Syllabus for M.Sc. (MCS) I Yr
Semester I, Paper-I
Algebra

Subject Code: MCS 401	
No. of credits	**4**
Instructional hours	**4 hrs/w**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I
Automaphisms- Conjugacy and G-sets- Normal series solvable groups- Nilpotent groups. (Pages 104 to 128 of [1])

Unit II
Structure theorems of groups: Direct product- Finitly generated abelian groups- Invariants of a finite abelian group- Sylow's theorems- Groups of orders p2,pq . (Pages 138 to 155)

Unit III
Ideals and homomsphism- Sum and direct sum of ideals, Maximal and prime ideals- Nilpotent and nil ideals- Zorn's lemma (Pages 179 to 211).

Unit-IV
Unique factorization domains - Principal ideal domains- Euclidean domains- Polynomial rings over UFD- Rings of traction.(Pages 212 to 228)

Text Books:
[1] Basic Abstract Algebra by P.B. Bhattacharya, S.K. Jain and S.R. Nagpanl.
Reference: 1] Topics i7n Algebra by I.N. Herstein.

Syllabus for M.Sc. (MCS) I Yr
Semester I, Paper-II
Real Analysis

Subject Code: MCS 402	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I
Metric spaces- Compact sets- Perfect sets- Connected sets

Unit II
Limits of functions- Continuous functions- Continuity and compactness Continuity and connectedness- Discontinuities – Monotone functions.

Unit III
Rieman- Steiltjes integral- Definition and Existence of the Integral- Properties of the integral- Integration of vector valued functions- Rectifiable waves.

Unit-IV
Sequences and series of functions: Uniform convergence- Uniform convergence and continuity- Uniform convergence and integration- Uniform convergence and differentiation- Approximation of a continuous function by a sequence of polynomials.

Text Books:
[1] Principles of Mathematical Analysis (3rd Edition) (Chapters 2, 4, 6)By Walter Rudin, Mc Graw-Hill Internation Edition

Semester-I, Paper-III
Operating System

Subject Code: MCS 403	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT-I

Introduction – Mainframe systems –Desktop Systems - Multiprocessor Systems - Distributed Systems Clustered Systems – Real Time Systems – Handheld Systems – Hardware Protection – System Components – Operating System Services – System Calls – System Programs – Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter – process Communication.

UNITII

Threads –Overview –Threading issues – CPU Scheduling – Basic Concepts – Scheduling Criteria –Scheduling Algorithms – Multiple Processor Scheduling – Real Time Scheduling – The CriticalSection Problem Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – monitors.

UNIT –III:

System Model– Deadlock Characterization – Methods for handling Deadlocks – Deadlock Prevention –Deadlock avoidance –Deadlock detection – Recovery from Deadlocks - Storage Management –Swapping – Contiguous Memory Allocation - Paging – Segmentation – Segmentation withpaging

UNIT- IV:

Virtual Memory – DemandPaging – Process Creation – Page Replacement – Allocation of frames – Thrashing – fileConcept – Access Methods – Directory Structure – File System Mounting File Sharing –Protection – File System Structure – File System Implementation – Directory Implementation –Allocation Methods- Free space Management – Kernel I/O Subsystems –Disk Structure – DiskScheduling – Disk Management – Swap Space Management. Case study: The Linux System,Windows.

REFERENCE BOOKS:

Abraham Silberschatz, Peter Baer Galvin and Greg
Gagne, “Operating System Concepts”, Sixth Edition, John Wiley & Sons (ASIA) Pvt. Ltd, 2003
1. Harvey M. Deitel, “Operating Systems”, Second Edition, Pearson Education Pvt. Ltd, 2002
2. Andrew S. Tanenbaum, : Modern Operating Systems”, Prentice Halla of India Pvt. Ltd,2003
3. William Stallings, “Operating System”, Prentice Hall if India, 4th Edition, 20034.
PromodChnadraP.Bhatt – “An Introduction to Operating Systems, Concepts and Practice”, PHI, 2003

Semester I, Paper-IV
OOPS Through JAVA

Subject Code: MCS 404	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I:

IntroductiontoCoreJava

ClassandObject,ObjectOrientedconceptswithrespecttoJava,Interfaces,PackagesandException Handling,Applets

AbstractWindowToolkitandSwing

ComponentsandGraphics,Containers,FramesandPanels,LayoutManagersBorderlayout,FlowlayoutGridlayout,Cardlayout,AWTallcomponents,Swing&ItsFeatures,JApplet,Icons&LabelsButtonLabel,TextField&ToggleButtons,checkboxes,Radiobuttons,ComboBox&Lists,Scrollpanes,Trees,Tables,MenuBars&Menus,ToolBars,DialogBoxes,FileDialog,ProgressBar,Choosers

UnitII:MultithreadingandI/O

Multithreadingconcepts,ThreadLifecycle,Creatingmultithreadedapplication,Threadpriorities,Threadsynchronization.JavaInputOutput:JavaIOpackage,Byte/CharacterStream,Bufferedreader/writer, Filereader/writer,Printwriter,FileSequential/Random

UnitIII:JDBC

JavaDatabaseConnectivity(JDBC)**:**IntroductiontoJDBC,TypesofJDBCConnectivity,Typesofstatementobjects(Statement,PreparedStatementandCallableStatement),Typesofresultset,ResultSetMetadata,Insertingandupdatingrecords,JDBCandAWTConnectionpooling.

