

## ELECTIVES FOR ISE 2009 CHECKSHEET

### *ISE TECHNICAL ELECTIVES*

Students must take **two** ISE Technical Elective (**6 credit hours**) which must be selected from the list below. Non-ISE courses **may not** be substituted for ISE Technical Electives. ISE Technical Electives may also be used to satisfy the Technical Elective requirement. The purpose of the ISE Technical Elective requirement is to enable students to develop expertise in a particular area of the ISE discipline.

ISE 3004	Industrial Cost Control <i>Pre: ISE 2014 or ME 2024</i>
ISE 4004	Theory of Organization
ISE 4015	Management Systems Theory, Applications, and Design I
ISE 4016	Management Systems Theory, Applications, and Design II
ISE 4264	Industrial Automation <i>Pre: ISE 2204 or 2214. Requires Laboratory Work</i>
ISE 4414	Industrial Quality Control <i>Pre: ISE 4404</i>
ISE 4424	Logistics Engineering <i>Pre: ISE 3414</i>
ISE 4624	Work Physiology <i>Pre: ISE 3614</i>
ISE 4644	Occupational Safety and Hazard Control <i>Pre: ISE 3614</i>
ISE 4654	Principles of Industrial Hygiene
ISE 4974	Independent Study - Hours and credits established by faculty supervising work*
ISE 4984	Special Study - Hours and credits established when course is proposed/offered.
ISE 4994	Undergraduate Research - Hours and credits established by faculty supervising work*

*Note: \*A maximum of 3 credit hours of either ISE 4974 or ISE 4994 is allowed without prior approval as an ISE Technical Elective.*

### *TECHNICAL ELECTIVES*

Students must take **one** Technical Elective (**3 credit hours**), which may be chosen from the list below. The requirement of technical content restricts this elective to fall within College of Engineering (including ISE), Statistics, Chemistry, Physics, Computer Science, or Mathematics. The purpose of the Technical Elective requirement is to:

- Further develop the student's technical skills; and/or
- Provide an opportunity for the student to focus on a particular topic or area of study.

#### General restrictions for courses that CANNOT be used to satisfy the Technical Elective requirement:

- Any 1000 or 2000 level course.
- Any course not available for credit – see ISE Undergraduate Student Handbook.
- Any ENGR course below the 5000 level.
- Any undergraduate research or independent study course (3974, 3994, 4974, 4994) unless approved by the ISE Undergraduate Curriculum Committee (see the ISE Academic Advisor).

A list of courses that can be used to satisfy the Technical Elective requirement is presented below, followed by a list of specific restrictions for courses specifically **not** allowed as Technical Electives. **Please note any prerequisites for these courses in the Undergraduate Course Catalog.**

*Suggested Technical Electives in Engineering, Science, and Math*

AOE 3034	Vehicle Vibration and Control
AOE 3104	Aircraft Performance
CHE 3115	Transport Operations in Chemical Engineering
CEE 3104	Introduction to Environmental Engineering
CEE 3604	Transportation Engineering
CEE 4344	Water Resources Planning
CEE 4624	Planning Transportation Facilities
CHEM 3615	Physical Chemistry
CS 3414	Numerical Methods
CS 4004	Data and Information Structures
ECE 4234	Microelectronics
ECE 4524	Survey of Artificial Intelligence and Pattern Recognition
ESM 4044	Mechanics of Composite
ESM 4614	Reliability Methods in Engineering
MATH 3034	Proofs and Algebraic Systems
MATH 3134	Applied Combinatorics and Graph Theory
MATH 3224	Advanced Calculus
MATH 4225	Elementary Real Analysis
MATH 4245	Intermediate Differential Equations
MATH 4404	Applied Numerical Methods
MATH 4445-6	Introduction to Numerical Analysis
MATH 4554	Numerical Methods for Engineers
MATH 4564	Operational Methods for Engineers
MATH 4574	Vector and Complex Analysis for Engineers
ME 3614	Mechanical Design I
ME 4504	Dynamic Systems Control Engineering I
ME 4514	Controls Engineering II
ME 4524	Introduction to Robotics and Automation
ME 4634	Introduction to CAD/CAM
MSE 4304	Metals and Alloys in Design
PHYS 4714	Introduction to Biophysics

*Specific Restrictions – Courses NOT Allowed as Technical Electives:*

AOE 3054	AOE Instrumentation and Laboratory
AOE 4065-6	AOE Senior Design
AOE 4154	Aerospace Engineering Laboratory
AOE 4254	Ocean Engineering Laboratory
BSE 4104	Energy in Agriculture
BSE 4114	Probabilistic Engineering Design
BSE 4125-6	BSE Senior Design
CHE 4064	Process Systems Analysis
CHE 4104	Process Materials
CHE 4185-6	ChE Senior Design
CEE 3014	Construction Management
CEE 4034	Contract Specifications

CEE 4054	Construction Law: Roles and Responsibilities
CEE 4234	Property Line Law
CEE 4274	Land Development Design
CEE 4804	Professional and Legal Problems in Engineering
CHEM 3034	Advanced Scientific Glassworking
CHEM 4014	Survey of Chemical Literature
CHEM 4024	Career Planning for the Chemical Profession
CHEM 4615-6	Physical Chemistry for the Life Sciences
CS 3604	Professionalism in Computing
CS 4214	Simulation and Modeling
ESM 3704	Basic Principles of Structures
ESM 4015-6	ESM Senior Design
ESM 4404	Fundamentals of Professional Engineering
MATH 4044	History of Mathematics
MATH 4624	Topics in Analysis for Teachers
MATH 4634	Topics in Algebra for Teachers
ME 4015/16	ME Senior Design
ME 4744	The Complexity of Socio-Technological Problems
MINE 3064	Mining, Man and the Environment
MINE 3074	History of Mining
MINE 3094	Energy and Minerals in Society
MINE 4045-6	MinE Senior Design
MINE 4124	Mining Law
MINE 4144	Marketing and Transportation of Coal
MSE 4085-6	MSE Senior Design
STAT 3xxx and 4xxx	

