MASTER OF SCIENCE

(Operations Research and Computer Applications)

SYLLABUS
FOR
CREDIT-BASED CURRICULUM

(Applicable for 2013-2014 onwards)

DEPARTMENT OF COMPUTER APPLICATIONS,
NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI – 620 015
TAMIL NADU, INDIA

About us:

The Department of Computer Applications is one of the pioneering departments of the institution that offers Information Technology courses such as MCA and one among the top five offering MCA courses in the country. It is committed to impart quality education in the sub-fields of IT, a field growing in leaps and bounds.

Vision:

Towards a school of Information Science and Technology conforming to international standards

Mission:

- To offer state-of-art education in Information Science and Technology
- To provide strong theoretical foundation complemented with extensive practical training
- To inculcate value-based, socially committed professionalism to the cause of overall development of students and society

MASTER OF SCIENCE
(OPERATIONS RESEARCH AND COMPUTER APPLICATIONS)

Objective of the Programme:

This programme is structured to enable undergraduate students of Mathematics and Computer Science discipline to evolve as Masters of Science (Operations Research and Computer Applications). The programme imparts basic concepts of Operations Research, Computer Science and Applications. The programme also provides opportunity for the development of comprehensive knowledge and skills to develop systems based on optimization techniques for the emerging needs in the IT and ITES industries.

The board of studies for Computer Applications Department includes the following members:

- **Chairman:**

  Dr. S. Nickolas
  Head of the department

- **External Experts:**

  1. Dr. K. Chandrasekar
     Professor
     Department of Computer Science & Engineering
     National Institute of Technology Karnataka, Surathkal

  2. Dr. P. Rajendran
     Founder and Managing Director
     Paragon Dynamics Info Systems Pvt. Ltd.
     Chennai

- **Members:**

  1. Dr. N.P. Gopalan
  2. Dr. A.V. Reddy
  3. Dr. B. Ramadoss
  4. Dr. Michael Arock
  5. Dr. A.Vadivel
  6. Dr. S.R. Balasundaram
  7. Dr. P.J.A. Alphonse
  8. Dr. S. Domnic
  9. Dr. (Mrs). B. Janet
  10. Mrs.S. Sangeetha
  11. Ms. R. Eswari
  12. Mr. U. Srinivasulu Reddy
  13. Mr. I. Brem Navas
  14. Mr. R. Gobi
  15. Ms. Pragati Priyadharshini

Syllabus

Semester	Subject Code	Subject Name	L	T	P	C
I	CA 761	Probability, Statistics and Estimation	3	0	0	3
	CA 763	Discrete Mathematics	2	1	0	3
	CA 765	Linear Programming And Simulation	2	1	0	3
	CA 767	Computer Organization And Architecture	3	0	0	3
	CA 769	Programming in C and C++	3	0	0	3
	CA 751	Linear Programming Lab	0	0	4	2
	CA 753	Programming Lab in C and C++	0	0	4	2
II	CA 762	Non-linear Programming	2	1	0	3
	CA 764	Data Analytics	2	1	0	3
	CA 766	Operating Systems	3	0	0	3
	CA 768	Database Management Systems	3	0	0	3
	CA 770	Data Structures and Algorithms	3	0	0	3
	CA 752	Data Structures Lab	0	0	4	2
	CA 754	Unix/Linux Lab	0	0	4	2
III	CA 771	Replacement, Reliability and Network Models	2	1	0	3
	CA 773	Visual programming	3	0	0	3
	CA 775	Inventory Theory and Dynamic Programming	3	0	0	3
	XXXX	Elective - I	3	0	0	3
	XXXX	Elective - II	3	0	0	3
	CA 755	Visual Programming Lab	0	0	4	2
	CA 757	DBMS Lab	0	0	4	2
IV	CA 799	Project Work	0	0	0	10
		Grand Total	**40**	**5**	**24**	**67**

Elective Papers

Subject Code	Subject Name	L	T	P	C
CA 781	Advanced Data Analytics	3	0	0	3
CA 782	Multiple Criteria and Decision Making	3	0	0	3
CA 783	Logistics Management	3	0	0	3
CA 784	Supply Chain Management	3	0	0	3
CA 785	Quality Control and Assurance	3	0	0	3
CA 786	Decision Support Systems	3	0	0	3
CA 787	Software Engineering	3	0	0	3
CA 788	Object Oriented Programming, Analysis and Design	3	0	0	3
CA 789	Graphics and Multimedia	3	0	0	3
CA 790	Computer Networks	3	0	0	3

