educational agencies.

851B. Foundations of Administration: Practice and Problems
Winter, Spring, Summer, 3(3-0) EAD 851A or approval of department.
Emphasizes basic administrative theory and research, focuses on current practice and emerging trends in such problems and issues as personnel, plant, finance, community school programs, and instructional improvement. Intended primarily for persons actively preparing for administrative positions in schools and other educational agencies.

851C. Seminar: Educational Leadership and Organizational Climate
Winter, 3 credits. Approval of instructor.
Exploration of dimensions and alternative ways to measure educational leadership and organizational climate. Use of existing instruments for diagnostic or research projects.

851D. Project Planning Evaluation and Management
Fall, 3(3-0) Approval of instructor.
Educational projects as an organizational strategy for developing and supporting innovation and change. Emphasis on planning evaluation and management techniques for project development funding and implementation.

852A. Administration of Educational Institutions: Elementary School Administration
Winter, Summer, 3(3-0) Twelve graduate credits in Education including EAD 851A, EAD 851B or approval of department.
Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas.

**Educational Administration — Descriptions
of
Courses**

852B. Administration of Educational Institutions: Secondary School Administration

*Fall, Winter, Spring, Summer. 3(3-0)
Twelve graduate credits in Education including EAD 851A, EAD 851B or approval of department.*

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas.

852C. Administration of Educational Institutions: Instructional Supervision

*Fall, Winter, Spring, Summer. 3(3-0)
Twelve graduate credits in Education including EAD 851A, EAD 851B or approval of department.*

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas.

852D. Administration of Educational Institutions: Business Administration of Schools

Winter, Summer. 3(3-0) Twelve graduate credits in Education including EAD 851A, EAD 851B or approval of department.

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas.

852E. Administration of Educational Institutions: Middle School Administration

Winter, Summer. 3(3-0) Twelve graduate credits in Education including EAD 851A, EAD 851B or approval of department.

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas. Organization and administrative aspects of middle schools. Emphasis on basic characteristics of a middle school and how the administrator implements these characteristics. Research on middle schools studied.

852F. Administration of Educational Institutions: The Principal and Individualized Instruction

Summer. 3(3-0)

Exploration of the nature and scope of responsibilities of areas in educational administration. Designed to serve as an initial application of administrative theory for those aspiring to one of the several areas. Role of the principal in implementing administrative-instructional strategies in individualizing instruction including decision making, teaming strategies, home-school community relations, instructional programming, and differentiated staffing.

852G. Foundations of Educational Law

Winter, Summer. 3(3-0) Graduate students.

Fundamentals of educational law, oriented particularly towards the needs of teachers to understand legal issues of governance, teaching and student-related relationships.

853B. Procedures in Guidance: Counseling and Guidance in the Classroom

Fall, Winter. 3(3-0) Approval of department.

Examination of factors underlying counseling activities of teachers and administrators. Basic principles, methods and techniques related to diagnosing, interviewing, consulting and referring counselees for special assistance are included.

855. Research in Educational Administration

*Fall, Winter, Spring, Summer. 3(3-0)
EAD 851A, EAD 851B, CEP 803.*

The identification of an individual research problem and the application of principles and techniques of educational research in seeking a solution to the problem.

860. Adult Education: A General Survey

Fall, Spring, Summer. 3(3-0) Approval of department.

Overview of extent, origins, forms, purposes, content, sponsors, methods and guiding theories of continuing education and its significance for individuals, institutions, communities and nations.

861. The Adult As Learner

Fall, Spring, Summer. 3(3-0) EAD 860 or approval of department.

Theories of adult development, learning and liberation. Personal and professional implications for continuing education programs.

862. Seminar: Continuing Education Leadership in Local Communities

*Fall, Winter, Spring, Summer. 3(3-0)
May reenroll for a maximum of 6 credits. Majors or approval of department.*

Formal and non-formal community education for adults. Administration, agency cooperation, accountability, ethical and political concerns, managing controversy, and balancing objective study with advocacy in programs of personal and community development.

