

MASTER OF SCIENCE
(Operations Research and Computer Applications)

SYLLABUS
FOR
CREDIT-BASED CURRICULUM

(Applicable for 2011-2012 batch onwards)



DEPARTMENT OF COMPUTER APPLICATIONS
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI 620 015
TAMILNADU, INDIA

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI – 620 015.

DEPARTMENT OF COMPUTER APPLICATIONS

**MASTER OF SCIENCE (Operations Research and Computer Applications)
(CREDIT SYSTEM)**

Objective of the Programme:

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

M.Sc. (O.R. and C.A.) Programme

The total credits required for completing the M.C.A. programme is 65.

SEMESTER I

Subject Code	Subject Name	L	T	P	C
CA 761	Probability, Statistics and Estimation	3	0	0	3
CA 763	Discrete Mathematics	3	0	0	3
MA 615	Linear Programming And Simulation	3	0	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 Using LINDO and C	0	0	4	2
CA 753	Programming Lab in C and C++	0	0	4	2
Total		15	0	8	19

SEMESTER II

Subject Code	Subject Name	L	T	P	C
MA 602	Non-linear Programming	3	0	0	3
CA 764	Data Analytics	3	0	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
Total		15	0	8	19

SEMESTER III

Subject Code	Subject Name	L	T	P	C
MA 617	Replacement, Reliability and Network Models	3	0	0	3
CA 773	Visual programming	3	0	0	3
CA 775	Inventory Theory and Dynamic Programming	3	0	0	3
CA ---	Elective - I	3	0	0	3
CA ---	Elective - II	3	0	0	3
CA 755	Visual Programming Lab	0	0	4	2
CA 757	DBMS Lab	0	0	4	2
	Total	15	0	8	19

SEMESTER VI

Subject Code	Subject Name	L	T	P	C
CA 799	Project & Viva- Voce Examination	0	0	0	8
	Grand Total	45	0	24	65

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

ELECTIVES

(All 3-0-0-3)

Subject Code	Course of study
CA 781	Advanced Data Analytics
CA 782	Multiple Criteria and Decision Making
CA 783	Logistics Management
CA 784	Supply Chain Management
CA 785	Quality Control and Assurance
CA 786	Decision Support Systems
CA 787	Software Engineering
CA 788	Object Oriented Programming, Analysis and Design
CA 789	4GL and 5GL Systems
CA 790	Graphics and Multimedia
CA 791	Computer Networks

PROBABILITY, STATISTICS AND ESTIMATION

Pre-requisites: Calculus and Linear Algebra

Outline:

1. Random experiments, Probability spaces, Elementary theorems, Conditional probabilities, Independent events.
2. Probabilistic modeling and random variables, cdf and pdf of random variables; standard discrete and continuous models.
3. MGF and Characteristic functions, multivariate distributions; transformations, Covariance and correlation, Random variable sequences, inequalities.
4. MMS, MLE and linear Estimation, multivariate normal distribution.
5. Sampling distribution; interval Estimation and Tests of hypotheses.

Books:

1. Yannis Viniotis, "Probability and Random Processes for Electrical Engineers", Mc-Graw Hill International Edition, 1998
2. William R. Dillon and Mathew Goldstein, "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984

DISCRETE MATHEMATICS

Outline:

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”, 2006, Elsevier.
2. Narsingh Deo, “Graph theory and applications to Engineering and Computer Science”, 1986, PHI.
3. Arthur Gill, “Applied Algebra for the Computer Sciences”, 1976, Prentice Hall.
4. Michael Sipser, “Introduction to Theory of Computation”, 1996, PWS Publishing Co.

MA615

LINEAR PROGRAMMING AND SIMULATION

Outline:

1. 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.
2. 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.
3. Transportation Problem - Methods of generating Basic Feasible solution – Optimality - Modi method - Assignment Problem - Routing problems - Traveling Salesman problem.
4. Integer programming Problem - Gomory's method - Branch and bound. method. Linear Fractional programming – Variable transformation method - Updated objective function method - Bounded variable technique.
5. 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.

Books:

1. F.S.Hillier & G.J. Lieberman, "Introduction to Mathematical programming", McGraw-Hill International Edition.
2. H.A.Taha- "Operations Research: An Introduction", 6thEdition, Macmillan.

CA767

COMPUTER ORGANIZATION AND ARCHITECTURE

Objective : To introduce the nature and characteristics of modern day computers.