L : LECTURE | T : TUTORIAL | P : PRACTICAL | C : CREDITS

CA761 - PROBABILITY, STATISTICS AND ESTIMATION

Objective*: To learn Probability, Statistics and Estimation methodologies and aspects*

Random experiments - Probability spaces - Elementary theorems - Conditional probabilities - Independent events

Probabilistic modeling and random variables -cdf and pdf of random variables; standard discrete and continuous models

MGF and Characteristic functions – transformations - Covariance and correlation - Random variable sequences - inequalities

MMS – MLE - linear Estimation and interval Estimation

Sampling distribution; Test of significance - Tests of hypotheses and ANOVA

References:

1. Sheldom M.Ross, "Introduction to Probability Models", Elsevier 10th Edition, 2010

2. YannisViniotis, "Probability and Random Processes for Electrical Engineers", Mc-GrawHill International Edition, 1997.

3. William R. Dillon and Mathew Goldstein**,** "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984.

Outcome: ***Students will be able to solve problems systematically in probability and statistics and to use estimations efficiently.***

CA 763 – DISCREATE MATHEMATICS

Objective: ***To learn Discrete Mathematics methodologies and aspects***

Sets - Relations – Posets - Functions - Mathematical Inductions (Simple and strong) – Principles of Counting (Addition & Multiplication)

Graphs - Basic concepts - Isomorphism – complements - Matrix representation of graphs - Trees, Spanning trees, Minimal Spanning tree Algorithms - Euler graphs - Hamiltonian graphs.

Recurrence Relations and Generating Functions - Homogeneous and non-homogeneous recurrences and their solutions - solving recurrences using generating functions

Mathematical Logic – Predicate Calculus – Scope – Binding – Resolution – Regular Grammars

Finite Automata – Context-Free Grammars – Chomsky's Normal form -Griebach Normal Form - Push-down Automata - Equivalence of CFL's and PDA's - Non-context free languages.

References:

1. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier, 2006.
2. NarsinghDeo, "Graph theory and applications to Engineering and Computer Science", PHI, 1986.
3. Arthur Gill, "Applied Algebra for the Computer Sciences", Prentice Hall, 1976.
4. Michael Sipser, "Introduction to Theory of Computation", PWS Publishing Co., 1996

Outcome: ***Ability to understand and solve the Discrete Mathematics problems systematically and efficiently.***

CA 765- LINEAR PROGRAMMING AND SIMULATION

Objective: ***To learn Linear Programming Techniques and to use Simulation in LPP***

Convex sets, Extreme points, Convex and concave functions, properties - Linear Programming Problems: Formulation, Graphical solution, Fundamental properties of solutions - Simplex Method- Big-M Method - Two phase Method - Revised Simplex Method

Duality - Primal and Dual LPP problems – Properties - Dual Simplex Method - Sensitivity analysis - Discrete changes in cost vector in requirement vector – Coefficient-matrix Parametric programming - Parameterization of cost vector and requirement vector

Transportation Problem - Methods of generating Basic Feasible solution – Optimality –Modi Method - Assignment Problem - Routing problems - Traveling Salesman problem

Integer programming Problem - Gomory's method - Branch and bound method. Linear Fractional programming – Variable transformation method - Updated objective function method - Bounded variable technique

Simulation - Nature and need for simulation - Monte Carlo method - generation of pseudo random numbers by mid-square method, congruence multiplier method - Test for randomness - generating random variables for known probability distributions - Uniform, Exponential, Erlangian, Poisson, Normal Distributions - Applications to simple problems in Operations Research

References:

1. F.S.Hillier and G.J. Lieberman, "Introduction to Mathematical programming", McGraw-Hill International Edition, 1995.
2. F.S.Hillier and G.J. Lieberman, "Introduction to Operation Research: Concepts and Cases", McGraw-Hill International Eighth Edition, 2008.
3. H.A.Taha- "Operations Research: An Introduction", 6th Edition, Prentice Hall, 1997.

Outcome: ***Ability to solve LP problems systematically and to simulate LPP models using simulators.***

CA767 - COMPUTER ORGANIZATION AND ARCHITECTURE

Objective: ***To understand the basic structure of a digital computer and to study the operation of internal component***

Number Systems - Binary Arithmetic - Boolean algebra - Map Simplifications - Gates - Combinational Circuits - Sequential Circuits.

Memory: Internal - External - Memory Organization - Associative - Cache – Virtual memory.

CPU: Arithmetic and Logic Unit - Instruction Sets - RISC - CISC - Instruction pipeline - Addressing modes and formats - Register organization - Control Unit Operation - Processor organization.

External Devices: I/O modules - Programmed I/O - Interrupt Driven I/O - Direct Memory Access - I/O Channels - Asynchronous Data Transfer.

