Department of Industrial & Systems Engineering
IIT, Kharagpur

PROPOSAL FOR INTRODUCING A NEW SUBJECT

1. Name of the Department/Centre/School proposing to introduce the subject : **Industrial & Systems Engineering**
2. Name of the subject : **Safety Analytics**
3. L – T – P and Credit loading of the subject : L – T – P : 3 – 1 – 0 Credit : 4
4. Status of the subject
   a. Specify the Session, Semester from which the subject is going to be offered : Spring, 2015 – 16
   b. Level of the subject : PG Level
   c. Name (s) of the Programme (s) in whose curricula this subject will be included : 4th Year, INDU ENGG
   d. Whether the subject will be offered as Compulsory or Elective : Elective
   e. The semester in which the subject will be offered : Spring
5. Prerequisite (s) for the subject, if any, (Please give the subject number and names) : None
6. Objectives and contents
   a. Objective : The objective of this course is to impart students of both UG and PG levels with a holistic view of safety analytics across an organization through advanced analytic and reporting technologies. Upon completion of this course the students will know (i) types, sources and characteristics of safety data and their integration for organization-wide safety centric data model, (ii) safety data visualization and exploration, (iii) safety performance evaluation and monitoring, (iv) safety predictive models, and (v) safety related decision making.

   b. Contents (in 100 to 150 words)

   (Please attach the detailed lecture-wise breakup and/or list of experiments)

   Unit 1: **Safety data**: Data types, sources and characteristics; collection, recording and reporting; data capture systems including 3D spatial data models; data integration. [8 hours]
   Unit 2: Safety data visualization and exploration: Visualization, charts and probability distributions; content analysis, text mining, clustering, and principal component analysis [16 hours]
   Unit 3: Safety performance evaluation and monitoring: Key performance indicators and their measurements; control charts and safety capability analysis; multivariate charts. [8 hours]
   Unit 4: Safety predictive models: Poisson and multinomial distributions; generalized linear models

including log-linear, logistic regression and multinomial logit models; CART, association rules, and time series analysis; model verification and validation, resampling methods [16 hours]
Unit 5: Safety related decision making: Statistical measures of safety programme effectiveness; safety simulation for training related decisions; decision trees and resource allocation [8 hours].

7. Names of the faculty members of the Department/Centre/School who have the necessary expertise and will be willing to teach the subject (minimum two faculty members should be willing to teach the subject) **:**
   1. Prof J Maiti, ISE
   2. Prof J K Jha, ISE
   3. Prof Srikrishna Kumar, ISE

8. Do the contents of the subject have an overlap with any other subject offered in the institute? If yes, please give details as follows. **:** Yes, < 10%.
   a) The number and name of the existing subjects
   b) Approximate percentage of overlap
   c) Reason for offering the new subject in spite of the overlap

   (i) Applied Multivariate Statistical Modelling – I (IM60061)
   (ii) Advanced Multivariate Analysis (MA61037)

   The overlap is insignificant. Further, this is absolutely a new course considering the domain and data, its applications and treatments. It is primarily proposed for Micro-specialization in "Industrial Safety Engineering".

9. Recommended text books **:**
   1. McCullagh, P., and Nelder, J. A., Generalized Linear Models, Chapman and Hall, London, 1989.
   2. Stokes, M.E., Davis, C.S. and Koch G.G., Categorical data analysis using SAS, SAS Institute Inc., USA, 2012.
   3. Johnson, R.A. and Wichern, D.W., Applied Multivariate Statistical Analysis, PHI, Delhi, 2013.
   4. Ross, S.M., Introduction to Probability Models, Elsevier, New Delhi, 2010.

10. Reference books **:**
    1. Siegel, E., Predictive Analytics, Wiley India Pvt. Ltd., New Delhi, 2013.
    2. Davenport, T.H., Big Data at Work, HBR Press, Boston, 2014.
    3. Powel, S.G. and Batt, R.J., Modeling for Insight – A Master Class for Business Analysts, Wiley India Pvt. Ltd., New Delhi, 2008.

11. Names of the departments/centres/schools/ programmes whose students are expected to register this subject **:**
    1. Agricultural and Food Engineering
    2. Architecture and Regional Planning
    3. Chemical Engineering
    4. Civil Engineering
    5. Computer Science & Engineering
    6. Electrical Engineering
    7. Energy Science and Engineering
    8. Environmental Science and Engineering

9. Humanities & Social Sciences
10. Industrial and Systems Engineering
11. Mathematics
12. Mechanical Engineering
13. Metallurgical & Materials Engineering
14. Mining Engineering
15. Rajendra Mishra School of Engg Entrepreneurship
16. Ranbir & Chitra Gupta School of Infrastructure Design & Mngt
17. Reliability Engineering Centre
18. Steel Technology Centre
19. Vinod Gupta School of Management

Date:

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Signature of the Head/Dean of the Dept./Centre/School