Introduction for the Course

M.Sc. (Industrial Mathematics with Computer Applications) course syllabus is revised to cater to the needs of credit based-semester and grading system. The changing scenario of higher education in India and abroad is taken into consideration to make this syllabus more oriented towards the applications of Mathematics and Computer Science in Research and Industry. The syllabus encompasses the subjects related to Industrial Mathematics, Core Computer Subjects as well as the Emerging Technologies in Computer Science. Theory Courses will create the foundation for the development of logical thinking and the Practical Courses gives hands on experience towards the Industrial Requirements.

Taking into consideration the rapid changes in science and technology and new approaches in different areas of Mathematics and related subjects, Board of Studies in Mathematics with consent of teachers of Mathematics and Computer Science from different colleges affiliated to University of Pune has prepared the syllabus of **M.Sc. (INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS).**
To develop the syllabus the U.G.C. Model curriculums followed.

Aims:

(i) Give the students sufficient knowledge of fundamental principles, methods and a clear perception of the innumerous power of mathematical ideas and tools and knowledge of how to use them by modeling, solving and interpreting.

(ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.

(iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skill, creative talent and power of communication necessary for various kinds of employment

(iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Objectives:

(i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such annotations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.

(ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved with mathematical reasoning.

(iii) A student should get adequate exposure to global and local concerns so as to explore many aspects of Mathematical Sciences.

(iv) Students should be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

(v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

(vi) A student should be able to write necessary algorithms and programs in different languages as per the need of the industry

Eligibility:

Students from any graduation (with Mathematics up to second year 4) securing a minimum of 50% marks.

Student Registration:

Except the credits for practical Courses, where ever applicable, a student can register for less number of courses in a Semester subject to the condition that such a student will have to complete the degree in a Maximum of 5 years for 3 Years program

Structure of the Course
Semester I

T/P	Code	Course Title	% of Assessment		Total	Hours/week	Credits
			IA	UE			
T	MIM 101	Real Analysis	50	50	100	4	4
T	MIM 102	Linear Algebra and computational Geometry	50	50	100	4	4
T	MIM 103	Discrete Mathematical structures	50	50	100	4	4
T	MIM 104	C Programming	50	50	100	4	4
T	MIM 105	Elements of Information Technology	50	50	100	4	4
P	MIM 106	Lab Course based on MIM 104	50	50	100	4	4

T/P: Theory/Practical

Semester II

T/P	Code	Course Title	% of Assessment		Total Marks	Hours/week	Credits
			IA	UE			
T	MIM 201	Complex Analysis	50	50	100	4	4
T	MIM 202	Algebra II	50	50	100	4	4
T	MIM 203	Numerical Analysis	50	50	100	4	4
T	MIM 204	Object oriented Programming with C ++	50	50	100	4	4
T	MIM 205	Data structures using C	50	50	100	4	4
P	MIM 206	Lab Course	50	50	100	4	4

Semester III

T/P	Code	Course Title	% of Assessment		Marks	Hours/week	Credits
			IA	UE			
T	MIM 301	Topology	50	50	100	5	5
T	MIM 302	Design And Analysis of algorithm	50	50	100	5	5
T	MIM 303	Object Oriented Software Engineering	50	50	100	5	5
T	MIM 304	Operating Systems	50	50	100	5	5
T	MIM 305	Database Fundamentals	50	50	100	5	5
P	MIM 306	Lab Course based on MiM-304 and MIM-305	50	50	100	5	5

Semester IV

T/P	Code	Course Title	% of Assessment		Total Marks	Hours/week	Credits
			IA	UE			
T	MIM 401	Ordinary differentia equations	50	50	100	5	5
T	MIM 402	Coding Theory	50	50	100	5	5
T	MIM 403	Computer Networks	50	50	100	5	5
T	MIM 404	Programming in PHP	50	50	100	5	5
T	MIM 405	JAVA programming	50	50	100	5	5
P	MIM 406	Lab Course based on MiM-405 and MIM-404	50	50	100	5	5

Semester V

T/P	Code	Course Title	% of Assessment		Total Marks	Hours/week	Credits
			IA	UE			
T	MIM 501	Theoretical Computer Science	50	50	100	5	5
T	MIM 502	UNIX	50	50	100	5	5
T	MIM 503	.NET	50	50	100	5	5
T	MIM 504	ELECTIVE	50	50	100	5	5
P	MIM 505	Lab work based on MIM-502 and MIM-503	50	50	100	5	5

Examination pattern:
Each course will have: 50% marks for internal (i.e. in-semester) assessment.
50% of marks for semester-end examination conducted by University of Pune.
The student has to obtain forty percent marks in the combined examination of In-Semester assessment and Semester-End assessment with a minimum passing of thirty percent in both these separately.