Processors: Parallel – Grid – Multi-core – Mobile – Embedded - Cloud computing.

Case Study: Mobile processors.

References:

1. William Stallings, "Computer Organization and Architecture", 9th Edition, PHI, 2012
2. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson Education, 2013
3. Hennessy J. and Patterson D., "Computer Architecture— A Quantitative Approach", Morgan Kaufmann, 4th Edition, 2007.

Outcomes: ***Knowledge about the design and organization of components in computing systems.***

CA769 - PROGRAMMING IN C AND C++

Objective: ***To learn problem solving aspects of C and basic principles of object-oriented programming paradigm***

Introduction to Computers - Classification and Applications - H/W and S/W components - Programming paradigm- Program development cycle - Evolution of Programming languages Principles of Structured programming – Sequential, selective and repetitive structures

C Programming Language Fundamentals - Character set - Syntax - Input and output - Program writing, Control Structures – Iterative structures Arrays - Pointers – Operations on pointers - Multidimensional Arrays

Structures and Unions – Functions - Command Line Arguments - Dynamic Memory Allocation - Preprocessor Directives

Object Oriented Programming Concepts - Constructors and Destructors - Static Members and Function - Friend Functions - Inheritance - this pointer.

Polymorphism - Function Overloading - Operator Overloading - Virtual Functions - Templates

References:

1. Darnell & Margolis "ANSI C –A Systematic programming Approach" ,Narosa, 1991.
2. Holub, "C++ Programming", 1st edition, Addison Wesley,1995.
3. Bruce Eckel, "Thinking In C++" 2nd Edition, PHI, 2000.
4. Herbert Schildt, "C++ Complete Reference", 4th Edition, McGraw Hill, 2002.

Outcome: ***Ability to apply appropriate procedural and object-oriented programming concepts for solving problems.***

CA 751 – LINEAR PROGRAMMING LAB

Linear Programming and Transportation algorithms to be programmed in LINDO and C. Sensitivity Analysis using LINDO

CA 753 –PROGRAMMING LAB IN C AND C++

Problem solving using Programming Languages studied in CA 769

CA762 - NON-LINEAR PROGRAMMING

Objective: ***To learn mathematical techniques to solve non-linear optimizationproblems***

Unimodal and Convex functions, Hessian Matrix, Positive definite and Negative definite matrices - One dimensional optimization - Fibonacci Method- Golden Section Method - Quadratic Interpolation Method – Cubic Interpolation Method

Multi-dimensional unconstrained optimization - Univariate Method –Newton's Method, Conjugate Directions and Conjugate Gradient – Fletcher-Reeves Method – Davidson-Fletcher- Powell Method

Multi-dimensional constrained optimization - Lagrange multiplier method - Kuhn-Tucker Conditions - Modified Hookes and Jeeves Method - Interior and Exterior Penalty Function Method

Quadratic Programming – Wolfe's Method - Beales Method - Geometric Programming Polynomials - Calculus Method - Arithmetic Geometric Inequality Method

Separable programming - Piecewise linear Approximation Method - Case studies in Non-linear Programming

References:

1. S.S. Rao, "Optimization: Theory and Applications" 2nd Edition, Wiley Eastern
2. Bazaara, Shetty and Sherali "Non-linear Programming: Theory and Algorithms", Wiley

Outcome: ***Ability to deal with industry oriented constrained optimization problems and compute scientific results.***

CA764 -DATA ANALYTICS

Objective: ***To introduce concepts of data analytics to simplify the task of data analyst to make wise decisions in industries***

General Linear Regression Model, Estimation for β, Error Estimation, Residual Analysis Tests of significance - ANOVA, Forward, Backward, Sequential, Stepwise and all possible subsets, Dummy Regression, Logistic Regression and Multi-Colinearity

Discriminant Analysis-Two group problem, Variable contribution, Violation of assumptions, Discrete and Logistic Discrimination, The k-group problem, multiple groups, Interpretation of Multiple group Discriminant Analysis solutions

Principal Component Analysis-Extracting Principal Components, Graphing of Principal Components, Some sampling Distribution results, Component scores, Large sample Inferences, Monitoring Quality with principal Components

Factor Analysis-Orthogonal Factor Model, Communalities, Factor Solutions and rotation

References:

1. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", 6th Edition, Pearson Education, 2007.
2. William R. Dillon and Mathew Goldstein, "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984.

