**Winter 2015: EXAMPLE ABSTRACTS FOR SENIOR DESIGN (CECS)**

Example 1:

***Abstract***—A statistical analysis was performed on measured

***Project objective statement***

radar reflections from a broad range of personal vehicle classes.

The outcome of this study is two-fold: 1.) An improved understanding

of the radar scattering components of automobiles,

which informs the design of surrogate test targets for evaluating

automotive pre-collision system (PCS) radars, and 2.) statistical

***Design/analysis details***

models for evaluating surrogate targets and characterizing target

models for PCS radar system designs. We examined the validity

of two-parameter distribution models applied to measurements

of subject vehicle’s radar cross-section (RCS) and found the

Weibull distribution to be the best fit. In evaluating the goodnessof-

fit of the Weibull distribution model, using the Kolmogorov-

***Results of project***

Smirnov test, we deem an acceptable fit between the model and

the measured RCS data for our intended project outcome.

Example 2:

***Project objective statement***

***Abstract*** - An L-band total power receiver for use in a

synthetic thinned array radiometer (STAR) is described. The

total power architecture of a radiometer receiver requires

special considerations to control gain fluctuations due to

small temperature drifts. The STAR application requires

consistent passband and stable phase between receivers. The

***Design/analysis details***

design presented incorporates direct detection to eliminate

distributed local oscillators for phase stability, distributed

ceramic interference reject filters for passband consistency

and temperature compensating attenuators for gain stability.

The receiver is packaged in a unique “winged-hex’’ shape to

enable close packaging with the STAR antennas and to

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facilitate thermal management. The resulting low cost,

compact receiver is made from COTS components

Example 3:

***Abstract*** - In this paper we tackle issues relevant to model based

***Project objective statement***

control design for a Urea based Selective Catalytic Reduction (SCR)

process relevant to automotive applications. A three state, control

oriented, lumped parameter model of the system is used to investigate

essential controllability and observability properties of the Urea-SCR

***Design/analysis details***

plant. Results from the controllability and observability analysis of both

nonlinear and linearized models are shown to have realistic implications.

Observer design for predicting gas phase ammonia slip is outlined and

results presented. An altered definition of the catalyst efficiency is used

in control design. It is shown that this altered definition lends itself readily

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to control synthesis in the Sliding Mode framework while satisfying the dual

control objectives of maximizing NOx reduction and minimizing ammonia slip.

Example 4:

Nanodiamond (ND) is an attractive nanomaterial for reinforcement of biopolymers due to the ND’s superior mechanical and chemical properties, and low biotoxicity. A novel composite material has been produced for bone scaffolds utilizing the biodegradable polymer poly(L-lactic acid) (PLLA) and octadecylamine-functionalized nanodiamond (ND-ODA). Composites were prepared by admixing to a PLLA/chloroform solution chloroform suspension of ND-ODA in concentration range of 0-10 % (w/w). The dispersion of ND-ODA evaluated by transmission electron microscopy (TEM) shows uniform distribution of ND-ODA in PLLA matrix. The composites were characterized by differential scanning calorimetry (DSC). DSC analysis of the composites showed no significant thermal behavior changes with the addition of ND-ODA into the polymer. Biomineralization test shows that ND-ODA can enhance the mineral deposition on scaffolds. Improved mechanical properties and good biocompatibility with enhanced biomineralization combined suggest that ND-ODA/PLLA might have potential applications for bone tissue engineering.

***Project objective statement***

***Design/analysis details***

***Results of project***