Theory examination:
Internal examination:
At least one internal assessment must be conducted for the one credit course. (Four tests for four credits course).Each credit will have an internal (continuous) assessment of 50% of marks and a teacher must select a variety of procedures for examination such as:

1) Written Test and/or Mid Term Test (not more than one or two for each course)
2) Term Paper
3) Journal/Lecture/Library notes;
4) Seminar presentation;
5) Short Quizzes;
6) Assignments;
7) Extension Work;
8) An Open Book Test (with the concerned teacher deciding what books are to be allowed for this purpose)

External Examination

Theory examination will be conducted for a period of maximum 45 minutes for each credit.
University Practical examination:
Practical examination will be of the same duration as that of the practical exercises for that course. There shall be 10 marks for laboratory log book and journal, 10 marks for viva-voce. For practical course of four credits at least three experiments should be asked. For the course of two/ three credits at least two experiments and for the course of single credit one experiment should be asked. Certified journal is compulsory for appearing for practical examination. There shall be two experts and two examiners per batch for the practical Examination. One of the examiners will be external.

Internal Continuous Assessment Process for the Practical
The number of practical Assignments will be decided by the Course Faculty which covers all the Course Contents. Following are some Evaluation Criteria's

1) Journal Assessment.
2) Viva-voce at the time of submission of each practical
3) Group discussion of 5/6 students for testing the understanding level of a student

4) Additional practical work of interdisciplinary approach
5) Attendance- 5 Marks

Practical Attendance

Practical attendance percentage	Marks
75%-80%	1 Mark
81%-85%	2 Marks
86%-90%	3 Marks
91%-95%	4 Marks
Above 95 %	5 Marks

MIM-601 FULL TIME INDUSTRIAL TRAINIG /INDUSTRIAL PROJECT
Period – Minimum 4 months

1. There will be a teacher coordinator for a group of students. A teacher coordinator will take care of joining letters from students along with other necessary submission listed below.
2. A student will have to submit 2 reports during the period of ITP to the Department of the college.
3. After the completion of the ITP, a student will have to submit a synopsis along with the project completion certificate from the respective industry/research institute /educational institute.
4. A student will submit one hard copy (Student Copy) and a soft copy's (preferably 2 CDs) of the work carried out towards ITP.
5. The project will be graded by the experts (One internal examiner, one external examiner(academic expert) and one industrial expert) as follows:

O – 75 and above	C– 50 and above	F- A student will have to carry out project once again for a complete semester
A – 65 and above	D– 45 and above	
B – 55 and above	E– 40 and above	

Important Note: A student can complete ITP with a research project of a teacher / an expert funded by the University of Pune/ a funding agency.

Evaluation for internal 50 Marks will be done according to Progress Report written by Teacher Coordinator
Evaluation for external 50 Marks will be done by Industrial Expert, Academic Expert and One Internal Examiner.

M. Sc. (Industrial Mathematics with Computer Applications)
From the Academic Year 2015-16
M. Sc –III Semester V
MIM 501: Digital Image Processing

UNIT 1. **Introduction** [3]

1. What is Digital Image Processing?
2. The origins of Digital Image Processing
3. Examples of Fields that use Digital Image Processing
   - Gamma-Ray Imaging
   - X-Ray Imaging
   - Imaging in the Ultraviolet Band
   - Imaging in the Visible and Infrared Bands
   - Imaging in the Visible and Infrared Bands
   - Imaging in the Visible and Infrared Bands
   - Imaging in the Microwave Band
   - Imaging in the Radio Band
4. Fundamental steps in Digital Image Processing
5. Components of an Image Processing System

UNIT 2. Digital Image Fundamentals [6]

1. Elements of Visual Perception
2. Light and the Electromagnetic Spectrum
3. Image sensing and Acquisition
4. Image Sampling and Quantization
5. Some Basic Relationships between Pixels
6. An Introduction to the Mathematical Tools Used in Digital Image Processing
   - Array versus Matrix Operations
   - Linear versus Nonlinear Operations
   - Arithmetic Operations
   - Set and Logical Operations

