EE 491-I Special Topics in Electrical Engineering (Electrophysics)

**Designation:** EE Elective.

**Catalog Description:** Special Topics in Electrical Engineering. Course content will reflect special interests of visiting/permanent faculty; to be oriented toward juniors and seniors. (B) artificial intelligence; (C) circuits; (D) communications; (E) computer hardware; (F) computer software; (G) computer vision; (H) control; (I) devices; (J) fields; (K) power. Pre: consent.

**Credits:** 3

**Pre-requisites for EE 491-I (below):** EE 324 (Physical Electronics) or consent of instructor.

**Class/Lab Schedule:** 3 lecture-hours per week. Hours may be added as needed to accommodate large class size. The latter constitutes communications laboratory exercises. Such "presentation laboratory" added hours may be structure in more than one section (to be decided by instructor), time permitting.

**Instructor:** Dr. James Holm-Kennedy

**Topics Covered:**
2. Advanced EE Applications integrating multiple disciplines. The topics chosen are many and diverse relating to contemporary EE applications (e.g., optical communications devices, power generating devices, nanotube devices, biomedical devices and technologies, biomedical sensors, etc.)
3. Technical Dialog Skills
4. Invention Need Identification
5. Innovation Skills
6. Patent Drafting
7. Technical Writing Skills
8. Team Activities

**Course Structure:** Multiple peer interactive power point presentations are directed to developing technical presentation skills in systematic stages. Targeted are the development of advanced technical presentation skills, innovation skills, technical writing skills, information access and assimilation skills, brainstorming skills, technical dialog and peer communication interaction skills and team dynamics skills. Peer (and instructor) critiques, written and oral, are provide in class for each student presentation. Topics are take from the current trade and technical literature, science and science application sources, review articles and the internet.

**Structure:**
- Communications Orientation by Instructor: 1 week.
- *Team Presentation (3 students) 15 minute presentation -- to develop initial presentation confidence and assimilate basic information transfer rules. 1 1/2 weeks
- *20 minute presentation. (4 weeks). Further development of basic presentation skills, beginning technical depth management, peer discussion and dialog skills development. Short Written Abstract. Short paper.
- *30-40 minute presentation. (5 weeks) Advanced skills. Extreme technical depth and technical depth management. Extensive peer discussion.
- *Brainstorming training -- introductory exercises interspersed within course.
- *Innovation. Each student must create at least one invention (two required Sp09,2 included in future, time and class size permitting). The invention is presented in PPT to the class at the semester end for discussion and inputs. Two full days of student gatherings constitute the invention presentations of approximately 16-20 students (an "invention off"). The student writes a "rough" patent application including specification, figures and claims. A first draft patent is required. Innovation exercises including brainstorming are practiced periodically, time permitting.
- *Technical Writing. Technical writing is addressed in stages beginning with increasing length abstracts and ending with a major technical paper and a patent. The key technical writing demand is one of technical information organization and representation. The latter two are addressed in depth, repeatedly in the student presentation structure features with instructor feedback. The technical presentation exercises are in "written" information representation, information transfer format, and technically organized. There major issues in technical writing are address first in the presentations (organization, information representation).

**Visiting Lecturers:** Outside technical visitors are invited to provide advanced topic presentations outside of the students normal undergraduate courses.
Patent Attorney. A patent attorney from Palo Alto presents a lecture on patent content, drafting, claims drafting and prior art searching.

Visiting Engineer Presentations. Professionals from time to time, when available, are invited to provide advanced technical information on their research. Topics may include medical, advanced sensors, etc. An effort is made to acquire cross disciplinary experts and topics.

Textbook and Other Required Materials:
Current literature, trade magazines, internet sources, textbooks, science magazine and journals, resource personnel (to be contacted by presenter from time to time).

Course Objectives and Relationship to Program Objectives: The course directly addresses broad exposure to EE topics, especially across EE and broader disciplines. Presentation topic categories are selected to force the student to look broadly afield. Diverse EE applications outside of the traditional EE course subjects are selected to bridge technologies. Topics are selected to integrate EE concepts with knowledge from other fields (e.g., medicine, mechanical engineering applied to energy, nanoparticle applications, sensors applied to diverse areas). The diverse technical topic exposure targets introducing mixed disciplines, integration of diverse EE concepts into important current application regimes, development of an awareness of broad continual learning needs across disciplines. The development of information assimilation skills (self learning), multiple discipline awareness, technical fields evolution and skills in rendering newly acquired information into clear, organized and technical deep information transfer to peers are supported. Innovation need awareness is supported by weekly innovation needs lists assignments. Innovation skill is finessed by the latter and especially by requiring "bottom up" technical presentation. At least one invention is required of each student. The invention is presented to all class peers for discussion and critique. A patent is drafted in support of generating IP awareness. Peer evaluation (oral and written) is required of each student presenter by all peers (class members). The need for continual learning is emphasized and demonstrated repeatedly. (Program Objectives this course addresses 1, 2, 3, 4, 5, 6])

Course Outcomes and Their Relationship to Program Outcomes: The student shall acquire advance technical oral and written presentation skills, innovation skills, information access and assimilation skills, awareness of multiple disciplinary features of EE applications, peer interaction skills, self and peer critique skills. More specifically, w.r.t. ABET requirements:

Undergraduate Program Objectives Addressed: 1, 2 (via innovation), 3, 4, 5, 6
Undergraduate Program Outcomes addressed: 1, 2, 3, 4 (enabling of communication across disciplines), 5, 6, 7, 8, 9 & 10.

CONTRIBUTION OF COURSE TO MEETING THE PROFESSIONAL COMPONENT:
"Engineering topics: 100%"
Soft skills (technical presentations, oral and written, innovation): 100%.

Computer Usage: Power point required. Other computer programs as needed and desired by the student (a student decision). Otherwise, not required.

Design Credits and Features: This course has 1 design credits. However, all activities direct the student in learning design and creative problem solving skills. Further, conceptual command and synthesis of advance technical topic representation (design of information representation) are required in support of the technical presentation and innovation (design of invention). "Bottom up" presentation are a "best" presentation method and design constraint analogous to innovation (synthesize a solution to an engineering problem, structure the solution systematically with options determined by initial objectives being applied). The latter requirement "finesses" innovation skill. Direct innovation is supported by a detailed assignment met by each individual.

Instructor(s): Dr. James Holm-Kennedy (the only instructor for this professional skills acquisition course as outlined herein, at this time).

Person(s) Preparing Syllabus and Date: Dr. James Holm-Kennedy, 1/9/2009.