1086-62-129 **Kristin C. Mara*** (kmara08@winona.edu), 960 South Beaumont Road, Prairie du Chien, WI 53821, and **Samantha Louise Meadows** and **Rosemarie Roessel**. *Semiparametric Regression for Measurement of Parts Data.*

We will approximate the smooth function by a truncated polynomial basis with degree 2, which contains the polynomial basis and the splines constructed by knots. After we fix the number of knots, the function is estimated by methods such as OLS, penalized spline regression and linear mixed model. We propose our version of Bayesian penalized spline, which provides comparable results. The prior distribution is chosen to be "objective" so it will minimize the influence to the posterior distribution and maintain the advantages Bayesian statistics provided. The Jeffreys prior is adopted for the polynomial basis and the variance component in the model. The prior for the splines constructed by knots is elicited from the penalty term in the penalized likelihood. To ensure the posterior distributions are proper, we have to use an informative prior on the smoothing parameter. To achieve the goal of having an "objective" prior for the smoothing parameter, we will use the df_{fit} to determine the hyperparameter in the prior distribution. After we fit a nonparametric model, we will look at a semiparametric model, which will combine our nonparametric model with a categorical variable. We will use the AIC to compare those methods proposed through a simulated and a manufacturing data set. (Received July 26, 2012)