UNIT 3. Intensity Transformation and Spatial Filtering [7]

1. Background
2. Some Basic Intensity Transformation Functions
3. Histogram Processing
   - Histogram Equalization
   - Histogram Matching (Specification)
   - Local Histogram Processing
4. Fundamentals of Spatial Filtering

5. Smoothing Spatial Filters
6. Sharpening Spatial Filters
7. Combining Spatial Enhancement Methods

UNIT 4. Filtering in the Frequency Domain [10]

1. Background
2. Preliminary Concepts
3. Sampling and the Fourier Transform of Sampled Functions
4. The Discrete Fourier Transform (DFT) of One variable
5. Extension to Functions of Two Variables
    - Some Properties of the 2-D Discrete Fourier Transform
    - The Basics of Filtering in the Frequency Domain
    - Image Smoothing Using Frequency Domain Filters
    - Image Sharpening Using Frequency Domain Filters
    - Selective Filtering

UNIT 5. Image Restoration and Reconstruction [6]

1. A Model of the Image Degradation / Restoration Process
2. Noise Models
3. Restoration in the Presence of Noise Only- Spatial Filtering
4. Periodic Noise Reduction by Frequency Domain Filtering
    - Band reject Filters
    - Band pass Filters
    - Notch Filters
5. Estimating the Degradation Function
6. Inverse Filtering
7. Minimum Mean Square Error(Wiener) Filtering
8. Geometric Mean Filter

UNIT 6. Morphological Image Processing [5]

1. Preliminaries
2. Erosion and Dilation
3. Opening and Closing
4. The Hit-or-Miss Transformation
5. Some Basic Morphological Algorithms
    - Boundary Extraction
    - Hole Filling
    - Extraction of Connected Components
    - Convex Hull
    - Thinning
    - Thickening
    - Skeletons
    - Pruning

- Morphological Reconstruction

UNIT 7. Image Segmentation [6]

1. Fundamentals
2. Point, Line, and Edge Detection
    - Background
    - Detection of Isolated Points
    - Line Detection
    - Edge Models
    - Basic Edge Detection
    - Edge Linking and Boundary Detection
3. Thresholding
    - Foundation
    - Basic Global Thresholding
    - Optimum Global Thresholding Using Otsu's Method
    - Using Image Smoothing to Improve Global Thresholding
    - Using Edges to Improve Global Thresholding
4. Region-Based Segmentation

UNIT 8. Representation and Description [5]

1. Representation
    - Boundary (Border) Following
    - Chain Codes
    - Polygonal Approximations Using Minimum-Perimeter Polygons
    - Other Polygonal Approximation Approaches
    - Signatures
    - Boundary Segments
    - Skeletons
2. Boundary Descriptors
    - Some Simple Descriptors
    - Shape Numbers
    - Fourier Descriptors
3. Regional Descriptors
    - Some Simple Descriptors
    - Topological Descriptors
    - Texture

Text Book:

1. **Gonzalez, R. C. and Woods, R. E. [2002/2008], Digital Image Processing, 3rd ed., Prentice Hall**

Reference Books:

1. Sonka, M., Hlavac, V., Boyle, R. [1999]. Image Processing, Analysis and Machine Vision (2nd edition), PWS Publishing, or (3rd edition) Thompson Engineering, 2007
2. Gonzalez, R. C., Woods, R. E., and Eddins, S. L. [2009]. Digital Image Processing Using MATLAB, 2nd ed., Gatesmark Publishing, Knoxville, TN.
3. Anil K. Jain [2001], Fundamentals of digital image processing (2nd Edition), Prentice-Hall, NJ
4. Willian K. Pratt [2001], Digital Image Processing (3rd Edition), , John Wiley & Sons, NY
5. 5. Burger, Willhelm and Burge, Mark J. [2008]. Digital Image Processing: An Algorithmic Introduction Using Java, Springer
6. Digital Image Analysis (With CD-ROM), Kropatsch, Springer, ISBN 978038795066
7. Digital Image Processing, 6e (With CD), Jähne, Springer, ISBN:978-3-540-24035-8 2
8. Digital Image Processing and Analysis, B.Chanda and D.Dutta Mujummder, PHI learning Private Limited, ISBN-978-81-203-1618-8

M.Sc. (Industrial Mathematics with Computer Applications)
From the Academic Year 2015-16
M.Sc –III Semester V
[MIM-502]: DOT NET Technologies