Outcome: ***Ability to analyze and design new strategies to improve industries and companies decision making process.***

CA 766 – OPERATING SYSTEM

Objective: ***To understand the concepts of OS with case study on different operating systems.***

Operating System concept- OS Structure –Services-System calls – Process management-Process Concept-Operations on process-Cooperating processes- Inter-process communication-Process scheduling-Scheduling algorithms-Threads- Multithreading models

Process synchronization- critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors Deadlock-Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock

Memory management-Buddy system-Paging-segmentation-Virtual Memory –Demand paging-Page replacement algorithms – Allocation of frames – Thrashing-Working set model

Files and Directories - Files System structure- Implementation –File allocation methods-Free space management. I/O systems – I/O interface –Kernel I/O subsystem. Disk scheduling algorithms- Disk management-Swap space management

Protection and security. Case Study-Linux Operating system-The Linux Kennel-Design principles-Scheduling-Memory management-Files system-Input and Output- Inter process communication-Security

References:

1. Silberschatz, Galvin and Gagne, "Operating System Concepts", 9th Edition, John Wiley & Sons Inc., 2013
2. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, Prentice-Hall of India, 2007.
3. Sibsankar Haldar, Alex A.Aravind, "Operating systems", Pearson Education, 2009.

Outcomes: ***Understand the support rendered by operating system in every phase of computer based problem solving.***

CA768 - DATABASE MANAGEMENT SYSTEMS

Objective: ***To learn different database models and design of databases; query languages and transaction management***

File System versus DBMS, Advantages - ER-Model: Entities, Relationships, Additional Features of ER Model, Conceptual Design with ER Model.

Relational Model – Keys - Constraints – Querying – Views - Relational Algebra and Relational Calculus - SQL & QBE

Organization and Indexes - B^+ Trees – Query Optimization.

Database Design - Functional Dependencies, Normalization – 1 to 5 Normal Forms

DB Tuning – Security – Transaction Management – Concurrency Control – Crash Recovery

References:

1. Raghu Ramakrishnan and Johannes Gehrke, "Data Base Management Systems", 3rd Edition, McGraw-Hill. 2000.
2. Silberschatz, Korth and Sudarshan, "Data Base System Concepts", Tata McGraw Hill, 6th Edition, 2010.
3. C. J. Date, "An Introduction to Database Systems", 8th Edition, Addison Wesley, 2003.

Outcome: ***Gain knowledge and understanding of the design of a database, models used for structuring data and ability to implement and query the database.***

CA 770 – DATA STRUCTURES AND ALGORITHM

Objective: ***To learn the fundamentals and operations on various data structures and their applications***

Arrays, stacks, queues, linked lists, trees- their applications. Fundamental Strategies in algorithm design - recursion, divide and conquer, greedy and dynamic programming methods.

Problems and instances- Efficiency of algorithms- asymptotic notations- solving recurrence relations, complexity of Sorting algorithms- Exchange sort, selection sort, Insertion Sort, Heap Sort, Quick Sort, Radix Sort. Medians and order statistic. Complexity of searching- Binary search- hash tables, binary search trees, insertion and deletion.

Graph algorithms- breadth and depth first searches, MST using disjoint set union algorithm, single source and all pairs shortest path, flow networks, maximum bipartite matching – complexity analysis.

Polynomials - FFT, multiplication of large integers, Algorithms for random number generation. Probabilistic algorithms- selection, sorting, searching and Monte Carlo methods

Definition of non-deterministic polynomial algorithms: Basic concepts of NP-Hard and NP-complete problems- Cook's theorem, Reduction of Clique, Node cover, Chromatic Number as NPC. Scheduling problem - NP hard

References:

1. Horowitz, Sahni and Rajasekaran -" Fundamentals of Computer Algorithms", 1st Edition, Galgotia, 1999.
2. Cormen, Leiserson, Rivest and Stein - "Introduction to Algorithms", 3rd Edition, MIT Press,2009

Outcome: ***Ability to select appropriate data structures for solving real time problems.***

CA 752 – DATA STRUCTURES LAB

Implementing the algorithms in the course CA 770

CA 754 – UNIX / LINUX LAB

Problems on Shell Programming implementation of OS algorithm

CA771 - REPLACEMENT, RELIABILITY AND NETWORK MODELS

Objective: ***To learn different mathematical models such as network, replacement and reliability models.***

Network Models: Network Flow - Flow-Cut- MaxFlow- MinCut theorem - Max Flow Problem: Formulation of Network Flow -Network Flow Algorithms: Ford – Fulkerson - Labeling method – Maxflow Mincut method- Applications: Transportation problem, etc

Network approach to transshipment problem, shortest route problem (Network flow programming) – Critical Path Method (CPM) - PERT network - probabilistic aspect of PERT - practical problems - Formulation and solution

Replacement Models:Replacement problem-formulation- replacement policies in deterministic case: type (*i*) money value changes with time (*ii*) money value not change with time and stochastic cases - group replacement policy.

