Courses

910. Seminar

Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 2 credits for the Master's program and a maximum of 4 additional credits for either the Ph.D. or the diploma program.

915. Respiratory Physiology

Fall of even-numbered years. 4(3-2) PSL 801, approval of department.

Development of ideas leading to our present state of knowledge in respiration.

919. Cardiovascular System

Fall. 4(3-3) May reenroll for a maximum of 12 credits if different topics are taken. PSL 802.

Classical and current literature on physiology of heart, circulation, and microcirculation. Each fall a different one of these three topics will be discussed. Laboratory work illustrates methodology and special procedures.

945. Physiology of Mammalian Reproduction

Winter of odd-numbered years. 4(5-0) DRY 445 or PSL 445 or approval of deparment. Interdepartmental with and administered by Dairy Science.

Chemistry and biosynthesis of reproductive hormones. Gonadal, hypothalamic and pituitary development of reproductive potential. Ovulation, fertilization, implantation and placentation will be studied. Relationships of conceptus, uterus and corpus lutem. Parturition.

950. Topics in Physiology

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 9 credits. Approval of department.

Classical and modern concepts in selected areas of physiology.

980. Problems

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 9 credits. Approval of department.

Limited amounts of individual work on selected research problems.

999. Doctoral Dissertation Research

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

POLITICAL SCIENCE PLS

College of Social Science

100. American National Government

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

Major aspects of national government with emphasis on the policy-making process.

140. Comparative Politics

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

Comparison of political systems in western and non-western nations.

160. International Relations

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

Contemporary world affairs surveyed. The struggle for power, the nation-state system; factors creating harmony and hostility among nations. War and peace in our time.

170. The Isms

Fall, Winter, Spring, Summer. 3(3-0) Introduction to basic contemporary political ideologies; theoretical foundations of democracy, socialism, communism, political elitism, and nationalism. Special attention to ideology underlying contemporary political problems.

200. Introduction to Political Science Fall, Winter, Spring, Summer. 3(3-0)

Acquaints the student with the theories, methods and concepts of political science. Emphasis is on ideology and interests in the political process.

251. Human Values and Politics: On Liberty (S)

Fall. 4(4-0)

Liberty as a basic value underlying public issues of life or death: right to live; rights of women and children; slavery; justification of war and terrorism; capitol punishment; biological planning.

252. Human Values and Politics: Equality and Justice (S)

Winter, 4(4-0)

Equality and justice as basic values underlying major public issues in areas such as crime and punishment, education, family and employment. Effect of public policy on equal opportunity.

253. Human Values and Politics: Authority and the Individual (S)

Spring. 4(4-0)

Individualism and authority as basic values underlying public issues; free speech; rights of minorities; right of privacy; community norms and individual preferences.

IDC. Introduction to Contemporary China

For course description, see Interdisciplinary Courses.

290. Methods of Political Research

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

Design and execution of research in political behavior and institutions. Major emphasis on logic underlying various types of political research, on identification of appropriate data sources and field methods.

291. Methods of Political Research

Fall, Winter, Spring. 4(3-1) PLS 290.

Analysis of political data, with major emphasis on quantitative techniques.

301. American State Government

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

Major aspects of policy-making process at the state government level. Comparison of state political systems.

302. American Urban Government

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

Urban political process in America. Politics of policymaking for urban functions; politics of intergovernmental relations.

303. Michigan Government

Spring. 3(3-0)

How Michigan government is organized and conducted and how policies are made; sources of executive-legislative conflict; politics of taxation; role of the state in local affairs; balance of political forces in the state.

310. Public Bureaucracy in the Policy Process

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

Introduces student to following major areas of public administration: development of administration in the U.S.; theories of administrative organization; principles and methods of administrative management; executive leadership; interpersonal and intergroup relationships; levels of decision making, ethics and responsibility.

313. Public Policy Analysis

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

Problems and methods in perception of public problems, determination of goals, generation and evaluation of alternatives, policy choice. Planning and program budgeting, political and analytical methods of policymaking compared.