Unit IV:

RMIandServletIntroduction&ArchitectureofRMI,Javarmiclassesandinterfaces,WritingsimpleRMIapplication,Parameterpassinginremotemethods(marshallingandunmarshalling). ServletOverview&Architecture,SettingupApacheTomcatServer,HandlingHTTPGetRequest,HandlingHTTPGetRequestContainingDataHandlingHTTPPostRequest

Suggestedreadings:

1. HerbertSchildt,Java“TheCompleteReference”,TataMcGraw-Hill
2. DeitelandDeitel."Java-HowtoProgram",Addison-WesleyPress,Reading,Mass
3. David Flanagan"Javain a Nutshell(Java2.1)",
2ndEd.,O'ReillyandAssociatesPublishing,Sebastopol,CA,

Syllabus for M.Sc. (MCS) I Yr
Semester II, Paper-I
Complex Analysis

Subject Code: MCS 451	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT-I

Regions in the Complex Plane -Functions of a Complex Variable - Mappings -Mappings by the Exponential Function- Limits - Limits Involving the Point at Infinity - Continuity -Derivatives - Cauchy–Riemann Equations -Sufficient Conditions for Differentiability -Analytic Functions - Harmonic Functions - Uniquely Determined Analytic Functions -Reflection Principle - The Exponential Function -The Logarithmic Function -Some Identities Involving Logarithms - Complex Exponents - Trigonometric Functions –Hyperbolic Functions

UNIT-II

Derivatives of Functions w(t) - Definite Integrals of Functions w(t) - Contours –Contour Integrals - Some Examples -Examples with Branch Cuts - Upper Bounds for Moduli of Contour Integrals –Anti derivatives -Cauchy–Goursat Theorem -Simply Connected Domains-Multiply Connected Domains -Cauchy Integral Formula -An Extension of the Cauchy Integral Formula - Liouville's Theorem and the Fundamental Theorem of Algebra –Maximum Modulus Principle.

UNIT-III

Convergence of Sequences - Convergence of Series - Taylor Series -Laurent Series –Absolute and Uniform Convergence of Power Series- Continuity of Sums of Power Series – Integration and Differentiation of Power Series - Uniqueness of Series Representations-Isolated Singular Points - Residues - Cauchy's Residue Theorem - Residue at Infinity - The Three Types of Isolated Singular Points - Residues at Poles - Examples - Zeros of Analytic Functions -Zeros and Poles -Behavior of Functions Near Isolated Singular Points

UNIT-IV

Evaluation of Improper Integrals -Improper Integrals from Fourier Analysis - Jordan's Lemma - Indented Paths - - Definite Integrals Involving Sines and Cosines – Argument Principle - Rouche´'s Theorem -Linear Transformations -The Transformation w = 1/z - Mappings by 1/z - Linear Fractional Transformations -An Implicit Form - Mappings of the Upper Half Plane

Text: James Ward Brown, Ruel V Churchill, *Complex Variables with applications*

Syllabus for M.Sc. (MCS) I Yr
Semester II, Paper-II
Functional Analysis

Subject Code: MCS 452	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit –I
NORMED LINEAR SPACES: Definitions and Elementary Properties, Subspace, Closed Subspace, Finite Dimensional Normed LinearSpaces and Subspaces, Quotient Spaces, Completion of Normed Spaces.

Unit-II
HILBERT SPACES: Inner Product Space, Hilbert Space, Cauchy-Bunyakovsky-SchwartzInequality, Parallelogram Law, Orthogonality, Orthogonal Projection Theorem, OrthogonalComplements, Direct Sum, Complete Orthonormal System, Isomorphism between SeparableHilbertSpaces.

Unit-III
LINEAR OPERATORS: Linear Operators in Normed Linear Spaces, Linear Functionals, TheSpace of Bounded Linear Operators, Uniform Boundedness Principle,Hahn-Banach Theorem,Hahn-Banach Theorem for Complex Vector and Normed Linear Space, The General Form ofLinear Functionals in Hilbert Spaces.

Unit-IV
FUNDAMENTAL THEOREMS FOR BANACH SPACES AND ADJOINT OPERATORS INHILBERT SPACES: Closed Graph Theorem, Open Mapping Theorem, Bounded InverseTheorem, Adjoint Operators, Self-Adjoint Operators, Quadratic Form, Unitary Operators,Projection Operators.

Text Book:
A First Course in Functional Analysis-Rabindranath Sen, Anthem Press An imprint of Wimbledon Publishing Company.

Reference:
1. Introductory Functional Analysis- E.Kreyzig- John Wilely and sons, New York,
2. Functional Analysis, by B.V. Limaye 2nd Edition.
3. Introduction to Topology and Modern Analysis- G.F.Simmons. Mc.Graw-Hill International Edition.

Syllabus for M.Sc. (MCS) I Yr
Semester II, Paper-III
SOFTWARE ENGINEERING

Subject Code: MCS 453	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT- I: Introduction to software Engineering – Project size and its categories – planning a software project – software developing life cycle – planning and organizational Structure.

UNIT-II: Software cost estimation, least factor – cost estimation techniques – maintenance cost estimation – Software Requirement Specifications – formal specification techniques.

UNIT-III: Software Design – Fundamental Design concepts and relations of Modularization – Module design techniques – detailed design consideration – Implementation issues – Structures coding techniques – coding style – standards and guidelines – Documentation – Verification and Validation techniques – Quality Assurance – Walk through and inspection – Testing – format verification.

UNIT-IV: Software tools – Overview of CASE – Software reliability – Software errors – Faculty – Repairs and availability – Software maintenance – Management aspects of maintenance – Maintenance tools and techniques.

