

RAJALAKSHMI ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University, Chennai)

Common Open Electives for PG courses as per R2019

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
CP19031	BUSINESS ANALYTICS	OE	3	0	0	3

Objectives:	
•	To understand the role of business analytics within an organization.
•	To analyze data using statistical and data mining techniques.
•	To gain an understanding of how managers use business analytics to formulate and solve business problems.
•	To become familiar with processes needed to develop, report, and analyze business data.
•	To use decision-making tools/Operations research techniques.

UNIT-I	INTRODUCTION	9
Business analytics: Overview of Business analytics– Scope of Business analytics– Business Analytics Process– Relationship of Business Analytics Process and organization – competitive advantages of Business Analytics– Statistical Tools: Statistical Notation– Descriptive Statistical methods– Review of probability distribution and data modelling– sampling and estimation methods overview.		
UNIT-II	REGRESSION AND VISUALIZATION	9
-Trendiness and Regression Analysis: Modelling Relationships and Trends in Data– simple Linear Regression. – Important Resources– Business Analytics Personnel– Data and models for Business analytics– problem solving– Visualizing and Exploring Data–Business Analytics Technology		
UNIT-III	ANALYTICAL MODELS	9
Organization Structures of Business analytics–Team management–Management Issues– Designing Information Policy– Outsourcing– Ensuring Data Quality– Measuring contribution of Business analytics– Managing Changes. Descriptive Analytics– predictive analytics– predicative Modelling– Predictive analytics analysis– Data Mining and Methodologies– Prescriptive analytics and its step in the business analytics Process– Prescriptive Modelling–nonlinear Optimization.		
UNIT-IV	FORECASTING TECHNIQUES	9
Qualitative and Judgmental Forecasting– Statistical Forecasting Models– Forecasting Models for Stationary Time Series– Forecasting Models for Time Series with a Linear Trend– Forecasting Time Series with Seasonality– Regression Forecasting with Casual Variables– Selecting Appropriate Forecasting Models– Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform– New-Product Development Model,–Newsvendor Model– Overbooking Model– Cash Budget Model.		
UNIT-V	DECISION ANALYSIS	9
Decision Analysis: Formulating Decision Problems– Decision Strategies with the without Outcome Probabilities– Decision Trees– The Value of Information, Utility and Decision Making– Recent Trends in: Embedded and collaborative business intelligence– Visual data recovery– Data Storytelling and Data journalism.		
Total Contact Hours		: 45

Course Outcomes:	
Upon completion of the course, the students will be able to	
•	Demonstrate knowledge of data analytics.
•	Think critically in making decisions based on data and deep analytics.
•	Use technical skills in predicative and prescriptive modeling.
•	Translate data into clear, actionable insights.
•	Make decisions using various tools.

Reference Book(s):	
1	Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications", Pearson FT Press, 2014.
2	James R Evans, "Business Analytics", Pearson's Education, 2016.

CO - PO matrices of course

PO \ CO	PO1	PO2	PO3	PO4	PO5
CP19O31.1	1	-	3	3	2
CP19O31.2	3	3	3	3	2
CP19O31.3	3	1	3	3	2
CP19O31.4	3	2	3	3	1
CP19O31.5	3	3	3	3	3
AVERAGE	2.6	2.3	3.0	3.0	2.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation : "-"

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
PG19O33	Waste to Energy (Common to all)	OE	2	1	0	3
Course Objectives:						
●	To provide knowledge on solid waste sources.					
●	To identify the methods of solid waste disposal.					
●	To impart knowledge on energy generation by Bio-Chemical Conversion.					
●	To provide knowledge on energy generation by Thermo- Chemical Conversion.					
●	To impart knowledge on e-waste					
UNIT-I	Solid Waste Sources					9
Solid Waste Sources, types, composition, Properties, Global warming, Municipal Solid Waste: Physical, chemical and biological properties , Waste Collection and, Transfer stations, Waste minimization and recycling of municipal waste, Segregation of waste, Size Reduction , Managing Waste. Status of technologies for generation of Energy from Waste Treatment and Disposal Aerobic composting, incineration, Furnace type and design, Medical waste /Pharmaceutical waste treatment Technologies, incineration, Environmental impacts, Measures to mitigate environmental effects due to incineration .						
UNIT-II	Solid Waste Disposal Methods					9
Land fill classification, Types, methods and Siting consideration, Layout and preliminary design of landfills: Composition, characteristics, generation, Movement and control of landfill leach ate and gases, Environmental monitoring system for land fill gases.						