320. The American Judicial Process

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

Analysis of the structure and functions of judicial systems. Organization, administration, and politics of judicial bureaucracies. Roles of judges, juries, counsel, litigants, and interest groups in adjudication processes.

321. Judicial Policymaking

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

Consideration of political behavior of judges (especially Justices of Supreme Court) and their policymaking. Focus on policy questions currently important, including civil liberties, national economic policy and interrelationships among governmental units.

324. The American Legislative Process

Fall, Winter. 3(3-0)

Nature of legislative process in the United States; organization and procedure of legislative bodies; direct legislation; relationship of legislative branch to other branches of government.

325. The American Executive Process Spring, 3(3-0)

Role of the president, state governors, and municipal executives in the American system of government. Analysis and discussion of constitutional status and powers, selection, administrative responsibilities, legislative and political leadership, accountability and responsibility of chief executives.

330. Government and the Mass Media

Spring. 3(3-0) Juniors.

How press, radio, television and journals shape public opinion and government policy; examines questions of influence and linkage, regulation vs. free comment, and the media as an interest group.

331. American Political Parties

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

Origins, structure, and functions of political parties. Dynamics of the two-party system. Role of third parties.

332. Interest Groups and Political Movements

Fall, Winter. 3(3-0)

Group theory and politics. Growth of organizations and associations to represent the interests of business, labor, agricultural, professional, veterans, and other groups. Internal politics of private associations and their impact on public policy.

333. Political Opinion and Voting Behavior

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

Development of political attitudes, idealogy, and partisanship and their relation to voting behavior; political participation; comparisons of mass and elite attitudes and behavior; representation of public opinion in the political system.

334. Campaigns and Elections

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

Methods of campaigning. Nominating process and recruitment of candidates. Formation of electoral coalitions and analysis of election results. Examination of trends and changes in electoral support.

335. Comparative Parties and Pressure Groups

Spring. 3(3-0)

Dynamics of political party and pressure group behavior in selected political systems. Comparative analysis of organization, ideologies, membership, leadership, tactics, power and influence of parties.

337. Ethnicity, Race and Politics Winter. 3(3-0) Juniors.

Ethnicity and race as factors in the political process and as issues of public policy.

338. Politics and Inequality Fall. 3(3-0)

Nature of democratic politics, distribution of power and the role of political elites, and impact of politics on social inequality and policymaking, in the United States and in comparative perspective.

3.39 Political Socialization Fall. 3(3-0).

The development of political attitudes in children; changes in content over time; the influence of the family, school, peers; group differences in political attitudes; political socialization through the life cycle.

340. Theories of Comparative Politics Fall. 3(3-0)

Alternative methods for comparative crosscultural analyses of political systems. Political structures, functions, cultures, stability and change. The problem of equivalence.

IDC. Contemporary South Asia

For course description, see Interdisciplinary Courses.

344. The Politics of Developing Areas Spring. 3(3-0) .

Process of political growth in emergent societies of the world; stresses of change and flux resulting from economic development in relation to the structure and dynamism of government.

345. Political Institutions and Behavior in South Asia

Fall. 3(3-0)

Political ideas and institutions in India, Pakistan, and related territories; analysis of constitutional development, political parties, legislatures, administration, planning, foreign policy and their interaction with the social system.

347. African Politics Winter. 3(3-0)

Political practices and perspectives in Africa. Special attention to emerging independent na-tions of Sub-Saharan Africa. Analyses of sociopolitical change, nationalism, cultural duality, nation-building, pan-Africanism.

349.Politics of English Speaking Democracies

Spring. 3(3-0)

Political institutions and development of the English speaking nations. Special attention to Great Britain, Canada and the U.S. parliamentary systems, parties, pressure groups, and problems of these societies.

Political Institutions and 353. Behavior in Southeast Asia

Spring, 3(3-0)

Philippines, Indonesia, Malaysia, Thailand, Viet Nam, Cambodia, Laos, Burma.

Canadian Government and Politics 5 4 1

Spring. 3(3-0)

Government structure and politics stressing how federalism and parliamentary institutions shape party organization, interest groups and government policy. Special attention to Quebec.