864. Adult Education: Teaching Strategies

Winter. 3(3-0) EAD 860, EAD 861.

Strategies and techniques for effective teaching of adult learners. Particular attention to strategies that can enhance learner participation in planning, implementing and evaluating instruction in seminars, workshops and classes.

865. Education for Older Adults

Fall, Summer. 3(3-0) Graduate student.

Capabilities, interests, limitations, and needs of older persons as learners. Common stereotypes and conditions under which older persons benefit from and contribute to adult education.

866A. Seminar in Adult Literacy

Winter. 3(3-0) Graduate student.

Causes of adult illiteracy, problems of adult illiterates, and the societal problems associated with illiteracy. Programs and strategies for reducing illiteracy.

866B. Teaching Adult Basic Education

Fall. 3(3-0) Graduate student.

Strategies for teaching adults to read, write and compute. Adult basic education student characteristics; program characteristics; content, organization and policy issues.

867. Developing Interpersonal Skills in Working with Adults

Spring, Summer. 3(3-0) Graduate student.

Processes, procedures, and underlying theories inherent in the development of effective interpersonal skills in working with adults, either as individuals or in group situations.

868. Non-Formal Education for Rural Development

Fall. 3(3-0)

General principles relating non-formal education and rural development. Comparison of non-formal, extension, continuing education systems in African, Asian, American, European rural societies; impact on continuity and change in rural social systems.

869A. Career Education

Fall, Summer. 3(3-0)

Historical background, curricular implications and instructional strategies related to kindergarten through adult career education programs. Program content and organization for developing awareness, exploration, decision making and planning skills.

869B. Procedures in Guidance: Career Development Services

Winter, Summer. 3(3-0) Approval of department.

Analysis of group and individual methods providing information related to career planning, educational opportunities, and person-social concerns. Utilization of information from placement agencies, follow-up studies, and community surveys in curriculum revision is stressed.

869C. Training in Industry

Winter, Summer. 3(3-0) Graduate student.

An analysis of education and training programs in business and industry. Training cycle, adult learners in the work place and competencies of trainers.

869D. Employment and Training

Winter, Summer. 3(3-0) Graduate student.

Employment and training programs in the public and private sectors. The agencies, policies, funding and collaboration to assist the employed and unemployed adult. The role of education and training professionals.

870A. U. S. Society and Higher Education

Fall, Spring. 3(3-0) Approval of department.

The U. S. society and its relationship to higher education with emphasis on the current status and future of post secondary education in the U.S.

870B. Historical and Comparative Foundations of Education: Higher Education in the United States

Winter, Summer. 3(3-0) Approval of department.

Development of higher education in the United States and its foreign antecedents. Survey of higher education today with attention to purposes, curriculum, organization, financing, and the major issues in these areas. Attention is also given to a world view of higher education with special focus upon the influences of United States higher education in foreign countries.

**Descriptions — Educational Administration
of
Courses**

870C. Political Issues in American Higher Education

Fall. 3(3-0) Graduate students in College and University Administration or approval of instructor.

Current political power and decision-making issues in higher education. Emphasis given to the role of the educator in the legislative process and techniques for improving governmental relations.

870D. Contemporary Issues in American Higher Education Administration

Winter. 3(3-0) Graduate students in College and University Administration or approval of instructor.

External and internal demands and stresses facing American higher education. How administrators should respond to critical issues and problems.

870E. Community College

Fall, Spring. 3(3-0) Approval of department.

Purposes, functions, and offerings of the community college.

870F. The American College Student

Fall, Winter, Summer. 3(3-0) Students in graduate degree programs or approval of department.

Analysis of research data, theory, hypotheses and strategies regarding the nature of the college student and learning environment.

870G. Student Affairs Administration in Higher Education

Fall. 3(3-0) Approval of instructor.
Overview of student personnel services in colleges and universities. Philosophy, organization, and administration of the personnel program at this level and of specific services provided. Opportunity to visit and study college personnel programs.