Reliability Models:Basic concepts - Failure density - Failure rate analysis-hazard functions - hazard models - Normal, Exponential, Poisson, Hyper - exponential, Erlang, gamma and Weibull distributions – Reliability of systems - Series parallel, K-out-of-n-system- perfect and imperfect switches.

Maintainability: Basic concepts, Maintainability equations – Availability - Maintainability Maintenance: preventive and corrective maintenance –Mathematical models for preventive and corrective maintenance.

References:

1. Ford, L.R & Fulkerson, D.R, "Flows in Networks", Princeton University Press, 2010
2. KantiSwarup, P.K. Gupta and Man Mohan, “Operations Research” Sultan Chand &Sons, New Delhi, 2009.
3. B.S. Dhillon, “Maintainability, Maintenance and Reliability for Engineers” CRC press Taylor & Francis Group, LLC, 2006.
4. Enrico Zio, “An introduction to the basics of reliability and risk analysis”, World Scientific, 2007.

Outcomes: ***Ability to solve real time problems using network, replacement and reliability models.***

CA 773 – VISUAL PROGRAMMING

Objective: ***Understand the principles of graphical user interface designdevelop desktop applications and web services using .NET***

.NET Framework - Architecture, Common Language Runtime, Common Type System, Namespaces, Assemblies, Memory Management, Process Management, Class Libraries.

Visual programming principles – GUI Design - User-centered Design - Navigation - Accessibility - Structure – Elements- Visual hierarchy – Typography – Graphics – Animation – Creative design.

.NET – Declaration – Expression - Control Structures – Function - String - Array - Encapsulation - Class - Property - Indexer - Delegate - Inheritance - Interface - Polymorphism - Exception Handling - Modules - Graphics - File handling and Data Access.

.NET – Form- Event–Form Controls – Containers – Menus - Data controls - Printing – Reporting – Dialogs – Components - Single and Multiple Document Interfaces.

ASP.NET – Web Pages, Web Forms, Web Site Design, Data Controls, Validation Controls, HTML, Navigation Controls, Login Controls, Reports - Master Pages – Web Service Architecture - Basic Web Services – Web Reference – Standards.

References:

1. Matt J. Crounch, "ASP.NET and VB. NET Web Programming", Pearson Education, 2006.
2. Kevin Hoffman, "Microsoft Visual C# 2005 Unleashed", Pearson Education, 2006.
3. Sandeep Chatterjee and Janes Webber, "Developing Enterprise Web Services: An Architect's Guide", Pearson Education, 2005.
4. Wilbert O. Galitz,"The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques", Wiley Desktop Editions, 2007.

Outcomes: ***Ability to understand and develop applications using Visual studio environment***

CA775 - INVENTORY THEORY AND DYNAMIC PROGRAMMING

Objective: ***To learn how to control inventory costs and applications of Dynamic programming***

Inventory control – Basic elements and costs; Single item deterministic- Economic lot size models with uniform rate, finite & infinite production rates, with or without shortage-Multi-item models with one constraint

Deterministic models with price-breaks - All - units discount model and incremental discount model. Probabilistic single period profit maximization models with uniform demand, instantaneous demand, with or without setup cost – Demand distribution discrete and continuous case

Dynamic inventory models, Multi-echelon problems, Integrated approach to production inventory and to maintenance problems. Two-echelon model

Dynamic programming - Bellman's principle of optimality, characteristics of a dynamic programming problem.Solutions of simple classical problems with single constraint. Solution to Linear Programming problem and Integer Programming problem using Dynamic programming approach

Applications of dynamic programming-The shortest path through a network, production planning, investment planning, cargo loading and Knapsack problems

References:

1. Sven Axsater, “Inventory Control”, 2nd Edition, Springer Science Business Media, 2006
2. Starr M.K and Miller D.W, "Inventory control Theory and Practice", 1st Edition, PHI, 1985.
3. Taha H.A, "Operations Research: An Introduction", 8th Edition, Pearson Education Inc.M, 2008
4. Bellman R, Dynamic Programming , Dover Publication , 2003
5. DeNardo “ Dynamic Programming: Models and Applications”, Dover Publications , 1982

Outcome: ***Ability to control inventory costs and applications of Dynamic programming in real life scenario***

CA 755 – VISUAL PROGRAMMING LAB

Exercises to solve problems using in C#, ASP, VB - .NET languages

CA 757 – DBMS LAB

Exercises / case studies that require table design, normalization and query building.