356. Western European Political Institutions and Behavior

Analysis of parlimentary systems of Britain and selected European societies. Basic institutions, socioeconomic conditions, recruitment of leadership, pressure groups, and party organization and tactics, voting behavior. Policymaking, roles of executive, legislature and bureaucracy.

Soviet Political Institutions and Behavior

Fall. 3(3-0)

Study of soviet society as a political system; its origins, development, institutions, functioning, and trends. Comparisons will be made with other political systems.

359.Eastern European Governments Spring. 3(3-0)

Comparative analysis of East-European socialist countries, their political cultures, institutions, problems, policies, and trends of development.

Theory and Practice of Foreign Policy

Fall. 3(3-0)

Systematic analysis of the dynamics of contemporary world politics. Major theories and concepts of foreign policymaking and international politics. Comparative study of factors shaping foreign policy in various states. Examination of current and recurrent problems.

365. The United States in World Affairs

Spring. 3(3-0)

Resources, policies, and role of the United States as a great power. Contemporary United States foreign policy in the key and critical areas of the world. Major factors affecting future course of American foreign policy.

367. Foreign Policies of Major Powers

Spring. 3(3-0)

Examination of the foreign policies and decision-making processes of major powers, such as the Soviet Union, China, Great Britain, France, Japan, and India. Analysis of their foreign policy goals, the role of ideology, national interest, and institutions.

Politics and Military Force Winter, Spring. 3(3-0) PLS 200 or M S

325 or approval of department.

Organization and use of military force in relation to the achievement of political goals of the United States and other powers.

369.National Security Policy

Fall, Spring. 3(3-0) Sophomores.

The development of strategic thought and current problems of strategic policy in the United States.

370. Classics of Political Thought Fall. 3(3-0)

Political ideas of Plato, Aristotle, Cicero, Augustine, Aquinas, and other leading political philosophers of classical Greece, Rome, and Christendom through the medieval periods.

371. Classics of Political Thought Winter. 3(3-0)

Political ideas of Machiavelli, Hobbes, Locke, Montesquieu, Rousseau, and other leading polítical philosophers whose works are fundamental in understanding such modern concepts as sovereignty, the state, freedom, and power.

372. Classics of Political Thought Spring. 3(3-0)

Political ideas of Burke, Benthan, Hegel, Mill, Marx, and other leading political and social philosophers whose works underlie such modern political ideologies as liberalism, socialism, and

375. Comparative Communisms-Theory

Fall. 3(3-0)

Development of Communist doctrine. Marxism, and Marxism-Leninism. Critical analysis of the principal ideas of Marxism, and Communism. Conflicts between different interpretations of Marxist-Leninist doctrine within contemporary Communism.

American Political Thought Fall. 3(3-0)

Colonial times to the Civil War. Roger Williams, Thomas Jefferson, John Adams, and John C. Calhoun will be discussed in the context of major political issues.

378.American Political Thought Winter, 3(3-0)

Civil War to present. Henry George, Edward Bellamy, Thorstein Veblen, and John Dewey will be discussed in the context of major politi-

Selected Aspects of State and Local Government

Winter, 3(3-0) May reenroll for a maximum of 9 credits. Political science Seniors or approval of department.

Covers different subjects at different times such as community decision making, metropolitan problems, and intergovernmental relations.

Politics of Schools

Fall. 4(3-2)

Description and explanation of authority structures in schools. Examination of alternative philosophical bases of school organization and behavior. Explanation of the political context and consequences of findings on educational achievement. Field work required.

415. Advanced Seminar in Policy and Bureaucracy

Fall, Spring. 3(3-0) Political science Seniors or approval of department.

Special aspects of public administrative processes and organization, with special reference to particular policy areas and the policy process.

Courses

420. Judicial Policymaking and Behavior

Winter, Spring. 4(4-0) Political science Seniors or approval of department.

Analysis of policymaking by judicial systems. Research theory and methods in judicial behavior. Socialization of judges, and the relationship between judicial attributes, and judicial ideologies and attitudes and values.