TEXT BOOK:
Pressman – Software Engineering, Mc. Graw Hills Publishing Co., 1987.
REFERENCE BOOK:
R. Fairly – Software Engineering, Mc. Graw Hills Publishing Co., 1986.

Syllabus for M.Sc. (MCS) I Yr
Semester II, Paper-IV
PROGRAMMING USING PYTHON

Subject Code: MCS 454	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT I : Introduction to Programming Languages : What is program and programming paradigms, Programming languages-their classification and characteristics, language translators and language translation activities, Use of Algorithms/Flow Charts for problemsolving **Building Blocks of Program:** Data, Data Types, Data Binding, Variables, Constants,Declaration, Operations on Data such as assignment, arithmetic, relational, logical operations,dry run, Evaluating efficiency of algorithms in terms of number of operations and variables used
Introduction to Python Programming: Features, basic syntax, Writing and executing simple program, Basic Data Types such as numbers, strings, etc Declaring variables, Performing assignments, arithmetic operations, Simple input-output

UNIT II :
Sequence Control – Precedence of operators, Type conversion
Conditional Statements: if, if-else, nested if –else
Looping: for, while, nested loops
Control statements: Terminating loops, skipping specific conditions **String Manipulation:**declaring strings, string functions **Manipulating Collections** Lists, Tuples **Dictionaries –** Concept of dictionary, techniques to create, update& delete dictionary items.**Functions:** Defining a function, calling a function, Advantages of functions, types of functions, function parameters, Formal parameters, Actual parameters, anonymous functions, global and local variables **Modules:** Importing module, Creating & exploring modules, Math module,Random module, Time module,

UNIT III : GUI Programming in Python (using Tkinter/wxPython/ Qt) -
What is GUI, Advantages of GUI, Introduction to GUI library,Layout management, Events and bindings, Font, Colors, drawing on canvas (line, oval, rectangle, etc.) Widget such as : Frame, Label, Button, Checkbutton, Entry, Listbox, Message,
Radiobutton, Text, Spinboxetc

Python File Input-Output: Opening and closing file, Various types of file modes, reading and writing to files, manipulating directories **Exception Handling** – What is exception,Various keywords to handle exception such try, catch, except, else, finally, raise – **Regular Expressions –** Concept of regular expression, various types of regular expressions, using Matchfunction

Database connectivity in Python – Installing mysql connector, accessing connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity **Algorithm, Searching and Sorting –** Searching and sorting techniques, Efficiency ofalgorithms

Text books:

1) Charles Dierbach, *Introduction to Computer Science using Python*, Wiley,2013
2) James Payne ,*Beginning Python: Using Python 2.6 and Python 3,* Wiley India,2010
3) Paul Gries , Jennifer Campbell, Jason Montojo, *Practical Programming: An Introduction to Computer Science Using Python 3,* Pragmatic Bookshelf, 2/E2014
4) James Payne ,*Beginning Python: Using Python 2.6 and Python 3,* Wiley India,2010

Additional References:

1. Paul Gries , Jennifer Campbell, Jason Montojo, *Practical Programming: An Introduction to Computer Science Using Python 3*, Pragmatic Bookshelf, 2/E2014
2. Adesh Pandey, *Programming Languages – Principles and Paradigms*, Narosa,2008
3. A. Lukaszewski, *MySQL for Python: Database Access Made Easy*, Pact Publisher, 2010

M.Sc II yr Semester III

Computer networks-Paper I

Subject Code: MCS 501	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT I

Overview of the Internet: Protocol, Layering scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP referencemodel Data Link Layer – Design issues, CRC Codes, Elementary Data Link Layer Protocols, Sliding Window Protocol Multiple Access Protocols – ALOHA, CSMA, Collision free Protocol's , Ethernet -Physical Layer, Ethernet Mac Sub Layer, Data Link Layer Switching & use of bridges, Learning bridges, Spanning Tree bridges , Repeaters, Hubs, Bridges, Switches, Routers and Gateways

UNIT II

Network Layer, Network Layer Design Issues, store and forwards packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinite Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT III

Internetworking: Tunneling,Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP, Transport Layer: Services Provided to the upper layers elements of transport protocol-addressing connection establishment, Connection Release, Connection Release, Crash Recovery.

UNIT IV

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols, The internet Transport Protocols-Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, TCP Sliding Window, The TCP Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP. Application Layer-Introduction, Providing Services, Applications Layer paradigms, Client server model, Standard Client-Server application-HTTP, FTP, Electronic mail, TELNET, DNS, SSH.

TEXT BOOKS:

1) Computer Networks, Andrew S.Tanenbaum, David J Wetherall, Pearson Education, 5th Edition.

2) Computer Networks A Top-Down Approach, Behrouz A Forouzan, FirouzMosharraf, TMH.

B.Sc II yr Semester III

Mathematical Methods- **Paper- II**

Subject Code: MCS 502	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I

Existence and Uniqueness of solution of $dx/dy = f(x,y)$. The method of successive approximation- Picard'stheorem- Sturm-Liouville's boundary value problem. Partial Differential Equations: Origins of first-order PDES-Linear equation of first-order-Lagrange'smethod of solving PDE of Pp+Qq = R – Non-Linear PDE of order one-Charpit method- Linear PDES withconstant coefficients.