CA 799 – PROJECT WORK

CA781 - ADVANCED DATA ANALYTICS

Objective*: To introduce concepts of data analytics to simplify the task of data analysis to make wise decisions in industries or companies*

Spatial map using metric and non-metric data, Naming and interpreting the dimensions using canonical correlation.

Attribute based perceptual map using factor analysis, spatial map using preference data through simple Euclidean model.

Cluster Analysis-Similarity measures - Clustering Techniques: Hierarchical and partitioning methods, Graphical methods, Assessing cluster solutions.

Canonical Correlation Analysis-Canonical Variates and Correlations

Interpreting the Population Canonical Variates, Sample Canonical Variates and sample Canonical correlations, Large Sample Inferences; MANOVA

References:

1. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", 6th Edition, Pearson Education, 2007.
2. William R. Dillon and Mathew Goldstein, "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984.

Outcome: A*bility to analyze and design new strategies to make good decisions to improve industries and companies turnover.*

CA782 - MULTIPLE CRITERIA DECISION MAKING

Objective: ***Tointroduce the concept of multiple criteria decision making and give outline of some of the simpler strategies developed to solve multiple criteria problem***

Multiple Criteria Decision Making: Basic concepts, static and dynamic optimization, problem formulation, pareto optimality, efficient set, classification of methods.

Utility function method, weighting methods, Graphical Method using weights, Bounded Objective Method, Lexicographic Method, Multi- objective simplex methods by Zelency and Philips.

Linear Goal Programming- deviation variables, Pre-emptive priorities, Graphical Method, Modified Simplex Method, Branch and Bound Method and Cutting Plane Method for integer Goal programming models, Non-Linear Goal Programming- Simplex based Method- Pattern Search Method.

Group Decision Making, Dynamic Programming approach to multi objective Network Problems, Multi objective transportation problem, Genetic Algorithms

Case Study: Real-time problems solving

References:

1. Ralph E. Steur, "Multiple Criteria Optimization Theory, Computation and Application", John Wiley, 1985.
2. J.P. Ignizio, "Goal Programming and Extensions", Heath Lexington Books, 1985.

Outcome: ***Ability to apply the multi criteria decision making methods on the real life problems and classify the decision making methods***

CA783 - LOGISTICS MANAGEMENT

Objective: ***To provide basic knowledge of logistics and its management in the context of globalization, and to develop students' skills in system logistics thinking***

Logistics - Definition – concepts- activities - functions.

Transportation - warehousing, order processing, information handling and procurement. Materials management functions and control, inventory - Management in logistics system, inventory decision-making, MRP, MRP in systems, multi-echelons.

Distribution Management, Outbound logistics, Facility location, Classical location problems, Strategic planning models for location analysis, location models, multi objective analysis of location models, Overview Of Vehicle Routing Problems, Integrated Models of Location and Routing, direct shipment, warehousing, cross-docking; push vs. pull systems.

Transportation decisions (mode, selection, fleet size), market channel structure. Logistics Customer Service, Modelling logistics systems, Simulation of logistic systems, cost effective distribution strategies, Value of information in logistics, E- logistics, risk-pooling effect, International and global issues in logistics, Integrated functional activities in logistics, Role of government in international logistics, Principal characteristics of logistics in various countries and regions.

Logistics in different industries: Third party, and fourth party logistics, Airline Schedule Planning, Railway Networks, Postal services, the maritime industries, health industries

References:

1. Martin Christopher, "Logistics and Supply Chain Management", 4th Edition, Prentice Hall, 2011.
2. David. Bloomberg, Stephen LeMay, Joe Hanna, "Logistics", Prentice Hall 2002.

Outcomes: ***Ability to put into practice principles and methods of logistics, analyze and make informed judgments on important issues to solve general problems related to logistics management***

CA784 - SUPPLY CHAIN MANAGEMENT

Objective: ***To learn efficient integration of suppliers, manufacturers and it encompasses many levels of firm's activities in order to minimize costs and satisfy service level requirements.***

Fundamentals of Supply Chain Management - Supply chain networks - integrated supply chain planning - Decision phases in supply chain - Supply chain models and modeling systems.
Supply chain planning: Strategic - operational and tactical - Supply chain strategies - Supply chain drivers and obstacles - Strategic Alliances and Outsourcing - purchasing aspects of supply chain.

Supply chain performance measurement: The balanced score card approach - Performance Metrics - Planning demand and supply - Demand forecasting in supply chain - aggregate planning in supply chain - Predictable variability. Supply Chain Inventory Management.