430. Seminar in Political Organization and Behavior

Fall, Spring. 3(3-0) May reenroll for a maximum of 9 credits. Political science Seniors or approval of department.

Covers different subjects at different times such as legislative behavior, electoral behavior, and public opinion.

437. Psychology of Political Behavior

Fall, Winter, Spring. 3(3-0) PSY 335 or SOC 251 or six credits in sociology or political science. Interdepartmental with and administered by the Department of Psychology.

Psychological theories, principles, methods and techniques applied to political behavior; belief systems; personality influences; decision making, psychological patterns in legislative voting; political leadership; interpersonal and international relations and tensions.

IDC. Refugees, Displaced Persons, Exiles

For course description, see Interdisciplinary Courses.

IDC. Issues in Refugee Assistance

For course description, see Interdisciplinary Courses.

454. Special Topics in Comparative Politics

Fall. 3(3-0) May reenroll for a maximum of 9 credits. Political science Seniors or approval of department.

Comparative analysis of various topics, such as political recruitment, elites, urbanization, and totalitarian systems.

469. Special Problems in International Politics

Winter. 3(3-0) May reenroll for a maximum of 9 credits. Political science Seniors or approval of department.

Analysis in depth of special problems, subjects, or areas in international politics: Sino-Soviet conflict; nationalism and international politics; alliances and international politics.

473. Selected Aspects of Political Thought

Spring. 3(3-0) May reenroll for a maximum of 9 credits. Political science Seniors or approval of department.

A senior seminar which will focus on philsophical and ideological problems raised in contemporary political thought.

490H. Honors Internship

Fall, Winter, Spring, Summer. 3 to 6 credits. May reenroll for a maximum of 9 credits. Students in Honors College or in PLS Honors Program and approval of department.

Supervised participation in research or teaching.

491H. Senior Honors Thesis

Fall, Winter, Spring, Summer. 3 to 6 credits. May reenroll for a maximum of 9 credits. Honors Program participants.

A substantial piece of writing involving original research under direction of a faculty member.

494. Field Work in Political Science

Fall, Winter, Spring. 3(1-10) to 12(1-40) May reenroll for a maximum of 12 credits. Approval of department.

Supervised field work may be offered in several of the areas of departmental study, such as public administration, political organization and behavior, public law and judicial behavior, state and local government, comparative political institutions and behavior, etc. Field work may involve internship with public agencies, participation in survey research, intensive analysis of judicial behavior, etc. Students should reserve several mornings or afternoons for this work.

495. Independent Study

Fall, Winter, Spring, Summer. 3 to 6 credits. May reenroll for a maximum of 6 credits. Advanced undergraduates. Approval of instructor and department.

Individual reading and research supervised by a member of the department.

800. Proseminar in Political Theory and Research Methods

Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

Issues arising in the pursuit of reliable knowledge about political phenomena; to the major problems in relating theory and empirical research; and to major theoretical ideas in the study of political institutions and behavior.

810. Proseminar in Public Administration

Fall, Winter. 4(3-0) Majors or approval of department. May reenroll for a maximum of 8 credits.

Survey of the important American literature, ideas and schools of thought and practice of this century. Contemporary and emerging problems of responsibility, planning, personnel and organizational methods in American government discussed against the background of the past fifty years' systematic study of public administration.

812. Public Personnel Administration Fall. 4(3-0)

Historical development and current practices of personnel management in government. An introduction to various public personnel topics including: employee recruitment and selection, affirmation action and labor relations programs, employee development, and others.

815. Politics of Public Budgeting

Spring. 4(3-0) PLS 810 or approval of department.

Politics of the budgetary process: theories, budget cycle, scarcity and budgetary planning, budgetary reforms, analysis in the budgetary process. Developments in budgeting such as sunset legislation and zero-base budgeting.

837. Psychological Aspects of Politics

Fall, Winter, Spring. 4(3-0) Interdepartmental with the Department of Psychology.