UNIT-III	Energy Generation from Waste Bio-chemical Conversion	9
Sources of energy generation, anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, Industrial waste, agro residues, Anaerobic Digestion.		
UNIT-IV	Energy Generation from Thermo-chemical Conversion	9
Biogas production, Land fill gas generation and utilization, Thermo-chemical conversion: Sources of energy generation, Gasification of waste using Gasifiers, Briquetting, Utilization and advantages of briquetting, Environmental benefits of Bio-chemical and Thermo- chemical conversion.		
UNIT-V	E-waste	9
E-waste in the global context – Growth of Electrical and Electronics Industry in India – Environmental concerns and health hazards – Recycling e-waste: a thriving economy of the unorganized sector – Global trade in hazardous waste – impact of hazardous e-waste in India. Management of e-waste: e-waste legislation, Government regulations on e-waste management – International experience – need for stringent health safeguards and environmental protection laws of India.		
		Total Contact Hours : 45
Course Outcomes: Upon the completion of the subject, the student will be able to		
●	Understand the technologies for generation of energy from solid waste	
●	Compare the methods of solid waste disposal	
●	Understand the concept of energy generation by Bio-chemical conversion	
●	Understand the concept of energy generation by Thermo-chemical conversion	
●	Understand about e-waste	
Text Book (s):		
1	P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. “Solid Waste Engineering”, Second edition, Cengage learning India Pvt. Limited, 2016	
2	Nicholas P. Cheremisinoff, “ Handbook of Solid Waste Management and Waste Minimization Technologies”, An Imprint of Elsevier, New Delhi, 2003	
3	Zander Ellis, “Industrial Waste Management”, Larsen and Keller Education, 2017	
Reference Books(s) / Web links:		
1	C Parker and T Roberts (Ed), “Energy from Waste – An Evaluation of Conversion Technologies”, Elsevier Applied Science, London, 1985	
2	Sofer, Samir S, Oskar R. Zaborsky, “Biomass Conversion Processes for Energy and Fuels”, Springer, 2012	
3	Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., “Solid Waste Management”, New York, Van Nostrand, 1973	
4	Amalendu Bagchi. “Design of Landfills and Integrated Solid Waste Management”. 3 rd edition, John Wiley and Sons. New York, 2004	
5	C. S. Rao. “Environmental Pollution Control Engineering”, Wiley Eastern Ltd. New Delhi (1995)	
6	“E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011”	
7	KL Shah, “Basics of Solid and Hazardous Waste Management Technology”, Prentice Hall, 2003	
8	M Datta, “Waste Disposal in Engineered Landfills”, Narosa Publishing House, 1997	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1				
CO2	1	1				
CO3	1	1				
CO4	1	1				
CO5	1	1				
AVG	1	1	0	0	0	0

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
ED19031	INDUSTRIAL SAFETY	OE	3	0	0	3

Objectives:	
<input type="checkbox"/>	To understand the Fundamental concept and Principle of Industrial Safety
<input type="checkbox"/>	To apply the principle of Maintenance Engineering
<input type="checkbox"/>	To Study about various types of wear and methods to reduce it.
<input type="checkbox"/>	To know about various fault-finding methods of machine tools
<input type="checkbox"/>	To understand about preventive and periodic maintenance methods.