Inventory theory models: Economic Order Quantity Models - Reorder Point Models and Multi-echelon Inventory Systems - Relevant deterministic and stochastic inventory models and Vendor managed inventory models. Role of transportation in a supply chain: direct shipment - warehousing - cross-docking; push vs. pull systems; transportation decisions (mode selection, fleet size) - market channel structure - vehicle routing problem. Decisions in a supply chain - Mathematical Foundations of distribution management - Supply chain facility layout and capacity planning.

Strategic Cost Management in Supply Chain. The financial impacts - Volume leveraging and cross docking - global logistics and material positioning - global supplier development - target pricing - cost management enablers - Measuring service levels in supply chains - Customer Satisfaction

References:

1. David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies", 3rd Edition, McGraw-Hill, 2008.

2. Christopher, M. "Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Services", London, Financial Times/Pitman, 2005.

Outcome: ***Ability to apply logistics and purchasing concepts to improve supply chain operations***

CA785 - QUALITY CONTROL AND ASSURANCE

Objective: ***To ensure that all works are performed in compliance with applicable standards, specifications, regulations, codes and good construction practices.***

Introduction to Quality Control- meaning of Quality and its improvement – Statistical methods for Quality improvement – Total Quality Management - methods and philosophy of statistical process control

Control Charts for variables - control chart for X and R - Control chart for X and S - Control Charts for attributes - Control Charts for fraction defective- Control Chart for conformities- Control Chart for non - conformities

Fundamentals of experimental design– factorial experiments for process design and improvement - fractional factorial experiments for process design and improvement

Acceptance Sampling Problem- Single Sampling plans for attributes- double, multiple and sequential sampling- AOQL plans

Taguchi principle - Taguchi approach to parameter design- improving robust parameter design-ISO9000 standard history-ISO9000 series (what, why and how) – elements of ISO9000 standards

References:

1. Montgomery, Douglas C. "Introduction to Statistical Quality Control", 3rd edition, John Wiley, 2008.
2. Juran J.M. and Gryna F.M. "Juran's Quality Control Handbook", 4th edition, McGraw Hill, 1988.

Outcome: ***Ability to focus quality control metrics in all areas of business***

CA786 - DECISION SUPPORT SYSTEMS

Objective: ***To understand the methodology and applications of decision support, and acquire knowledge of the architecture, characteristics, and design, of Decision Support Systems***

Decision making process- problem solving techniques- decision support - decision styles- group decision making

Features of various CBIS: DSS - characteristic and capabilities of DSS- components of DSS Classification of DSS

Sources of data- data file environment – database environment – data models- relevance of relational Database design in DSS. Model Base Management Systems: Types of models- function, time, certainty, uncertainty, risk, structure- OR models- Dichotomous model of mind- Simon's model in information system design

User interface: graphics, menus, forms, DSS tools- DSS generators- specific DSS, Constructing a DSS steps in designing a DSS- identification of decision, building of DBMS, MBMS and DGMS- implementation, performance, testing - Case studies on DSS applications

Executive information needs- characteristics and capabilities of EIS- EIS model- EIS implementation

References:

1. Turban E. "Decision Support and Expert Systems- Managerial Perspective", Macmillan, 1988.
2. Peter & Keen, G.W., "Decision System- An organizational perspective", Addison Wesley, 1978.

Outcome: ***Ability to understand managerial decisions, to participate in the decision making process, and to be able to develop models and systems to support the decision making.***

CA787 SOFTWARE ENGINEERING

Objective: ***To impart concepts of a comprehensive study on the theories, processes, methods, and techniques of building high-quality software in cost-effective ways.***

The evolving role of software – Software characteristics, components and applications-Layered technology – the software process – Software process models -Software process and project metrics – Measures, Metrics and Indicators.

Risk Management: Reactive vs. Proactive Risk Strategies – Software Risks – Risk Identification; Software Project Planning: Project planning objectives;Project estimation :Decomposition techniques – Empirical estimation models;System Engineering.

Analysis and Design: Concepts and Principles.

Testing fundamentals – Test case design – White box testing – Basis path testing – Control structure testing – Black box testing – Strategies: Unit testing integration testing – Validation Testing – System testing – Art of debugging.

Clean-room Software Engineering - Software reuse – Reengineering and Reverse Engineering.

References:

1. Roger S. Pressman, "Software Engineering-A practitioner's approach", 7th Edition McGraw Hill, 2009.
2. Ian Sommerville, Software engineering, 8th Edition, Pearson education Asia, 2007.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer Verlag, 2005.
4. James F Peters and Witold Pedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 2009.