Relevance of psychological concepts, theories and methods for the study of political institutions, organizations and behavior.

IDC. Subsaharan Africa Seminar

For course description, see Interdisciplinary Courses.

840. Proseminar in American Politics Winter, Spring. 4(3-0) May reenroll for

a maximum of 8 credits.

Basic literature and concepts in American politics and critical examination of approaches and methods.

850. Proseminar in Comparative Politics

Winter. 4(3-0) May reenroll for a maximum of 12 credits.

Developments in comparative politics and critical examination of its methods, approaches, and purposes.

860. Proseminar in International Relations

Fall, Spring. 4(3-0) May reenroll for a maximum of 8 credits.

International relations as a field of graduate study. Special attention to methods, major substantive problems, and principal bibliography.

870. Proseminar in Political Thought

Fall, Winter. 4(3-0) May reenroll for a maximum of 8 credits.

Selected classics in political thought and some of the significant ways of approaching the literature. Major political concepts in the ancient and modern literature, and contemporary bibliography in political thought.

880. Proseminar in General Political Theory

Winter, Spring. 4(3-0) May reenroll for a maximum of 8 credits. PLS 800 or approval of department.

Survey of contemporary theories of political processes, emphasizing conceptualizations that transcend, and apply to, specific content areas. Includes analysis of political conflict processes, individual and social choice, political leadership.

894. Field Experience Practicum

Fall, Winter, Spring, Summer. 4 to 12 credits. May reenroll for a maximum of 12 credits. Craduate students; approval of Program Guidance Committee.

Participant observation of the administration of public policy in governmental organizations. Faculty supervision is provided to ensure both a practical and a scholarly experience. Agency subject to guidance committee approval.

899. Master's Thesis Research

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

901. Research Methods of Political Science

Winter, Spring. 4(3-0) May reenroll for a maximum of 8 credits. PLS 800 or approval of department.

Design and execution of political research. Special attention given to politometric methods, their theoretical bases, uses, and interpretations.

903. Advanced Problems of Political Research

Fall, Winter, Spring, Summer. 4(3-0) May reenroll for a maximum of 12 credits. PLS 800 or approval of department.

Analysis of special problems in political research. Such areas as the philosophic basis of political science, the nature of political research and in-depth study of research techniques and strategies may be covered.

911. Theories of Administrative Organization

Winter, 4(3-0) Majors or approval of department.

Analysis of some recent contributions by the behavioral sciences to formal organization theory.

914. Comparative Public Administration

Winter. 4(3-0) Majors or approval of partment.

Comparative study of the administrative systems of major nations. Analysis of the manner in which these patterns have been transplanted into dependent and developing contries and of the subsequent modifications of these patterns. Social and cultural setting of administration.

921. Judicial Systems

Winter of even-numbered years. 4(3-0) Structure and functions of judicial systems, including both American state and federal courts and those of other countries. Interrelationships between courts, administration of judicial bureaucracies (supporting administrative personnel as well as judges) and analysis of judicial decision-making processes.

922. Iudicial Behavior

Fall of even-numbered years. 4(3-0)

Design and execution of research in judicial decision making. Projects include both individual and group work, and field as well as library research. Critical evaluation of reports of other research investigations with which seminar projects articulate.

931. Political Groups and Movements

Fall of even-numbered years. 4(3-0)

Operation of interest groups, sociopolitical movements, cliques, and juntas. Interests and ideologies underlying these groups and channeling of their demands into the political system. Basis, growth, and internal politics of political groups and movements and their relation to formation of public policy and governmental institutions.

932. Legislative Process

Spring of even-numbered years. 4(3-0) Behavior of legislative bodies in the context of the political system, including other governmental institutions. Selection and legislative roles of legislators, and legislative decision making.

933. Political Parties

Fall of odd-numbered years. 4(3-0)

Operation of political parties in the political system. Relationship between party organization, electoral system, and the recruitment and advancement of political leaders. Interaction between parties and other political groups.