Unit II

Heat equation and Waveequation- Laplace equation. Partial Differential Equations of order two with variable coefficients- Canonical form Classification ofsecond order PDE- separation of variable method solving the one-dimensional

Unit III

Power Series solution of O.D.E. – Ordinary and Singular points- Series solution about an ordinary point -Series solution about Singular point-Frobenius Method. Lagendre Polynomials: Lengendre's equation and its solution- Lengendre Polynomial and its properties-Generating function-Orthogonal properties- Recurrance relations- Laplace's definite integrals for Pn (x)- Rodrigue's formula.

Unit-IV

Bessels Functions: Bessel's equation and its solution- Bessel function of the first kind and its properties-Recurrence Relations- Generating function- Orthogonality properties.

Hermite Polynomials: Hermite's equation and its solution- Hermite polynomial and its properties-

Generating function- Alternative expressions (Rodrigue's formula)- Orthogonality properties- Recurrence Relations.

Text Books:

[1] "Elements of Partial Differential Equations", By Ian Sneddon, Mc.Graw-Hill International Edition.

[2] "Text book of Ordinary Differential Equation", By S.G.Deo, V. Lakshmi Kantham, V. Raghavendra, Tata Mc.Graw Hill Pub. Company Ltd.

[3] "Ordinary and Partial Differential Equations", By M.D. Raisingania,
S. Chand Company Ltd., New Delhi.

M.Sc II yr Semester III

Advanced RDBMS with Oracle

Paper III(A)

Subject Code: MCS 503A	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT-I

Basic concepts

Database and Need for DBMS, Characteristics of DBMS Database Users, 3-tier architecture of DBMS (its advantages over 2-tier), Views of data-schemas and instances Data Independence

Data Models

Introduction to various data models –Record based & Object based , Cardinality Ratio & Relationships, Representation of entities, attributes, relationship attributes, relationship set, Generalization, aggregation, Structure of relational Database and different types of keys

Relational Model

Codd's rules, Relational data model & relational algebra, Relational model concept,Relational modelconstraints, Relational Algebra, Relational database language,Data definition in SQL, Views and,Queriesin SQL, Specifying constraints and Indexes inSQL, Specifying constraints management systems,Oracle /Ingres/ SQL Server / My SQL

UNIT-II

Relational Database design

Database Design – ER to Relational, Functional dependencies, Normalization,Normal forms based on primary keys(1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF), Loss less joins and dependency,preserving decomposition.

Queries

Select with all options Operators Arithmetic ComparisonLogical(in, between, like, all, %, _, any, exists, is null, and ,or,not, Distinct) Order by clause

SQL Functions

DateSys_date ,next_day, Add_months, last_day, months_between,Numericround, trunc, abs, ceil, cos,exp, floor Character initcap, lower, upper, ltrim, rtrim, translate, length, lpad, rpad, replace Conversion to_char, to_date, to_number Miscellaneous Uid, User, nvl, vsize, decode, rownumGroup function avg, max, min, sum, count, with Group by and Having ClauseNested functions

UNIT-III

Joins

Simple join Equi join Non equi join Self join Outer join,Set operators (Union, union all, intersect, minus) **Sub queries and Correlated query,DML statements (Insert, Update, Delete withclause)TCL (Commit, Rollback, Savepoint) Locks in Oracle DDL Statements**

Data types CharacterChar,Varchar/varchar2, Long NumberNumber (p) - fixed point, Number (p,s) -floating pointDateRawLong raw Introduction to LOB data types (CLOB,BLOB, BFILE)

PL / SQL Introduction to PL/SQLAdvantages of PL/SQL PL/SQL Character SetData types - Character,Raw,rowid,boolean, binary, integer,number, Variable, constantPL/SQL blocks Attribute - % type,%rowtypeoperators function comparison, numeric, character, date. control structure sequential –goto Error handlingconcept of exception pre defined exceptions - no_data_foundcursor_allready_open,dup_val_on_index,storage_error,program_error,zero_divide , invalid_cursor, login_denied, invalid_number, too_many_rows, dbms_output, user_defined exceptions

UNIT-IV

Cursor Explicit& implicit Cursor, Cursor for loop, Parametric cursor,Declaring cursor variables, Constrained and unconstrained ,cursor variables, Opening a cursor variable from a query,Closing cursorvariables, Restrictions using cursor variables .**Composite Data types** Record, Declaration, refer, recordassignment Table declaration, table attributes (count, delete, exists, first,last, next, prior) **Database Triggers** Types of Triggers Enabling, disabling Predicates- inserting, updating, deleting**Procedures and Functions** Definition, Implementation and Execution **Packages**

Books :

1. Introduction To Database Systems By C.J.Date, Pearson.
2. Data Base System Concept by Korth, TMH, 5thEd.
3. Data Management Systems by Alexis Leon, Mathew Leon
4. Principals of Database Management by James Martin, PHI.
5. Computer Database Organization by James Martin,PHI,3rd Ed.
6. Relational database design for Micro Computers applications by Prentice Hall(Jackson)
7. Introduction to Data Management Systems by AtulKahate, Pearson Education Pub.
8. Fundamentals of Database Systems by Elmasri, Navathe, Pearson,5thEd
9. Data Mining: Concepts and systems - Jiawei nan, MichelineKamber, (MorganKaufmann publishers
10. Database systems : "Design implementation and management"- Rob Coronel, 4th Edition, (Thomson Learning Press)

Books:

1. SQL - The complete Reference by Groff James & Weinberg Paul.,TMH,2nd Ed.
2. SQL for Professionals by Kishore Swapna&NaikRajesh,TMH.
3. SQL from the ground up by Pyofinch Mary
4. SQL Unleashed by Ladanyi Hans.
5 Oracle 7 by Ivan Bayross,BPB Pub.
6 Understanding SQL by Gruber Martin,BPB Pub.
7. Teach yourself SQL in 14 days by Morgan Bryan & Perkins Jeff
8. Oracle PL/SQL Programming by Scott Urman
9. Teach yourself PL/SQL in 21 days by Lucus Tom,techmedia,2nd Ed.
10. OCP: Oracle 10g Certification Kit (1Z0-042 and 1Z0-043)
11. Oracle Database 10g OCP Certification All-In-One Exam Guide (Oracle Database 10g Handbook) by DamirBersinic, John Watso
12. Oracle Database 10g DBA Handbook by Kevin Loney, Bob Bryla, PublisherMcGraw-Hill
13. Understanding SQL by Gruber Martin,BPB Pub.
14. Teach yourself SQL in 14 days by Morgan Bryan & Perkins Jeff
15. Oracle PL/SQL Programming by Scott Urman
16. Teach yourself PL/SQL in 21 days by Lucus Tom,techmedia,2nd Ed.
17. OCP: Oracle 10g Certification Kit (1Z0-042 and 1Z0-043)
18. Oracle Database 10g OCP Certification All-In-One Exam Guide (Oracle Database 10g Handbook) by DamirBersinic, John Watson
19. Oracle Database 10g DBA Handbook by Kevin Loney, Bob Bryla, PublisherMcGraw-Hill

M.Sc II yr Semester III

Cloud Computing
Paper IIIB

Subject Code: MCS 503(B)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I: Web Service as distributed application
The Service Endpoint Interface (SEI) and Service Implementation Bean (SIB), JAX-WS, Publishing WebService, Calling Web Service from applications developed in different platform, SOAP, Message transport, Service contract, Web Services returning Richer Data types, WSDL structure.

Unit II: SOAP Based Web Services
Structure of SOAP Message (In JAX-WS), SOAP Messaging Architecture, SOAP Header, Client-side SOAPHandler, Generating a Fault, Service-side SOAP Handler, Handler methods, Message Context and Transport Headers, Web Services and Binary Data

Unit III: REST-style Web Services
What is REST? HTTP methods, Java API for RESTful Web Services (JAX-RS), JAX-RS with Jersey, CRUD RESTful Web Service, SOAP and REST in Harmony, Interoperability between the Java Platform and WCF, WSIT, Web Services Security, Wire-Level Security, WS-Security.

Unit IV: Amazon Web Services (AWS) Essentials
Architecting on AWS, Building complex solutions with Amazon Virtual Private Cloud (Amazon VPC),Leverage bootstrapping and auto configuration in designs, Architect solutions with multiple regions, Employ Auto Scaling design patterns, Amazon CloudFront for caching, Big data services including AWSData Pipeline, Amazon Redshift and Amazon Elastic MapReduce. AWS OpsWorks.

Text book:
Java Web Services Up and Running 2nd edition, Martin Kalin, O'Reilly (2013)
Pro Power Shell for Amazon Web Services, Brian Beach, Apress, 2014.
Reference:
Text book: Java Web Services Up and Running 2nd edition, Martin Kalin, O'Reilly (2013)
Pro Power Shell for Amazon Web Services, Brian Beach, Apress, 2014.
Reference: Programming Amazon EC2, Jurg van Vliet, Flavia Paganelli, O'Reilly Media, 2011.
JAX-WS Reference Implementation (RI) Project, https://jax-ws.java.net/.
Java API for RESTful Services (JAX-RS), https://jax-rs-spec.java.net/.RESTful Web Services in Java, https://jersey.java.net/.AWS Training.

M.Sc II yr Semester III

Robotics and Artificial Intelligence- Paper IIIC

Subject Code: MCS 503(C)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I: Introduction to Robotics What is a Robot? Definition, History of Robots: Control Theory, Cybernetics, GreyWalter Tortoise, Analog Electronic Circuit, Reactive Theory, Braitenberg'sVehicle,Artificial Intelligence, Vision Based Navigation, Types of Robot Control. Robot Components: Embodiment, Sensors, States, Action, Brains and Brawn, Autonomy, Arms, Legs, Wheels, Tracks, and What really drives them effectors and actuators: Effector, Actuator, Passive and Active Actuation, Types of Actuator, Motors, Degree of freedom Locomotion: Stability, Moving and Gaits, Wheels and Steering, Staying on the path. Manipulators: Endeffectors, Teleoperation, Why is manipulation hard? Sensors: Types of Sensors, Levels of Processing, Passive and Active sensors, Switches, Light sensors, Resistive position sensor.

Unit II: Sonar, Lasers and Cameras: Ultrasonic and Sonar sensing, Specular Reflection, Laser Sensing, Visual Sensing, Cameras, Edge Detection, Motion Vision, Stereo Vision, Biological Vision, Vision for Robots, Feedback or Closed Loop Control: Example of Feedback Control Robot, Types of feedback control, Feed forward or Open loop control.

Unit III: Languages for Programming Robot:
Algorithm, Architecture, The many ways to make a map, What is planning, Cost of planning, Reactive systems, Action selection, Subsumption architecture, How to sequence behavior through world, hybrid control, Behavior based control and Behavior Coordination, Behavior Arbitration, Distributed mapping, Navigation and Path planning.

