RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Open Elective ME- 703(A) Operation Research & Supply Chain

Course Objective:

The student will be made .

1. To be familiar with all the OR Techniques and optimization methods.
2. To understand the role of logistics in the supply chain within a focal firm as well as between organisations linked within a given supply chain network. and ,
3. To be familiar with various inventory control techniques.
4. To clear idea of the decision making and meta-heuristic algorithm.

Course Content:

Unit 1 Linear system and distribution models: Mathematical formulation of linear systems by LP, solution of LP for two variables, Simplex method, special cases of LP- transportation and assignment model and their graphical solution, Vogels Approximation Method (VAM) or penalty method, cell evaluation degeneracy, basics of SW Lindo, Tora, Excell.

Unit II Supply chain (SCM): Definition, importance, expenditure and opportunities in SCM; integrationof inbound, outbound logistics and manufacturing to SCM, flow of material money and information,difficulties in SCM due to local v/s system wide (global) optimization and uncertainties in demand andtransportation; Bull-whip effect; customer value; IT, info-sharing and strategic partnerships; plant andwarehouse-network configuration; supply contracts and revenue sharing; outsourcing; transportation,cross docking and distribution, forecasting models in SCM; coordination and leadership issues; changeof purchasing role and vendor rating, variability from multiple suppliers.

Unit III Inventory models: Necessity of inventory in process and safety stock, problem of excess inventory and cycle time, JIT/ Lean Mfg; basics of inventory models with deterministic demand, Classical EOQ Model, ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP to ERP to SCM and e-business.

Unit IV (a) **Waiting Line Models:** Introduction, Input process, service mechanism, Queue discipline,
single server (M/M/1), average length and average time calculations, optimum service rate; basic multipleserver models (M/M/s)
(b) **Competitive strategy:** concept and terminology, assumptions, pure and mixed strategies, two-person zero sumgames, saddle point, dominance, graphical, algebraic and LP methods for solving game theory
problems.

Unit V: (a) **Network Analysis:** Project Planning, Scheduling and Controlling; Project management; Network Techniques and its role in project management, Network logics, Fulkerson's Law, Merits and Demerits of AON Diagrams; Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Determination of critical path, Float/Slack.
(b**) Meta-heuristics:** Definition of heuristic and meta-heuristic algorithms; introduction to Tabu search,Simulated Annealing and Genetic algorithms and solution of traveling salesman, non linearoptimization problems.

References:

1. Hillier FS and Liberman GJ; Introduction to Operations Research concept and cases; TMH
2. Simchi-Levi, Keminsky; Designing and managing the supply chain; TMH.
3. Heera and Gupta,Operation Research, S Chand Pub.
4. Sharma JK; Operations Research; Macmillan
5. Taha H; Operations research; PHI
6. Jain, pandey & shrivastava; Quantitative techniques for management, New Age publishers.
7. Srinivasan G; Quantitative Models In Operations and SCM; PHI Learning
8. Mohanty RP and deshmukh SG; Supply Chain Management; Wiley India
9. Sen RP; Operations Research-Algorithms and Applications; PHI Learning
10. Bowersox DJ, Closs DJ, Cooper MB; Supply Chain LogistiMgt; TMH
11. Bronson R ;Theory and problems of OR; Schaum Series; TMH
12. Kantiswaroop,Operation Research, Sultan Chand

Course Out Comes:

Evaluation:

Evaluation will be continuous and integral part of the class as well as through external assessment.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Open Elective ME- 703(B) Artificial Intelligence Techniques

Course Objectives

After studing this course, students will be able to

1. learn about importance of AI techniques. Adoption of Artificial Intelligence (AI) technologies is widely expanding in our society. Applications of AI include: self-driving cars, personal assistants, surveillance systems, robotic manufacturing, machine translation, financial services, cyber security, web search, video games, code analysis and product recommendations.

2. Know the exact application of AI Techniques. Such applications use AI techniques to interpret information from a wide variety of sources and use it to enable intelligent, goal-directed behavior.

3. understand the working of Modern AI based systems. It often involves self-learning systems that are trained on massive amounts of data, and/or interacting intelligent agents that perform distributed reasoning and computation.

4. Know about sensors used in AI based systems.AI connects sensors with algorithms and human-computer interfaces, and extends itself into large networks of smart devices.

5. know the opportunities after having knowledge of AI techniques. The knowledge of Artificial Intelligence opens career opportunities in companies that are building the next generation of intelligence and language understanding for their products: for example intelligent personal assistants, opinion mining systems, customer support system, biomedical applications, computer games, smart adaptive devices, robots, smart planning systems.

Syllabus

Unit 1: Introduction to Artificial Intelligence

Main components and characteristics of AI (Feature Engineering,ANN,Deep Learning),Applications of AI, Advantages and disadvantages of AI, Goals of AI, Comparision of Programming of a System with AI and without AI,Challenges in AI, Programming languges preferably used in AI,Techniques/Algorithms used in AI,AI Software plaforms,Future of AI

Unit 2: Various types of production systems and search techniques: Types of production systems,Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies.

Unit 3: Knowledge Representation and Probabilistic Reasoning: Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning. Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Unit 4: Game playing techniques: Minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Unit 5: Introduction to learning ,ANN: Various techniques used in learning, introduction to Artificial neural networks, common sense, reasoning, Convolution Neural Network,Feedforward Neural Network, Recurrent Neural Network, Multilayer perceptron, Architecture / Three Layers in Artificial Neural Networks, Implementation of ANN, Applications of ANN in images,signals and languagesome example of expert systems.