870J. Institutional Advancement

Spring. 3(3-0) Approval of department.

Administration of institutional advancement programs, marketing higher education; governmental relations, alumni administration, development, institutional relations, and executive management.

871A. Budgeting in Higher Education

(EAC 871A.) Fall, Spring, Summer. 3(3-0) Approval of instructor.

Principles, practices, and problems related to budgeting in colleges and universities.

872A. Principles and Problems of Instruction in Higher Education

Fall, Winter, Spring, Summer. 3(3-0) Graduate students in College and University Administration or approval of instructor.

Instructional problems in the various areas of higher education with emphasis on common principles underlying each of them.

873A. Student Development and Student Services I

Fall. 3(3-0) Graduate students with Student Affairs Emphasis or approval of instructor.

History, development, philosophy, organization and administration of college student personnel as a profession. Emphasis upon the college student as an individual and a study of services, programs and staff skills needed to provide for growth, needs and development.

873B. Student Development and Student Services II

Winter. 3(3-0) Graduate students with Student Affairs Emphasis or approval of instructor.

Emphasis upon the student as a member of groups; peer and group influence and behavior; student organizations and group activities; services, strategies and staff skills for conducting such programs.

873C. Student Development and Student Services III

Spring. 3(3-0) Graduate students with Student Affairs Emphasis or approval of instructor.

Study of living and learning environments and related staff skills, facilities and programs which affect student behavior and development; examination of personal qualities, professional organizations and other factors associated with being a professional person.

874A. Dynamics of Life Transitions

(EAC 874A.) Fall, Spring. 3(3-0) Graduate students or approval of instructor.

Students explore stages, psychosocial conflicts, and strategies for managing career related transitions with particular emphasis on implications for staff and student development in educational organizations.

874B. Transactive Process in Organizational Settings

(EAC 874B.) Winter. 3(3-0) EAD 874A or approval of instructor.

Students identify and analyse personal, professional and organizational variables which affect transactions within organizations in educational settings.

874C. Designing Developmental Activities

(EAC 874C.) Spring. 3(3-0) EAD 874B or approval of instructor.

Students will explore staff development activities and their adaptation to the needs of a variety of clientele. Alternative approaches to staff development programming.

876A. Practicum Experience in Student Affairs Administration

Fall, Winter, Spring, Summer. 2(1-5) May reenroll for a maximum of 8 credits. Graduate students with Student Affairs Emphasis only.

Observation and participation in on and off-campus offices and agencies related to the student's major field of study.

878A. Independent Research in Higher Education

Fall, Winter, Spring, Summer. 2 to 6 credits. May reenroll for a maximum of 9 credits. Master's students in College and University Administration. CEP 803.

Problems and practices in Higher Education Administration. Development of research prospectus, review of significant literature, conduct of research under supervision, and presentation of findings and conclusions.

881. Workshops in Educational Administration

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

Laboratory approach which provides opportunities for experienced educational personnel to concentrate their study on common administrative and supervisory problems.

882. Seminars in Educational Administration (MTC)

Fall, Winter, Spring, Summer. 3(3-0) May reenroll for a maximum of 15 credits. Approval of department.

Seminars in the various fields of emphasis in K-12 administration, college and university administration and adult and continuing education.

883. Readings and Independent Study in Educational Administration

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 15 credits. Approval of department.

Study on an individual or group basis in the various fields of emphasis.

884. Laboratory and Field Experience in Educational Administration

Fall, Winter, Spring, Summer. 1 to 9 credits. May reenroll for a maximum of 15 credits. Approval of department.

Supervised graduate practicums, observations, internships, and externships in the various areas of emphasis.

899. Master's Thesis Research

Fall, Winter, Spring, Summer. 2 to 12 credits. May reenroll for a maximum of 12 credits. Approval of department.