Unit IV: Artificial Intelligence
Introduction, State space search: Generate and test, Simple search, Depth First Search (DFS), Breadth First Search (DFS), Comparison and quality of solutions. Heuristic Search: Heuristic functions, Best First Search (BFS), Hill Climbing, Local Maxima, Beam search, Tabu search. Finding Optimum paths: Brute force, branch & bound, refine search, Dijkstra's algorithm, A* algorithm. Admissibility of A* algorithm.

Text book:

The Robotics Primer by Maja J Matarić, MIT press Cambridge, Massachusetts,
London, England (2007).
A First course in Artificial Intelligence, Deepak Khemani, Tata McGraw Hill Education (India) private limited (2013)

References: Artificial Intelligence: A Modern Approach, 3e, Stuart Jonathan Russell, Peter Norvig, Prentice Hall.

M.Sc II yr Semester III

Design and Analysis Algorithm
Paper IVA

Subject Code: MCS 504(A)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT-I: Introduction and elementary data structures – order notation – Analysis of algorithm – Review of elementary data structures - head and Heap Sort – Hashing – sets representation - UNION, FIND operation.

UNIT-II: Divide – and – conquer and the Greedy Model – The General Method, binary search, finding, maximum and minimum - Merge sort – Quick sort and selection sort – Knapsack problem – Optimal storage on tapes, job sequencing with deadlines – optimal merge pattern, minimum spanning trees and single source shortest pattern.

UNIT-III: Dynamic Programming and traversal techniques – Multistage graphs, all pairs shortest path–Optimal binary search trees – O/I Knapsack – reliability design, travelling sales man problem – game trees, disconnected components and depth first search.

UNIT-IV: Back Tracking and branch bound Technique – 8 queens problem, graph colouring, Hamiltonian cycles – Knapsack problems, O/I Knapsack problems, Travelling sales person problems, Lower – Bound theory. NP – hard and NP-Completeness, Basic concepts, cook's theorem – NP Hard Graph problem and scheduling problem – NP Hard code generation problem – decision problem – node covering theorem.

Text Book:

1. E. Horowitz and S. Sahini, Fundamentals of Computer Algorithms, Galgotia Publications, 1984.
2. A.V. Aho, J.V. Hopcraft and J.D. Ullmann, The design and analysis of computer Algorithm, Addison Wesley Publications Company 1974

M.Sc II yr Semester III

Object Oriented Analysis and Design Using UML and Visual agile Modeling

Paper IV B

Subject Code: MCS 504(B)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT I :

Introduction to Object-Oriented Analysis and Design, A Short Example., Overview of UML and Visual agile Modeling, History.Overview of UP, Iterative and Evolutionary Development, Waterfall Lifecycle, Iterative and Evolutionary Analysis and Design, Risk-Driven and Client-Driven Iterative Planning, Agile Methods and Attitudes, Agile Modeling, Agile UP, UP Phases, UP Disciplines, the UP Development Case Case Study Strategy: Iterative Development + Iterative Learning .Case One: The NextGen POS System, Case Two: The Monopoly Game System. Definition of Inception, Inception ArtifactsDefinition: Requirements, Evolutionary vs. Waterfall Requirements, Skillful Means to Find Requirements, Types and Categories of Requirements, UP Requirements Artifacts and its Organization.Definition of Actors,
Scenarios, and Use Cases, Use Cases and the Use-Case Model. Motivation for the Use Cases, Three Kinds of Actors, Three Common Use Case Formats, Example: Process Sale, Fully Dressed Style. Guideline to find Use Cases. Applying UML: Use Case Diagrams, Applying UML: Activity Diagrams, Other Benefits of Use Cases, Example: Monopoly Game, Process: How to Work With Use Cases in Iterative Methods? Showing the Supplementary Specification, Glossary, Vision & Business Rules, Evolutionary Requirements in Iterative Methods.Iteration 1 Requirements and Emphasis: Core OOA/D Skills. Process: Inception and
Elaboration. Process: Planning the Next Iteration.

UNIT II

Domain Model, Motivation for the Creation of a Domain Model, Guideline to Create a Domain Model and to find Conceptual Classes, Example: Find and Draw Conceptual Classes. Agile Modeling-Sketching a Class Diagram. Guideline: Agile Modeling-Maintain the Model in a Tool? Guideline: Report Objects- Include 'Receipt' in the Model? A Common Mistake with Attributes vs. Classes.Associations, Attributes in domain model. Iterative and Evolutionary Domain Modeling.Example: NextGen SSD. System Sequence Diagrams, Motivation, Applying UML: Sequence Diagrams. Relationship Between SSDs and Use Cases, Naming the System Events and Operations, Modeling SSDs Involving Other External Systems, Example: Monopoly SSD. Iterative and Evolutionary SSDs. System Operation, Contracts Usefulness, Guideline to Create

and Write Contracts. Example: NextGen POS Contracts. Example: Monopoly Contracts. Applying UML: Operations, Contracts, and the OCL. Process: Operation Contracts within the UP.Iterative process. Provoking Early Change.Logical Architecture, Focus in the Case Studies, Software Architecture, Applying UML: Package Diagrams. The Model-View Separation Principle. Connection between SSDs, System Operations, and Layers, Example: NextGen Logical Architecture and Package Diagram. Example: Monopoly Logical Architecture.Agile Modeling and Lightweight UML Drawing. UML CASE Tools. Static and Dynamic Modeling, The
Importance of Object Design Skill over UML Notation Skill. Other Object Design Techniques: CRC
Cards.Sequence& Communication Diagrams. Common UML Interaction Diagram Notation.Basic Sequence Diagram Notation. Basic Communication Diagram Notation.Applying UML: Class Diagram Notation. Relationship between Interaction and Class Diagrams