Part I: C#

1. DOT NET Framework **(3)**

a. Introduction to DOT NET
b. DOT NET class framework
c. Common Language Runtime
    i. Overview
    ii. Elements of .NET application
    iii. Memory Management
    iv. Garbage Collector : Faster Memory allocation, Optimizations
d. Common Language Integration
    i. Common type system
    ii. Reflection API

2. Introduction to C# **(8)**

a. Language features
    i. Variables and Expressions, type conversion
    ii. Flow Control
    iii. Functions, Delegates
    iv. Debugging and error handling, exception handling (System Defined & User defined)
b. Object Oriented Concepts
    i. Defining classes, class members, Interfaces, properties
    ii. Access modifiers, Implementation of class, interface and properties
    iii. Concept of hiding base class methods, Overriding
    iv. Event Handling
c. Collections
    i. Defining and using collections, Indexers, iterators
d. Generics
    i. Using generics
    ii. Defining Generics, generic Interfaces, Generic methods, Generic Delegate
e. Operator Overloading

3. Window Programming **(4)**

a. Window Controls
    i. Common Controls
    ii. Container Controls
    iii. Menus and Toolbars
    iv. Printing
    v. Dialogs

4. Data Access **(8)**
a. File System Data
b. XML
c. Databases and ADO.NET
d. Data Binding

5. DOT NET Assemblies **(3)**
a. Components
b. .NET Assembly features
c. Structure of Assemblies
d. Calling assemblies, private and shared assemblies

Part II: ASP.NET

1. Introduction to ASP.NET **(2)**

2. Server Controls and Variables, control Structures & Functions **(5)**
a. Forms, webpages, HTML forms, Webforms, Life cycle of pages
b. Request & Response in Non-ASP.NET pages
c. Using ASP.NET Server Controls
d. Datatypes : Numeric, text, arrays, datacollections
e. Functions : web controls as parameters
f. Creating Master pages.

3. Event Driven Programming and PostBack **(3)**
a. HTML events
b. ASP.NET page events
c. ASP.NET Web control events
d. Event driven programming and postback

4. ASP.NET Server Controls **(4)**
a. ASP.NET Web Controls
b. HTML Server Controls

5. DOT NET State management **(2)**
a. Introduction to Cookies, Sessions
b. Session events
c. State management Recommendations

6. Web Services **(2)**
a. HTTP, XML & Web services
b. SOAP
c. Building ASP.NET web service
d. Consuming a web service

7. DotNet MVC Architecture **(4)**

a. Fundamentals of ASP.NET MVC

i. The Model View Controller Architecture

The Model,The View,The Controller

ii. MVC benefits

b. ASP.NET MVC Web application

i. First MVC application

ii. Adding the Controller

iii. Creating and Rendering the View

Recommended Text and Reference books:

- Beginning Visual C# 2010, Wrox Publication [for chapter 1 to 5]
- Professional Visual C#, Wrox Publication
- Beginning ASP.NET 4.5, Wrox Publication
- Beginning ASP.NET MVC 4 by Jose Rolando Guay Paz Published by Apress (For Part II Chapter 7 a)
- Pro ASP.NET MVC 4 by Adam Freeman Published by Apress (For PartII Chapter 7 b)
- Programming ASP.NET MVC 4 by Jess Chadwick, Todd Synder and Hrushikesh Panda by O'Reilly publications.
- Beginning C# Object-Oriented Programming By Dan Clark , Apress
- ADO.NET Examples and Best Practices for C# Programmers, By Peter D. Blackburn Apress [for chapter 4 ADO]
- Database Programming with C#, By Carsten Thomsen, Apress

M.Sc. (Industrial Mathematics with Computer Applications)
From the Academic Year 2015-16
M.Sc –III Semester V
MIM – 503 UNIX

- **General Overview** **[3]**
  - History of UNIX
  - Basic System Structure
  - User Perspective
    - File System
    - Processing Environment
    - Building Block Primitives
  - Operating System Services
- **Introduction to Kernel** **[4]**
  - Block diagram of System Kernel
  - Introduction to system Concepts
    - An overview of File Subsystem
    - Processes
      - Concept of a process
      - Process states
      - State transition
      - Sleep() and Wakeup()
  - Kernel Data structure
- **The Buffer Cache** **[6]**
  - Buffer Headers
  - Memory Area of a buffer
  - Free list of a buffer
  - Hash queue of a buffer
  - Scenario for retrieval of a buffer
  - Reading and Writing of disk block
  - Advantages of Buffer cache
- Algorithms
  - getblk()
  - brelease()
  - breada()
  - bread()
  - bwrite()