911. Evaluating School Effectiveness

(CEP 810.) Winter. 3(3-0) CEP 808 or approval of instructor.

Approaches to evaluating school effectiveness. Recent research on school effectiveness. Alternative strategies for examining measured student achievement and school characteristics.

916. Staff Development and the Realities of Teaching

Fall. 3(3-0) Doctoral Proseminar Sequence in Teacher Education or approval of instructor. Interdepartmental with and administered by the Department of Teacher Education.

Elements in decisions about staff development. Context for inservice teacher learning. Comparison of knowledge sources in teacher development.

950. Theory and Practice of Administration

Fall, Winter, Spring, Summer. 3(3-0) Approval of department.

Administrative process as exemplified in agencies such as schools, colleges, universities, government agencies, business enterprises, and voluntary organizations. Relation of administrative theory to the practice of administration and to scientific knowledge of human relations in a free society.

951A. Community Relations

Winter, Spring, Summer. 3(3-0) Approval of department.

Communications strategies and problems for administrator of educational institutions. Problem identification and analysis are stressed.

951B. Educational Finance

Fall, Summer. 3(3-0) Approval of department.

Current issues concerning financing public elementary and secondary education in the United States. Current and historical analysis of patterns of revenue and sources and expenditures.

**Electrical Engineering and Systems Science — Descriptions
of
Courses**

- 951C. Education Law**
Fall, Winter, Summer. 3(3-0)
Approval of department.
Designed to discover general legal principles and examine laws and lawmaking agencies that affect educators and educational institutions and appropriate means to influence law development.
- 951E. Educational Personnel Administration**
Fall, Spring, Summer. 3(3-0)
Approval of department.
Recruitment, selection, orientation, training, salary and fringe benefits, welfare, morale, negotiations, etc., to assist the administrator to function more effectively with personnel.
- 951F. Planning Change in Educational Organizations**
Winter, Summer. 3(3-0)
Approval of instructor.
Analysis of research, theory and practice of the change process in educational organizations. Planned change concepts and methods are examined and tested by laboratory and field experiences.
- 951H. Field Research Methods in Education**
Spring. 3(3-0)
Methods of interview, participant observation or observation for carrying on educational research.
- 951J. Conflict Management in Educational Administration**
Fall, Spring. 3(3-0)
Approval of department.
Theories, rationales, and strategies of conflict management. Managing conflict situations in educational environments.
- 952A. Externship in Educational Administration**
Fall, Winter, Spring. 3 credits. *May reenroll for a maximum of 27 credits. Present or past position as an educational administrator.*
Discussion of participants' current administrative problems and solution strategies, faculty visits to participants' schools and speakers on issues in educational administration.
- 952B. Multidisciplinary Seminar in Educational Administration**
Fall, Winter, Spring. 3 credits. *May reenroll for a maximum of 18 credits. 9 credits of EAD 952A.*
Discussion of generic problems and issues in administration identified and interpreted through selected readings and speakers from the several behavioral sciences.
- 960. Seminar: Continuing Education in Higher Education Institutions**
Winter. 3(3-0)
May reenroll for a maximum of 6 credits. Majors or approval of department.
Patterns, problems, and potential for continuing education in two and four year colleges. Problems of governance, reward system, leadership roles, etc.
- 964. Adult Education: Program Planning**
Spring. 3(3-0)
EAD 860, EAD 861.
Educational program planning and development for organizations that serve adult populations. Alternative program planning strategies to accommodate adult learner needs, organizational resources and desired outcomes.
- 970A. The Law of Higher Education**
Fall, Spring. 3(3-0)
Graduate students in College and University Administration; others, approval of instructor.
Principles and cases of law applied to problems of governance, management, and instruction in post-secondary educational institutions. Emphasis upon personnel and student administration and equity issues.
- 970B. Higher Education Finance**
(EAC 970B.) Fall, Spring. 3(3-0)
Admission to M.A. or Ph.D. programs in the College of Education.