UNIT III

UML versus Design Principles. GRASP: A Methodical Approach to Basic OO Design. Connection between Responsibilities, GRASP, and UML Diagrams. Patterns, A Short Example of Object Design with GRASP. Applying GRASP to Object Design.Creator.Information Expert (or Expert).Low Coupling.Controller.High Cohesion. Use Case Realization, Use Case Realizations for the NextGen Iteration. Use Case Realizations for the Monopoly Iteration. Iterative and Evolutionary Object Design.Visibility Between Objects, Visibility, Four kinds of visibility.Programming and Iterative, Evolutionary Development, Mapping Designs to Code , Creating Class Definitions from DCDs, Creating Methods from Interaction Diagrams, Collection Classes in Code, Exceptions and Error Handling, Defining the Sale.MakeLineItem Method. Order of Implementation.Test-Driven or Test-First Development. Introduction to theNextGen POS Program Solution. Test-Driven Development.Refactoring.Forward, Reverse, and Round-Trip Engineering. Common Report of Valuable Features, suggestions for choosing a UML tool, suggestions on how to integrate UML wall sketching and tools.Case Study: NextGen
POS. Case Study: Monopoly.From Iteration 1 to 2. Iteration-2 Requirements and Emphasis: Object Design and Patterns

UNIT IV

Polymorphism.Pure Fabrication.Indirection.Protected Variations.Adapter GoF).
Factory.Singleton (GoF).Strategy (GoF).CompositeGoF)andOtherDesignPrinciples.FacadeGoF).Observer/Publish-GoF)andOtherDesignPrinciples.FacadeGoF).Observer/Publish-
Subscribe/Delegation Event Model (GoF).NextGen POS. Monopoly.UML Activity Diagram Notation.Guidelines. Example: NextGen Activity Diagram.Definitions: Events, States, and Transitions. UMLState Machine Diagram Notation. Example: NextGenUseCaseState Machine Diagram.Theinclude Relationship. Terminology: Concrete, Abstract, Base, and Addition Use Cases. The extend Relationship.The generalize Relationship. Use Case Diagrams.New Concepts for the NextGen Domain Model. Generalization.Defining Conceptual Superclasses and Subclasses.NextGen POS Conceptual Class Hierarchies.Abstract Conceptual Classes. Modeling

Changing States. Class Hierarchies and Inheritance in Software.Association Classes.Aggregation and Composition.Association Role Names.Roles as Concepts versus Roles in Associations.Derived Elements.Qualified Associations.Reflexive Associations.Using Packages to Organize the Domain Model. Example: Monopoly Domain Model Refinements.Architectural Analysis, Variation and Evolution Points. Common Steps in Architectural Analysis.Identification and Analysis of Architectural Factors. Example: Partial NextGen POS Architectural Factor Table.

Prescribed Text Book

T1 Larman , Craig, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Pearson Education, 3nd Ed., 2004.

Reference Book (S)

R1. Barclay Savage, Object Oriented Design with UML and JAVA, Elsevier, 2008.
R2. Brown, D.W., An Introduction to Object-Oriented Analysis, Wiley, 2nd Ed., 2004.
R3. Mark Priestley, Practical Object Oriented Design with UML, TMH, 2nd Ed., 2005.
R4. Michael Bleha, James Rambaugh, Object-Oriented Modelling & Design with UML, Pearson, 2nd Ed.,2005.
R5. Bahrami A., Object Oriented Systems Development using Unified Modeling Language, McGraw Hill, 1999.
R6. Grady Booch et al., Unified Modeling Language User Guide, Pearson Education, 1999
R7. Martin Fowler et al., UML Distilled, Pearson Education, 2000
R8. Rebecca Wirfs-Brock et al., Designing Object-Oriented Software, PHI, 1996
R9. Bruegge B., Object-Oriented Software Engineering, Pearson, 2000.

M.Sc II yr Semester III

Dot Net Technology- **Paper IV(C)**

Subject Code: MCS 504(C)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit — I

Introduction to .NET framework, .NET objects, Assembly, Components of Assembly, Private and Shared Assembly, Garbage Collector, JIT compiler. Namespaces Collections, Delegates and Events.Introducing C# 2010 — Exploring new features of visual studio 2010, exploring the visual studio 2010 IDE. Creating simple C# application, a. Language features, data types, variables, constants, expressions and Operators. i) Variables and Expressions, type conversion ii) Flow Controls and looping statements. Arrays-single, multi - dimensional and Jagged arrays iii) Functions, Delegates iv) Debugging and error handling, exception handling (System Defined and 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, Comparisons and Conversionsi. Defining and using collections, Indexers, iterators ii. Type comparison, Value Comparison iii. Overloading Conversion operators, as operator

UNIT — II

Windows applications — creating windows forms, displaying messages, creating MDI forms. Windows form controls-labels, text box, list box, rich text box, list box, check box, combo box controls, buttons.Handling XML — problem, solution, example, XML schemas and serialization.

UNIT—Ill

.NET and SQL Server —Introduction using SQL data sources, Data accessing withADO.NET (Working with Database) **Co**nnections , Data access, Data Adapter , Data set, Data reader . Executenonquery, Executescalar ,Executereader, Grid View Control Data List Details View and FormView Controls, ListView and DataPager controls. Creating applications using ADO.NET, stored procedures.Introduction to web services.