934. Voting Behavior, Political Attitudes and Public Opinion

Spring of odd-numbered years, 4(3-0)

Study of the voting behavior of electorates and decision-making bodies; of political attitudes and opinions; and of the relationships among political attitudes, popular voting, and public policies.

935. Seminar in Political Socialization

Fall, Winter, Spring. 4(3-0)

Processes and agents of political socialization; mechanisms of learning and differential influence of various agents of socialization; subgroup and comparative political socialization; socialization to new political roles.

941. Metropolitan Area Government and Politics

Fall of odd-numbered years. 4(3-0)

Core city and suburbia, issues and politics resulting from rapid urbanization, causes and effects of surban-central city frictions; the search for decision-making machinery in metropolitan areas.

942. Federalism and Intergovernmental Relations

Winter of odd-numbered years. 4(3-0)

How federal systems originate and are maintained; patterns in allocations of power between national and state levels; the political processes involved in intergovernmental relations, cooperative federalism; trends in American federalism.

943. Community Decision Making

Winter of even-numbered years. 4(3-0)

Discussion and critique of the power structure literature; emphasis on methods of studying community elites.

944. State Government and Politics Seminar

Spring of odd-numbered years. 4(3-0)

Comparative study of state governments based on resources and other aggregate characteristics, political organization and behavior. Models of political process, governmental structure variables and their relation to policy outputs.

953. The Politics of Selected Areas

Winter of even-numbered years. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

Analysis in depth, using comparative theory and method, of political systems and changes in selected administrative or cultural areas.

964. Selected Topics in International Relations

Winter. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

Intensive analysis of special problems and issues such as international political and economic development, international and intercultural communications, international violence, etc.

971. Classical and Medieval Political Thought

Spring of odd-numbered years. 4(3-0) Systematic analysis of selected works of such classical political philosophers as Plato, Aristotle and others whose work provides both an understanding of the premodern political perspective of the Western World and the philosophical underpinnings of modern political thought.

972. Modern Political Thought

Spring of even-numbered years. 4(3-0) Systematic analysis of selected works of such writers as Machiavelli, Hobbes, Locke, Montesquieu, Hume, Rousseau, Burke, Mill, Marx or other political philosophers. Special attention is given to those writers or works relevant to understanding the philosophical foundations of contemporary social science and ideology.

973. American Political Thought

Fall of odd-numbered years. 4(3-0)

Study of the thinkers and social forces which have shaped American political ideology.

981. Selected Topics in General Political Theory

Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. PLS 880 or approval of department.

Analysis in depth of such topics as individual political choice, collective choice and decision making, political coalitions, political leadership, political communication and diffusion processes, political integration and differentiation, equality and inequality, and interaction models of conflict.

990. Seminar

Fall, Winter, Spring. 4 to 12 credits. May reenroll for a maximum of 36 credits.

Intensive training in individual or group research. Sections of the seminar may involve one or more doctoral fields and the credit earned will vary accordingly.

993. Readings in Political Science

Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 10 credits.

999. Doctoral Dissertation Research

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

PORTUGUESE

See Romance and Classical Languages.

POULTRY SCIENCE

See Animal Science.

PSYCHIATRY

PSC

College of Human Medicine College of Osteopathic Medicine

520. Introduction to Psychiatry

Fall. 2(2-0) Admission to a college of medicine or approval of instructor.

Discrimination between various concepts of normality, understanding of psychological mechanisms, making observations and inference generation, recognition of normative crises and the psychiatric examination will be taught through lectures and discussions.

521. Psychopathology

Spring, Summer. 3(3-0) PSC 520 or concurrently.

Recognition, description, and treatment of most psychopathologic states will be taught using lectures, audio-visual presentations, and group discussions.

533. Fundamentals of Personality Dysfunction

Winter. 3(3-0) Admission to a college of medicine and approval of department; H M 514 concurrently.

Major psychiatric disorders. Mental disorders and patient behaviors that will be of value in working with nonpsychiatric and psychiatric patients.

590. Special Problems in Psychiatry

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 15 credits. Medical students; graduate students with approval of department.

Each student will work under direction of a staff member on an experimental, theoretical or applied problem.