Structures, processes and problems related to the financing of higher education in the United States. Emphasis on alternatives for the future.
- 971A. The Department in Higher Education**
Winter. 3(3-0)
Approval of instructor.
The Department as an administrative structural element of the University. The duties and responsibilities of the chairperson as they relate to the management of the Department.
- 971B. Management Systems in Higher Education Administration**
Fall, Spring. 3(3-0)
Graduate students in College and University Administration; others, approval of instructor.
The application of National Center for Higher Education Management Systems tools to decision making in higher education administration. Resource Requirement Prediction Model 1.6, student flow and faculty activity analysis are major tools investigated.
- 971C. Evaluation of Higher Education**
Spring. 3(3-0)
Graduate students in College and University Administration, EAD 872A or approval of instructor.
Ways in which evaluation takes place in higher education; course examinations, grading, comprehensive examinations, teacher evaluation, institutional evaluation, state surveys, and regional and national studies of higher education problems.
- 971D. Community College Administration**
Winter. 3(3-0)
Graduate students in College and University Administration. Others, approval of instructor.
Functional areas of community college administration with emphasis upon instruction, finance and student services including the importance of local, state and federal influences.
- 973A. College Student Affairs Administration I**
Fall. 3(3-0)
Doctoral students in Student Affairs Emphasis. Others, approval of instructor.
Emphasis on planning, organization, financing, research, evaluation and administration for programs and services which exist principally to serve individual student needs: counseling, orientation, health, placement, financial aids, etc.
- 973B. College Student Affairs Administration II**
Winter. 3(3-0)
Doctoral students in Student Affairs Emphasis. Others, approval of instructor.
Student organizations and activities; student union; on and off-campus living environments. Emphasis on planning, organization, financing, research, evaluation and administration of these programs and services.
- 973C. College Student Affairs Administration III**
Spring. 3(3-0)
Doctoral students in Student Affairs Emphasis. Others, approval of instructor.
Analysis of student rights and responsibilities; academic freedom; regulation of student conduct; systems of governance and judicial processes; legal basis for student personnel programs and administration.
- 976A. Doctoral Internship in College and University Administration**
Fall, Winter, Spring, Summer. 3(0-9)
May reenroll for a maximum of 12 credits. Doctoral students in College and University Administration, approval of instructor.
Students intern in on- and off-campus offices and agencies as observers of and participants in the administration of programs particular to their major field of study.
- 978A. Independent Research in Higher Education Administration**
Fall, Winter, Spring, Summer. 1 to 6 credits. *May reenroll for a maximum of 6 credits. Doctoral students in College and University Administration.*
Supervised and guided in-depth readings in literature and research specific to higher education administration which lead to the development of materials such as position papers, articles for publication, and grant and dissertation proposals.
- 982. Seminars in Administration and Curriculum**
Fall, Winter, Spring, Summer. 1 to 9 credits. *May reenroll for a maximum of 15 credits. Approval of department.*
Seminars in the various fields of emphasis.
- 983. Readings and Independent Study in Educational Administration**
Fall, Winter, Spring, Summer. 1 to 6 credits. *May reenroll for a maximum of 15 credits. Approval of department.*
Study on an individual or group basis in the various fields of emphasis.
- 984. Laboratory and Field Experience in Educational Administration**
Fall, Winter, Spring, Summer. 1 to 6 credits. *May reenroll for a maximum of 15 credits. Approval of department.*
Supervised advanced graduate practicums, observation, internships, and externships in the various areas of emphasis.
- 999. Doctoral Dissertation Research**
Fall, Winter, Spring, Summer. *Variable credit. Approval of department.*

**ELECTRICAL ENGINEERING
AND SYSTEMS SCIENCE**

College of Engineering

Electrical Engineering EE

300. Electric Circuits I

Fall, Winter. 4(4-0)
MTH 113.
Current voltage and power. DC and transient circuit analysis. Forced response. Sinusoids and the phasor concept. Bridges.