References:-

1.Rich E and Knight K, "Artificial Intelligence", TMH, New Delhi.
2.Nelsson N.J., "Principles of Artificial Intelligence", Springer Verlag, Berlin.
3. Stuart Russell , Artificial Intelligence: A Modern Approach , 3rd Edition), Peter Norvig, PHI, ISBN-13: 978-0136042594, ISBN-10: 0136042597
4. B. Yegnanarayana , Artificial Neural Networks ,PHI
5.Schalkoff, Artificial Neural Networks . Mc Graw HILL Education

Evaluation:

Evaluation will be continuous and integral part of the class as well as through external assessment

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Open Elective ME-703(C) Systems Engineering

This course in systems engineering examines the principles and process of creating effective systems to meet application demands.
The course is organized as a progression through the systems engineering processes of analysis, design, implementation, and deployment with consideration of verification and validation throughout.
COURSE OUTCOME: After successful completion of the course, students would be able to

* Plan and manage the systems engineering process
* Examine systems from many perspectives (such as software, hardware, product, etc.)
* Distinguish critical functions, diagnose problems, and apply descoping strategies and judge the complexity of production and deployment issues.
* Know about the complexity in modern systems such as in missiles, rocket engines, modern automobiles etc.
* Solve real complex problems

Syllabus:

Unit 1: Overview of Systems Engineering:
Introduction, Origin, Examples of Systems requiring systems engineering,Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, System Engineering Approaches.

Unit 2: Structure of Complex Systems:
System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.

Unit 3 Concept Development and Exploration:
Originating a New System, Operational Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.Exploration in system life cycle, Concept definition phase, Activities involved in concept definition phase.

Unit 4: Engineering Development:
Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction. Place of engineering design phase in system life cycle, Various activities involved in engineering design phase.

Unit 5: Integration and Evaluation:
Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.operation and support phase.

Books:

1.Alexander Kossiakoff, William N Sweet, "System Engineering Principles and Practice, Wiley India
2.Blanchard Fabrycky, Systems engineering and analysis, Pearson
3. Dwivedi Krishna K, Pandey M., Fundamentals of Systems Engineering , Wiley Precise Text book Series, Wiley India. ISBN: 978-265-6654-9
4. Dennis M. Buede, William D.Miller, "The Engineering Design of Systems: Models & Methods" Wiley India
5.JeffreyL Whitten, Lonnie D Bentley, "System Analysis and Design Methods" 6.Richard Stevens, Peter Brook," System Engineering – Coping with complexity, Prentice Hall of India.
7.Eisner, H. Essentials of Projects and Systems Engineering Management, 2nd edition. John Wiley & Sons, New Jersey, USA.
8. Buede, D. M.. The Engineering Design of Systems, Models and Methods. John Wiley & Sons, New Jersey, USA.

Evaluation:

Evaluation will be continuous and integral part of the class as well as through external assessment

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New Scheme Based On AICTE Flexible Curricula

Mechanical Engineering, VII-Semester

Open Elective ME-703(D) Reliability Engineering

Course Objectives:

1. To introduce the basic concepts of reliability, various models of reliability.
2. To analyze reliability of various systems.
3. To introduce techniques of frequency and duration for reliability evaluation of repairable systems.

Unit 1. Reliability :

Definition, Importance, History, Reliabilty Vs. Quality,Failure pattern of complex product, Factor of safety and reliability, Reliability analysis procedure, Reliability management , Some examples of system failures., Reliability function-MTTF, Hazard rate function, Bathtubcurve

Unit 2. Basic probability theory:

Set theory, Laws of probability, Probability theorem Random variables and probability distributions, Bay's Theorem, Central limit theorem,

Unit 3. Functions of random variables:

Single , two and several random variables, Probability distribution functions, density functions for different types of discrete and continuous variables, mean, mode and median, Numerical solutions, Extremal distributions, derivation of the reliability function-constant failure rate model – time dependent failure models. Weibull distribution – normal distribution – the lognormal distribution.

Unit 4. Modeling of geometry, strength and loads:

Fatigue strength, Time dependent reliability of components, Failure rate versus time, reliability and hazard functions and different distributions, Estimation of failure rate, Expected residual life, Series, parallel and mixed systems, complex systems, Reliability enhancement,

Unit 5. Reliability based design:

Optimization problems, Failure modes and effect analysis, Event tree and fault tree analysis, Reliability testing, Reliability data and analysis, measurement of reliability, Monte Carlo Simulation, Computation of reliability, Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

References:

1. Singiresu S. Rao, Reliability Engineering, Pearson
2. Grant E. L. & Leave Worth, Statistical Q. C., T.M.H.
3. Balagurusamy, Reliability Engg., T.M.H.
4. Mahajan , Statistical Q.C.
5. Juran and Grayan, Quality Planning Analysis, T.M.H
6. Charles E. Ebling, "An introduction to Reliability and Maintainability Engg", Tata McGraw-Hill, 2000
7. Atrick D T o'connor, "Practical Reliability Engineringt", John-Wiley and Sons inc, 2002
8. David J Smith, "Reliability, Maintainability and Risk: Practical Methods for Engineers", Butterworth, 2002.