- **Internal representation of Files** **[6]**
  - Inodes
    - Definition
    - Accessing inode
    - Releasing nodes
  - Structure of a regular file
  - Directories
  - Conversion of Path name to an inode
  - Super block
  - Inode assignment to a new file
  - Allocation of disk block
- Algorithms
  - iget()
  - iput()
  - bmap()
  - namei()
  - ialloc()
  - ifree()
  - alloc()
- **System call for the File System** **[10]**
  - OPEN
  - READ
  - WRITE
  - File and Record locking
  - Adjusting the position of file I/O and lseek
  - CLOSE
  - File Creation
  - Creation of a special file
  - Change directory and Change root
  - Change owner and Change Mode
  - stat and fstat
  - pipes
    - The pipe system call
    - Opening a named pipe
    - Reading and writing pipes
    - Closing Pipes
  - DUP system call
- Mounting and Unmounting file systems
    - Crossing mount points in file path name
    - Unmounting a file system
  - link
  - unlink

        - File system consistency
        - Race condition
        - File system abstraction
        - File system maintenance
- Algorithms
    - open
    - read
    - mknode
    - chdir
    - pipe
    - mount
    - unmount
    - link
    - unlink
- **The structure of a process** **[10]**
    - Process states and transitions
    - Layout of a system memory
        - Regions
        - Pages and Page Tables
        - Layout of Kernel
        - The uarea
    - The context of a process
    - Saving the context of a process
        - Interrupt and Exceptions
        - System call interface
        - Context switch
        - Saving a context of abortive routine
        - Copying a data between System and User Address Space
    - Manipulation of Process Address Space
        - Locking and Unlicking a region
        - Allocating region
        - Attaching a region to a process
        - Changing a size of a region
        - Loading a region
        - Freeing a region
        - Detaching a region for a process
        - Duplicating region
    - sleep
        - Sleep events and addresses
        - Algorithms of Sleep and Wakeup
- Algorithms
    - inthand()
    - syscall()

- allocreg()
- attachreg()
- growreg()
- loadreg()
- freereg()
- detachreg()
- dupreg()
- sleep()
- wakeup()

- **Process control block** **[10]**
    - Process creation
    - Signals
        - Handling signals
        - Process group
        - Sending signals from processes
    - Process termination
    - Awaiting Process termination
    - Invoking other programs
    - The user id of a process
    - Changing the size of a process
    - The shell
    - The system boot and init process
- Algorithms
    - fork()
    - issig()
    - psig()
    - exit()
    - wait()
    - exec()
    - xalloc()
    - brk()
    - start()
    - init()
- Memory Management [5]
    - Swapping.
    - Demand Paging.

Reference Book:

- The design of Unix Operating System By Maurice J. Bach Published by PHI publication

For Lab Work: Advance Programming in UNIX environment by W. Richard Stevens and Stephen A. Rago Second Edition Published by Pearson Publication

M.Sc. (Industrial Mathematics with Computer Applications)

From the Academic Year 2015-16

M. Sc. –III Semester V

Statistical Methods MIM-504

Ch.No.	Name of the Chapter	Total no of lectures
1	Review of Theory of probability • Sample Space • Events • Probability of an event • Conditional Probability and independence	4
2	Random Variables • Random Variable • Discrete and continuous random variable • Probability distribution of a discrete and continuous random variable • Distribution function • Mean and Variance	5
3	Standard probability distributions • Binomial(n,p) • Poisson(λ) • Exp(θ) • Uniform(a,b) • Normal(μ,σ^2)	9
4	Correlation and Regression analysis • Product Moment Correlation Coefficient • Linear Regression • Method of least squares for estimation of regression coefficients	4
5	Multiple and Partial Correlation • Regression Equations and Regression Planes • Co-efficient of Multiple correlation • Partial Correlation • Generalization to more than 3 variables	5
6	Testing of Hypothesis Large sample tests(One sided and two sided tests) • One sample test for mean	6