Outcome: ***Ability to know the proven principles/techniques/tools, current standards, and best practices of Software Engineering.***

CA788 - OBJECT ORIENTED PROGRAMMING, ANALYSIS AND DESIGN

Objective: ***To understand the Concept of OOPs, Use-Case Diagrams and OOD process***

Object Oriented Analysis and Design - Object Model: Evolution - elements - Application- Classes and Objects: nature- Relationships among objects - Nature of a class- Relationship among classes.

Classification: Importance - Identifying classes and objects- Key abstractions and mechanisms - Notation elements - Class, State Transition object Interaction, Module and process diagram - Application - Process: Principles- micro and macro development processes.

Pragmatics: Management and Planning - Staffing - Release Management - Reuse- Quality Assurance and metrics- Document action- Tools- Special topics- Benefits and risks of OOD.

Object Oriented Programming - Java - Features - Structure - Elements of Java - Array, String, String Buffer, Vectors- Methods - Object Oriented Features - Classes, Objects - Constructors - Package - Inheritance - Interface - Abstract Class - Special types of classes - Applet Programming.

AWT - Graphics - Event Handling - Exception Handling - Utilities and Collections - I/O Streams - Multithreaded Programming - Swings - Networking - Examples in Servlets and RMI - Database Handling.

Reference:

1. Grady Booch, "Object Oriented Analysis and Design with Application", 3rd edition, Benjamin Cummings Publishing Co., 2007.
2. Patrick Naughton and Herbert Schildt, "Java2-Complete Reference", 5th edition, Tata Mc-GrawHill, 2011.

Outcomes: ***Ability to identify and implement applications using OOAD principles***

CA789 - GRAPHICS AND MULTIMEDIA

Objective: ***To learn the principles of Graphics Algorithms and Multimedia Techniques***

Display Devices – Interactive Input devices – Graphics – Bresenham's Line Drawing Algorithm – DDA Algorithm – Comparison of Line Drawing Algorithms – Circle Drawing Algorithm

Two-dimensional Transformations – Scan Conversion Algorithms – Windowing – Clipping – Segmenting – Viewport Transformations

3D Concepts - Projections – Parallel Projection - Perspective Projection – Visible Surface Detection Methods - Three-dimensional Transformations –Visualization and polygon rendering - Hidden Surface Elimination Algorithms

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring. Color models – XYZ-RGB-YIQ-CMY-HSV Models

Multimedia communication systems – Multimedia Information Retrieval – Video conferencing – Virtual reality

References :

1. Hearn D and Baker M.P, "Computer graphics–C Version", 2nd Edition, Pearson Education, 2004.
2. Donald Hearn, M. Pauline Baker, "Computer Graphics", 4th edition, PHI, 2010.
3. Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications and Applications", Pearson Education, 2004.
4. Siamon J. Gibbs and Dionysios C. Tsichritzis, "Multimedia programming", Addison Wesley, 1995.
5. John Villamil, Casanova and LeonyFernanadez, Eliar, "Multimedia Graphics", PHI, 1998.

Outcome: ***Ability to understand the concepts of graphics and multimedia and to develop animation as well gaming applications.***

CA790 - COMPUTER NETWORKS

Objective: ***To learn various network architectures and protocols. To study the functions of different layers in line with IEEE standards***

Building a network – Requirements – Network Architecture – OSI – Internet – Direct Link Networks LAN Technology – LAN Architecture – BUS/Tree – Ring – Star – Ethernet – Token Rings – Wireless Networks

Error Detection and Correction – VRC – LRC - CRC- Checksum - Hamming Distance for Error Correction - Industry component – simulator development to capture various packing flowing in the Data Link Layer – Various Error Detection and Correction algorithm

Switching - Packet Switching – Switching and Forwarding – Bridges and LAN switches – Internetworking – Simple Internetworking – Routing – Selective routing protocol specification

Reliable Byte Stream (TCP) – Simple Demultiplexer (UDP) – TCP Congestion Control – Congestion Avoidance Mechanisms. – Streaming Protocol

Domain Name Service (DNS) – Email - SMTP – MIME – HTTP – SNMP-TELNET-FTP. Network Security – Cryptographic Algorithms: RSA - DES — Applications.

References:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A systems Approach", 5th Edition, Harcourt Asia/Morgan Kaufmann, 2012.
2. James F. Kurose and Keith W. Ross, "Computer Networking - A Top Down Approach", 5th Edition, Addison Wesley, 2009.
3. William Stallings, "Data and Computer Communications", 7th Edition, PHI, 2004.
4. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Prentice Hall PTR, 2011.
5. Behrouz A.Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill, 2007.

Outcome: ***Ability to understand the working principle of Computer Networks***