Pre- requisites: Knowledge of fundamentals of Digital Computers.

Outline:

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 – Array - Vector – Grid – Multi-core – Mobile – Embedded - Cloud computing.

REFERENCES

1. William Stallings, “Computer Organization and Architecture”, 7th Edition, 2006, PHI.
2. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 4th Edition, 2007, Pearson Education.
3. Hennessy J. and Patterson D., “Computer Architecture — A Quantitative Approach”, 1990, Morgan Kaufmann.

PROGRAMMING IN C AND C++

Outline:

1. Introduction to Computers - Classification and Applications - H/W and S/W components - Programming paradigm- Program Development Cycle - Generation of Languages . C Programming Language Fundamentals - Character set - Syntax - Input and output - Program writing , Control Structures – Iterative structures.
2. Arrays - Pointers – Operations on pointers - Multidimensional Arrays.
3. Structures and Unions – Functions - Command Line Arguments - Dynamic Memory Allocation - File Allocation - Preprocessor Directives.
4. Object Oriented Programming Concepts - Constructors and Destructors - Static Members and Function - Friend Functions - Inheritance - this pointer.
5. Polymorphism - Function Overloading - Operator Overloading - Virtual Functions - Templates.

Books:

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

LINEAR PROGRAMMING USING LINDO AND C

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

PROGRAMMING LABS IN C AND C++

Programs on basic C and C++ concepts.

Semester II

MA602

NON-LINEAR PROGRAMMING

Outline:

Unimodal and Convex functions, Hessian Matrix, Positive definite and Negative definite matrices - One dimensional optimization - Newton's Method- Fibonacci Method- Golden Section Method - Quadratic Interpolation Method.

Multi-dimensional unconstrained optimization - Univariate Method - Neider and Meads 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.

Books:

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

DATA ANALYTICS

The course is application based. SPSS or SAS package will be used for applications and analysis part. The theory content is worth is 70 % and 30 % is for SPSS or SAS exercises.

Pre-requisites: CA 761

Outline:

General Linear Regression Model, Estimation for β , Error Estimation, Residual Analysis.

Tests of significance - ANOVA, 't' test, Forward, Backward, Sequential, Stepwise, All possible subsets, Dummy Regression, Logistic Regression, Multi-collinearity.

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.

Books:

1. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", fifth Edition, Pearson Education, 2002.
2. William R. Dillon and Mathew Goldstein, "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984.

OPERATING SYSTEMS

Pre-requisites: CA 767, CA 769

Outline:

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 Kernel-Design principles-Scheduling-Memory management-Files system-Input and Output- Inter process communication-Security

REFERENCES

1. Silberschatz, Galvin and Gagne, “Operating System Concepts”, 6th Edition, 2003, John Wiley & Sons Inc.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 3rd Edition, 2007, Prentice-Hall of India.
3. Sibsankar Haldar, Alex A.Aravind, “Operating systems”, 2009, Pearson Education.

CA768

DATABASE MANAGEMENT SYSTEMS

Pre-requisites: CA 767, CA 770

Co-requisite: CA 766

Outline:

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

Relational Model – 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, 2000, McGraw-Hill.
2. Silberschatz, Korth and Sudarshan, “Data Base System Concepts”, 2002, Tata McGraw Hill.

CA770

DATA STRUCTURES AND ALGORITHMS

Pre-requisite: CA 763, CA 761, CA 769

Outline:

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.

Books:

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

CA752

DATA STRUCTURES LAB

Implementing the algorithms studied in CA 770.

CA754

UNIX / LINUX LAB

Problems on Shell Programming and concurrency.

Semester III

MA617

REPLACEMENT, RELIABILITY AND NETWORK MODELS

Outline:

Single Commodity Static flows - the basic maximum flow problem - Variations of the maximum flow problem - Flows in graphs with gains – Multi-commodity flows.

Network simplex method - Network approach to transportation problems - critical path method - Resource leveling - Time/cost trade off – Compression and decompression - PERT network - probabilistic aspect of PERT - practical problems - Formulation and solution.

Equipment replacement policies in deterministic and Stochastic cases - replacement models for unbounded horizons and uncertain cost-replacement in anticipation of failure -group replacement policy.

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.

Simulation and Reliability Predictions - Maintenance- preventive and corrective – Maintainability Equation – Availability - Maintainability trade-off - Reliability improvement and allocation.