UNIT-I	Industrial Safety	10
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety colour codes. Fire prevention and firefighting, equipment and methods.		
UNIT-II	Physical and Chemical Hazards	11
Noise, compensation aspects, noise exposure regulation, properties of sound, occupational damage, risk factors, sound measuring instruments. Prevention and control of noise. Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. Dose, TLV - Methods of Evaluation, process or operation description, Field Survey, Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard.		
UNIT-III	ENVIRONMENTAL CONTROL	8
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.		
UNIT-IV	HAZARD ANALYSIS	8
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.		
UNIT -V	SAFETY REGULATIONS	8
Explosions – Disaster management – catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety – case studies.		
Total contact Hours: 45		

Course Outcomes: At the end of this course, the student can	
<input type="checkbox"/>	Explain the fundamental concept and principles of industrial safety
<input type="checkbox"/>	Apply the principle of Maintenance engineering
<input type="checkbox"/>	Able to understand the types of wear and methods to reduce it.
<input type="checkbox"/>	Able to find various faults in machine tools
<input type="checkbox"/>	Able to apply periodic maintenance for various equipment's.

Reference/Websites:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.
2. Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, CRC Press, 2003.
3. L M Deshmukh, Industrial Safety Management, Tata McGraw-Hill Education, 2005.
4. J Maiti, Pradip Kumar Ray, Industrial Safety Management: 21st Century Perspectives of Asia, Springer,2017.
5.. David L.Goetsch, “Occupational Safety and Health for Technologists”, 5th Edition, Engineers and managers, Pearson Education Ltd., 2005.of Asia, Springer,20175 .
6. https://nptel.ac.in/courses/110/105/110105094/

Subject Code	Subject Name (Theory Courses)	Category	L	T	P	C
ED19032	OPERATIONS RESEARCH	OE	2	1	0	3

Objectives: The course is intended to build up necessary background and	
•	To create awareness about optimization techniques in utilization of resources and to formulate the linear programming model for industrial applications
•	To provide knowledge and training in various applications of LPP like assignment model, transportation model, Network model and sequencing models
•	To understand the deterministic and stochastic inventory models
•	To understand the Single and Multi-server queuing models.
•	To provide knowledge about the various decision models

UNIT-1	LINEAR MODELS	15
Introduction to Operations Research - Scope, objectives, phases, models and limitations. Linear programming - formulation of LPP - Graphical method - Simplex algorithm - Artificial variables - Big M method - Two phase method - Duality formulation.		
UNIT - II	TRANSPORTATION MODELS AND NETWORK MODELS	8
Transportation models - Finding basic feasible solution - LCM, NWC and VAM methods - Optimality test using MODI method. Assignment Models - Hungarian method for optimal solution - Unbalanced problem - Traveling Salesman problem Networks models - Shortest route - Minimal spanning tree - Project network - CPM and PERT networks - Critical path scheduling Sequencing models - Processing n Jobs through 2 Machines - Processing n Jobs through 3 Machines - Processing 2 Jobs through m machines - Processing n Jobs through m Machines.		
UNIT-III	INVENTORY MODELS	6
Inventory models - Economic order quantity models - Quantity discount models - Stochastic inventory models - Multi product models - Inventory control models in practice		
UNIT - IV	QUEUEING MODELS	7
Queueing models - Queueing systems and structures - Notation parameter - Single server and multi-server models - Poisson input - Exponential service - Constant rate service - Infinite population - Simulation.M.M.1&M.M.S.system cost considerations		
UNIT - V	DECISION MODELS	9
Decision models - Game theory - Two-person zero sum games - Pure and mixed strategy - Graphical solution - Algebraic solution - Method of Dominance Replacement models - Replacement Introduction, Replacement of items that deteriorate with time - value of money unchanging and changing, Replacement of items that fail completely. Dynamic Programming - Simple Problem.		
Total Contact Hours :		45

Course Outcomes: Upon completion of this course, the students will be able to:	
•	To Formulate a real-world problem as a mathematical linear programming model and solve it using techniques of LPP
•	To build and solve specialized linear programming problems like Transportation Models, Assignment Models and Network.
•	To know about the maintenance of inventory level and its calculations
•	To Model a dynamic system as a queuing model and compute important performance measures
•	To solve the playing of game using pure and mixed strategy and to understand the replacement policy

Reference Books(s) / Web links:	
1	Taha H.A., "Operations Research- An introduction", Tenth Edition, Pearson, 2017.
2	Srinivasan G, "Operation research" PHI, 2010.
3	Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 1990.
4	Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992
5	Hillier and Libeberman, "Operations Research", Holden Day, 1986
6	Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.