	• One sample test for proportion • Two sample test for mean • Two sample test for proportion	
7	Testing of Hypothesis Small sample tests: • One sample test for mean • Two Sample test for mean • Paired t test • $\chi 2$ Test for independence of attributes • $\chi 2$ Test for goodness of fit. • One sample test for variance • Two sample test for variance	7
8	Statistics Assignments using R software • 10 assignments out of 13 using R-commands: i) Creating a data frame for the given data. ii) Presentation of data using graphical and diagrammatic methods. iii) Computation of basic statistical measures for raw data and grouped data iv) Computation of probabilities of Binomial, Poisson, Exponential and Normal distributions. v) Fitting of Binomial and Poisson distribution. vi) Fitting of Normal distribution. vii) Model sampling from Binomial, Poisson, Exponential and Normal distributions. viii) To compute correlation coefficient and lines of regression for a bivariate data. ix) To compute multiple and partial correlation co-efficients and fitting of multiple regression plane for a trivariate data. x) Large Sample tests. xi) Tests based on t distribution. xii) Tests based on χ^2 distribution. xiii) Tests based on F distribution.	20

Reference Books:

- Probability and Statistics for Engineers and Scientists: Walpole,Myers,Myers,Ye
- Statistics: Murray R.Spiegel, Larry J.Stephens
- Probability and Statistics for Engineers: Richard A.Johnson, C.B.Gupta
- Statistics using R: Narosa Publishing house by Dr S.G. Purohit, Dr. S.D.Gore, Dr. S.R.Deshmukh

M.Sc. (Industrial Mathematics with Computer Applications)
From the Academic Year 2015-16
M.Sc –III Semester V

MIM-505 Cryptography

Chapter 1 Introduction to cryptography **[5]**

1.1 History of cryptography

1.2 Cryptography in Modern world. Substitution cipher, Ceaser,Monoalphabetic. Transposition Cipher ,Rail fence, Simple Columnar, one time Pad

Chapter 2 Symmetric key cryptography **[10]**

2.1 Introduction and overview

2.2 Stream Cipher, Block cipher

2.3 Modes of operation Electronic code book, cipher block chaining, Cipher feedback

2.4 Algorithms : Data Encryption Standard, Advanced Encryption Standard, IDEA (International Data Encryption Algorithm)

2.5 Attacks against DES, AES, IDEA

Chapter 3 Public key Cryptography **[10]**

3.1 Introduction and Overview

3.2 Diffie Hellman Key exchange

3.3 Algorithms : RSA, Discrete Logarithm, MD5

3.4 Attacks against RSA , Discrete Logarithm, MD5

Chapter 4 Elliptic Curve Cryptography **[13]**

4.1 Introduction and Overview

4.2 Menezes Vanstone Encryption

4.3 Attacks

Chapter 5 Applications of Cryptography **[10]**

5.1 Digital Signature

5.2 Kerberos

5.3 Pretty Good privacy

5.4 Internet protocol security

Reference Books:

1.Understanding and Applying cryptography and Data security By Adam J. Elbirt (CRC press)

2. Applied Cryptography by Bruice Schneier (Wiley India Edition)

3 Cryptography and Network security by Atul Kahate (Tata Mcgraw Hill)

4 Number theory and Cryptography by Neil Koblitz

5.Cryptological Mathematics by Robert Lewand (Mathematical Association of America)

M.Sc. (Industrial Mathematics with Computer Applications)
From TheAcademic Year 2015-16
M.Sc –III Semester V

MIM-506 Distributed Database System

Unit 1: Distributed databases: An overview **[2]**

1.1 Features of distributed Vs centralized databases Chapter 1 from Book 2
1.2 Why DDB? DDBMS
1.3 Promises / problem areas in implementing a DDB Section 1.3, 1.5 from Book 1

Unit 2. DDBMS Architecture **[4]**

2.1 DBMS Standardization Chapter 4 from Book 1
2.2 Architectural models for DDBMS
2.3 DDBMS architecture
2.4 Distributed catalog management Section 21.8 from Book 3

Unit 3. Distributed database design **[10]**

3.1 Alternative design strategies Chapter 5 from book 1
3.2 Distributed design issues
3.3 Concepts of join graphs Section 4.2.1.2 from book 2
3.4 Fragmentation and allocation Chapter 5 from Book1

Unit 4. Overview of Query processing **[4]**

4.1 Query processing problems
4.2 Objectives of query processing Chapter 7 from book 1
4.3 Complexity of relational algebra operators
4.4 Characterization of query processors
4.5 Layers of query processing