Books:

1. Kennington. J and Helgason R, "Algorithms for Network Programming", 1st Edition 1981, John Wiley.
2. Ford, L.R & Fulkerson, D.R, "Flows in Networks", Princeton University Press.

CA773

VISUAL PROGRAMMING

Outline:

GUI concept – Data types – GUI Architecture – Message Processing – Keyboard and Mouse Handling Displaying Text and Graphics – File and Printer Handling – DDE – DDL – ODBC – COM/DCOM / CORBA.

The .NET Namespaces, Assemblies, .NET Memory Management, Process Management, Interoperation with COM. Transactions in .NET, Structures Exception Handling, Code Access Security, Web Controls using the .NET framework, The .NET Framework Class Library.

VB.NET – basic features - Inheritance, Value Types, Operator Overloading, Exception Handling, Arrays and Collections, Properties, Delegates and Events, Windows Forms, Dialog Boxes and Controls, Graphical Output, Files, Data access.

C#.NET – basic features, Arrays and Collections, parameter arrays, Inheritance, Garbage collection and Resource management.

ASP.NET – Validation controls – Accessing Data with web forms – Building ASP.NET applications – Building and XML web service handling XML.

Books:

1. Jeff Prosise, Programming Microsoft .NET, Microsoft Press
2. David S Plat, Introducing Microsoft .NET, 3rd Edition, Microsoft Press

CA775

INVENTORY THEORY AND DYNAMIC PROGRAMMING

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

Pre-requisite: Knowledge of Calculus

Outline:

Inventory control - Different variables involved. Single item deterministic- Economic lot size models with uniform rate, finite & infinite production rates, with or without shortage-Multi-item models with one constant.

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.

Dynamic inventory models, Multi-echelon problems. Integrated approach to production inventory and to maintenance problems. Feed back control in inventory management.

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, inventory problems, investment planning, cargo loading and Knapsack problems.

Books:

1. Starr and Miller, "Inventory control Theory and Practice", 1st Edition, 1985, PHI
2. Taha H.A, "Operations Research: An Introduction", 6th Edition, 1996, Macmillan.
3. Robert E. Larson and John L.Casti, "Principles of Dynamic Programming", Vol-I and II, 1st edition, 1982, Marcel Dekker.

CA755

VISUAL PROGRAMMING LAB

Exercises to learn programming in C#, ASP, VB - .NET languages(etc).

CA757

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

Electives

CA781 ADVANCED DATA ANALYTICS

The course is application based. SPSS or SAS package will be used for applications and analysis part. The theory content is worth is 70 % and 30 % is for SPSS or SAS exercises.

Pre-requisites: CA 761, CA 764

Outline:

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.

Books:

1. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis", 5th Edition, Pearson Education, 2002.
2. William R. Dillon and Mathew Goldstein, "Multivariate Analysis: Methods and applications", John Wiley and Sons, 1984.

CA782 MULTIPLE CRITERIA DECISION MAKING

Pre-requisite: Operations Research methods, Linear Programming and Non-linear Programming.

Outline:

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.

Real-time problems based on student background.

Books:

1. Ralph E. Steur, "Multiple Criteria Optimization Theory, Computation and Application", 1985, John Wiley.

2. J.P. Ignizio, "Goal Programming and Extensions", 1976, Heath Lexington Books.

CA783 LOGISTICS MANAGEMENT

Outline:

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

Books:

1. Martin Christopher, "Logistics and Supply Chain Management", Prentice Hall, 1998.
2. David. Bloomberg, Stephen LeMay, Joe Hanna, "Logistics", Prentice Hall 2002

CA784 SUPPLY CHAIN MANAGEMENT

Outline:

Fundamentals of Supply Chain Management, Supply chain networks, Integrated supply chain planning, Decision phases in s 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

Books:

1. David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies", 2nd Edition, McGraw-Hill, 2003.

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

CA785 QUALITY CONTROL AND ASSURANCE

Pre-requisite: CA761

Outline:

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. The

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.

Books:

1. Montgomery, Douglas C. "Introduction to Statistical Quality Control", 3rd edition, 1996, John Wiley.

2. Juran J.M. and Gryna F.M. "Juran's Quality Control Handbook", 4th edition, 1988, McGraw Hill.

CA786 DECISION SUPPORT SYSTEMS

Pre-requisite: Knowledge of computers and its general applications and basic understanding of managerial decision making in functional areas of management.

Outline:

Decision making process- problem solving techniques- how decisions are being supported- 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 Decision.