*Note: Most 3000 level STAT courses are **not allowed** - check with ISE Academic Advisor for details. Some 4xxx STAT courses are also **not allowed** as Technical Electives given the required STAT courses for ISE major – see Undergraduate Course Catalog.*

### ***ENGINEERING SCIENCE ELECTIVES***

Students must take **two** Engineering Science Electives (**6 credit hours**) from the list below. The purpose of Engineering Science Electives is to enable students to develop breadth in the engineering discipline. **Please note any prerequisites for these courses in the Undergraduate Course Catalog.**

CHE 2114	Mass and Energy Balances
CEE 3104	Intro to Environmental Engineering
CEE 3404	Theory of Structures
CEE 3304	Hydraulics I. Restricted to CEE's. ISEs may request an exception to a major restriction.
CEE 3604	Intro to Transportation Engineering
ECE 2204	Electronics I. Restricted to ECE's. ISEs may request an exception to a major restriction.
ECE 2574	Intro to Data Structures and Software Engineering
ECE 3574	Applied Software Engineering.
ECE 3254	Industrial Electronics.
ECE 4364	Alternate Energy Systems
ENGR 3124	Introduction to Green Engineering
ENGR 3134	Environmental Life Cycle Assessment

ESM 2204	Mechanics of Deformable Bodies.
ESM 3024	Introduction to Fluid Mechanics
ESM 3124	Intermediate Dynamics
ME 2124	Intro to Thermo Fluids Engineering
ME 3114	Engineering Thermodynamics.
ME 3404	Fluid Dynamics
ME 3514	Dynamic Systems
ME 3604	Kinematics and Dynamics of Machinery. Restricted to ME's. ISEs may request an exception to a major restriction.
ME 4524	Intro to Robotics and Automation
ME 4634	Intro to Computer-Aided Design and Manufacturing
ME 4644	Introduction to Rapid Prototyping.
MSE 3304	Physical Metallurgy
MSE 3054	Mechanical Behavior of Materials
MSE 4304	Metals and Alloys in Design

### ***NON-TECHNICAL ELECTIVES***

Students must select **two** Non-Technical Electives (**6 credit hours**) from the list below. **Please note any prerequisites for these courses in the Undergraduate Course Catalog.** Non-technical electives are courses unrelated to engineering and basic sciences that provide students with a broad, well-rounded background and a perspective on global issues. The purpose of Non-Technical Electives is:

- Enhance or complement knowledge and skills by providing breadth in those non-technical areas with relevance to most career paths in ISE;
- Enhance business, communication, and technical skills;
- Learn a foreign language;
- Develop an understanding of the basic functional aspects of business, including the areas of economics, finance, marketing, and management;
- Provide exposure to global issues for business and industry, including environmental and multicultural issues;
- Provide awareness/skills necessary for success in a globally competitive and multicultural workplace; and/or
- Develop an understanding of the meaning and role of ethics.

There are courses listed here which are approved as Non-Technical Electives that are also approved in the Curriculum for Liberal Education Guide (e.g., as Area 3 or Area 7 electives). For these courses, students may not use the course to satisfy both requirements. Any given course will satisfy only one requirement.

### ***Courses Allowed from the College of Science and College of Liberal Arts and Human Sciences***

COMM 2004	Public Speaking
COMM 3124	Interpersonal Communication
COMM 3134	Argumentation and Decision-Making
COMM 4044	International Communication
COMM 4074	Organizational Communication
ECON 2005-6	Principles of Economics
ECON 3104	Microeconomic Theory
ECON 3204	Macroeconomic Theory
ECON 3214	Money and Banking

ECON 4135	International Trade
ECON 4136	International Finance
ENGL 3764	Technical Writing
FL 1105-6	Elementary Language
FL 2105-6	Intermediate Language
FL 3104	Commercial Language* (Spanish only offered)
FL 3105-6	Grammar, Composition, and Conversation (Arabic, Japanese, Portuguese not offered)

*\*Note: Latin, Greek, or a student's native language are NOT acceptable.*

PHIL 4324	Business and Professional Ethics
PSCI 2055	World Politics and Economy I
PSCI 3516	European Political Systems
PSCI 3615	International Relations I
PSCI 3625	American Foreign Policy
PSYC 4024	Industrial and Organizational Psychology
AS 3215-6	Air Force Management and Leadership
AS 4215-6	National Security Forces in Contemporary American Society
MN 4005-6	Leadership and Management
MS 4005-6	MS IV, AROTC
UAP 3014	Urban Policy and Planning
SOC 4604	Organization of the Workplace
SOC 4614	Occupations in Social Context

*Courses Allowed from the College of Business*

ACIS 2215	Introduction to Accounting
FIN 3104	Introduction to Finance
FIN 3055	Business Law
FIN 4144	International Financial Management
MKTG 3104	Marketing Management
MKTG 4254	Product and Price Management
MKTG 4704	International Marketing

*Courses Allowed from the College of Engineering*

CE 4804	Professional and Legal Problems in Engineering
ME 4744	The Complexity of Socio-Technological Problems