Unit 5. Query decomposition & data localization **[2]**

5.1 Query decomposition
5.2 Localization of distributed data Chapter 8 from book 1

Unit 6. Optimization of distributed queries **[10]**

6.1 Query optimization
Centralized query optimization ;Join ordering in Chapter 9 from book1
fragment queries. Distributed query optimization algorithms
6.2 Centralized query optimization
6.3 Join ordering in fragment queries
6.4 Distributed query optimization algorithms

Unit 7. Management of distributed transactions **[2]**

7.1 Framework for transaction management Chapter 7 from book 2
7.2 Supporting atomicity of distributed transactions
7.3 Concurrency control of distributed transactions
7.4 Architectural aspects of distributed transactions

Unit 8. Concurrency control **[6]**

8.1 Foundations of distributed concurrency control Chapter 8 from book 2
8.2 Distributed deadlocks
8.3 Concurrency control based on timestamps

8.4 Optimistic methods for distributed concurrency Control

Unit 9. Distributed DBMS reliability **[8]**

9.1 Reliability concepts & measures
9.2 Failures & fault tolerance in distributed systems from book 1
9.3 Failures in DDBMS
9.4 Local reliability protocols
9.5 Distributed reliability protocols
9.6 Dealing with site failures
9.7 Network partitioning

Reference Books:

1. Principles of Distributed Database Systems; 2nd Edition By M. Tamer Ozsu and Patrick Valduriez Publishers: Pearson Education Asia ISBN: 81-7808-375-2
2. Distributed Database; Principles & Systems By Stefano Ceri and Giuseppo Pelagatti Publications: McGraw-Hill International Editions ISBN: 0-07-010829-3
3. Database systems (2nd edition) By Raghuramakrishnan and Johannes

M.Sc. (Industrial Mathematics with Computer Applications)
From the Academic Year 2015-16
M.Sc –III Semester V
MIM-507 Artificial Intelligence Elective Course

CHAPTER-1 Introduction to Artificial Intelligence **[2]**
What is AI?
Early work in AI
AI and related fields
AI problems and Techniques
(Book 1: Pages:4-22 OR Book 2: Pages 3-27)

CHAPTER-2 Problems, Problem Spaces and Search **[6]**
Defining AI problems as a State Space Search: example
Production Systems
Search and Control Strategies
Problem Characteristics
Issues in Design of Search Programs
Additional Problems
(Book 1: Pages. 25-47 OR Book 2: 57-82)

CHAPTER-3 Heuristic Search Techniques **[10]**
Generate-and-test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Mean-Ends Analysis
(Book 1: Pages. 50-72, Book 2: 83, 92-114)

CHAPTER-4 Knowledge Representation **[10]**
Representations and Mappings, Approaches to Knowledge Representation, Knowledge representation method, Propositional Logic, Predicate logic, Representing Simple facts in Logic, Representing Instances and Isa relationships, Computable Functions and Predicates, Resolution, Forward and backward chaining
(Book 1: 79 - 96, Book 2: 217-264, 265-311, 323)

CHAPTER-5 Slot – and – Filler Structures **[8]**
Weak Structures, Semantic Networks, Frames, Strong Structures, Conceptual Dependencies, Scripts
(Book 1 : Pages 118 - 204, 207-215 **)**

CHAPTER-6 Game Playing **[4]**
Minimax Search Procedures, Adding alpha-beta cutoffs
(Book 1: 231-239 OR Book 2: 122-139)

CHAPTER-7 Learning **[2]**
What is learning, Rote Learning, Learning by taking advice, Learning in problem solving, Learning from examples, Explanation based learning

(Book 1: 347-365 OR Book 2: 525-532, 629-632)

CHAPTER-8 Introduction to Neural Networks **[6]**

What are Neural Networks?
Artificial neurons, Neural networks and architecture
Neuron abstraction
Neuron signal functions
Architectures – Feed forward and feedback
(Book 3)

Books

Book 1: Artificial Intelligence, Tata McGraw-Hill Publishing Company Limited, 2nd Edition, By Elaine Rich and Kevin Knight
Book 2: Introduction to Artificial Intelligence and Expert System, Prentice Hall of India Pvt Ltd, New Delhi, 1997, 2nd printing, by Dan Patterson
Book 3: Neural networks, A Classroom Approach, Satish Kumar, Tata McGraw-Hill Publishing Company Limited, ISBN: 0-07-048292-6

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