Books:

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

CA787 SOFTWARE ENGINEERING

Outline:

Introductory concepts – The evolving role of software – Its characteristics, components and applications- A 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", 6th Edition, 1997, McGraw Hill.
2. Ian Sommerville, Software engineering, 6th Edition, 2000, Pearson education Asia.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", 1997, Springer Verlag.
4. James F Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", 2000, John Wiley and Sons, New Delhi.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", 2009, Oxford University Press, New Delhi.

CA788 OBJECT ORIENTED PROGRAMMING, ANALYSIS AND DESIGN

Pre-requisites: Programming in C and C++

Outline:

Programming Paradigms – Object Oriented Approach – Features and Comparisons - OO themes - Evidence for usefulness of OO development - OO modeling history – Programming Elements - Concepts- C++ Basics - Classes and Objects- Overloading Features-Friends – Arrays, Pointers – Inheritance – Types – Polymorphism – Virtual Functions.

Programming – Static Members - File Handling – Streams – Generic Programming – Templates - STL – Exception Handling.

Object Model – Evolution, Elements – Nature of Classes and Objects – Relationships among Classes - Classification – Identification of classes and objects – Key abstractions and mechanisms – Basic and Advanced Modeling techniques.

Notation elements — Class, State Transition object, Interaction, module and process diagrams - OMT analysis (James & Rumbaugh) - Comparison of various OO Analysis of Design Methodologies.

OO Applications – Case Studies – UML – Diagrams with examples – Applications - Design Patterns - Pattern Categories - Relationships between patterns - Pattern descriptions – Patterns based Applicatios.

REFERENCES

1. Grady Booch et al, "Object-Oriented Analysis and Design with Applications", 3rd Edition, 2007, Pearson.
2. Grady Booch, Ivar Jacobson and James Rumbaugh, "UML user guide", 2005, Addison Wesley Professional.
3. Michael Blaha and James Rumbaugh, "Object-Oriented Modeling and Design with UML", 2nd Edition, 2005, Pearson Education.

4. Bjarne Stroustrup, "The C++ Programming Language", 3rd Edition, 1997, Addison-Wesley.
5. E. Gamma, R. Helm, R. Johnson and J. Vlissides, "Design Patterns- Elements of Reusable Object-Oriented Software", 1995, Addison-Wesley.

CA789 4GL AND 5GL SYSTEMS

Pre-requisites: Database Management Systems

Outline:

4GL systems- Scope, Application and Method of Evaluation.

Program development with intelligent workstations- Distributed information services and Management - PC to mainframe links.

SQL dialects- Embedded SQL- QUEL- QBE Paradox QBE - Constraints. 4GL systems, Software development components and building blocks.

Data Communication Interface - Query Languages. Package Concepts and Components- forms, report writers, utilities- Front end products.

Database programming - Case Studies in 4GL and 5GL.

Books:

1. Simon Holloway, "Fourth Generation Systems: Their Scope and Method of Evaluation", 1985, Chapman and Hall
2. Dimitris N Chorafas, "Fourth and Fifth generation Programming Languages", 1986, Addison Wesley

CA790 GRAPHICS AND MULTIMEDIA

Pre-requisites: Matrix Theory, Analytical Geometry, Trigonometry

Outline:

Graphics: 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 – Interactive video – video on demand.

REFERENCES

1. Hearn D and Baker M.P, “Computer graphics–C Version”, 2nd Edition, 2004, Pearson Education.
2. Donald Hearn, M. Pauline Baker, “Computer Graphics”, 1992, PHI.
3. Ralf Steinmetz, Klara Steinmetz, “Multimedia Computing, Communications and Applications”, 2004, Pearson Education.
4. Siamon J. Gibbs and Dionysios C. Tsichritzis, “Multimedia programming”, 1995, Addison Wesley.
5. John Villamil, Casanova and Leony Fernanadez, Eliar, “Multimedia Graphics”, 1998, PHI.

CA791 COMPUTER NETWORKS

Prerequisites: Computer Organization and Architecture, Operating Systems

Outline:

LAN Technology – LAN Architecture – BUS/Tree – Ring – Star – Ethernet – Token Rings – Wireless.

Packet Switching – Switching and Forwarding – Bridges and LAN switches – Internetworking – Simple Internetworking – Routing.

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

Domain Name Service (DNS) – Email - SMTP – MIME – HTTP – SNMP-TELNET-FTP.

Introduction to Network Security – Cryptographic Algorithms: RSA - DES — Applications.

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