UNIT IV

Introduction to ASP.NET 4: ASP.NET features- ASP.NET lifecycle Creating web controls-Server & client web form controls. **ASP.NET server controls :** Types of Websites , Webpage Syntax, Solution Files, web.config and global.asax files.

Intrinsic Objects in ASP.net **Web Forms: Standard Controls (i)** Web Control Class Buttons, Text Boxes
Labels Literals, Place Holders, Hidden Field Control, File Upload Control

Web Forms: -
Standard Controls(ii) Image Controls, Image Buttons, Image Maps, List Boxes,Dropdown, Lists Bulleted Lists, Hyper Links Link Buttons Check Boxes Check Box Lists Radio Buttons ,Radio Button Lists , Tables Panels, View Multiview, Calender**Navigation Controls:-**Tree View Control Menu Control SiteMapPath Control
Wizard Control **Validation Controls:-**Required Field Validators, Comparison Validators, RangeValidators , Regular Expression Validators, CustomValidators Validation Summaries Validation Groups .
Login Controls : Login Control, Login View Control, Login Status Control, Login Name Control, Password Recovery Control, Create User Wizard Control, Change Password Control
State Management: Using view state, using session state, using application state, using cookies and URL encoding.
Master Pages: Creating master pages, content pages, nesting master pages, accessing master page controls from a content page.
ASP.NET Web Services Creating Web Service, Declaring Web Service, Setting the Web Service Attribute Deploying the Web Service Simple Object Access Protocol

Suggested Readings:
1. Introducing Microsoft .NET, David S.Platt, PHI publications.
2. .NET 4.0 Black Book, Dreamtech Press.

M.Sc II yr Semester III

Operations Research-**Paper IV(D)**

Subject Code: MCS 504(D)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I

Formulation of Linear Programming problems, Graphical solution of Linear Programming problem, General formulation of Linear Programming problems, Standard and Matrix forms of Linear Programming problems, Simplex Method, Two-phase method, Big-M method, Method to resolve degeneracy in Linear Programming problem, Alternative optimal solutions.Solution of simultaneous equations by simplex Method, Inverse of a Matrix by simplex Method, Concept of Duality in Linear Programming, Comparison of solutions of the Dual and its primal.

Unit II

Mathematical formulation of Assignment problem, Reduction theorem, Hungarian Assignment Method,Travelling salesman problem, Formulation of Travelling Salesman problem as an Assignment problem, Solution procedure .Mathematical formulation of Transportation problem, Tabular representation, Methods to find initial basic feasible solution, North West corner rule, Lowest cost entry method, Vogel's approximation methods, Optimality test, Method of finding optimal solution, Degeneracy in transportation problem, Method to resolve degeneracy, Unbalanced transportation problem.

Unit III

Concept of Dynamic programming, Bellman's principle of optimality, characteristics of Dynamic programming problem, Backward and Forward recursive approach, Minimum path problem, Single Additive constraint and Multiplicatively separable return, Single Additive constraint and Additively separable return, Single Multiplicatively constraint and Additively separable return.

Unit-IV

Historical development of CPM/PERT Techniques - Basic steps - Network diagram representation – Rules for drawing networks - Forward pass and Backward pass computations - Determination of floats -Determination of critical path - Project evaluation and review techniques updating.

Text Books:

[1] S. D. Sharma, Operations Research.
[2] KantiSwarup, P. K. Gupta and Manmohan, Operations Research.
[3] H. A. Taha, Operations Research – An Introduction.

M.Sc II yr Semester IV

Network Security -**Paper I**

Subject Code: MCS 551	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT-I

Conventional encryption, Security attacks, Security, Model for network security, conventional encryption model, encryption techniques, DES, Triple DES, key distribution, random number generation.

UNIT-II

Public – key cryptology, principles of public – key cryptosystems, RSA algorithm, key management, distribution of public keys, public key – distribution of secret keys.

UNIT-III

Authentication and digital systems, authenticate requirements – functions cryptographic checksum, hash function, digital signatures authentication protocols, Kerberos, X-509 directory, authentication services Diffie – Hellmann key exchange, digital signature standards.

UNIT-IV

Cryptographic algorithms, The MD 5 message digest algorithm, Secure Hash algorithm, international data encryption algorithm, LUCA public key encryption – Electronic mail and management security – pretty good privacy (PGP), privacy enhanced mail.

TEXT BOOKS:

1. William Stallings, Network and Internet work Security, Prentice Hall of India.
2. M.Sc.(Maths with Computer Science)

M.Sc II yr Semester IV

Computer Graphics - **Paper II**

Subject Code: MCS 552	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT – I: A survey of computer graphics, overview of graphic systems, Video Display devices, Raster scan systems, Random scan systems, graphic input devices, Hard copy devices. Graphics software.Output Primitives, Line Drawing Algorithms: DDA, Bressenham line Algorithm, Midpoint circle Algorithm, Ellipse Algorithm. Polygon fill Algorithms: Scan – line, Boundary fill, Flood fill Algorithms.

UNIT – II: Attributes of output primitives: Line Attributes, Curve Attributes, Area-fill and character
Attributes. Two dimensional transformations: Basic transformations, homogeneous representation, composite transformation, reflection and shear transformation.

UNIT – III: Two – dimensional viewing Viewing pipeline, window to view coordinate transformation. Clipping Operations: Cohen – Sutherland line clipping, Liang – Barsky line clipping, Nicholl-Lee-Nicholl Line Clipping, Sutherland – Hodgman polygon clipping, WeilerAutherton polygon clipping.

UNIT–IV: Three dimensional object representations, polygon surfaces, polygon tables, plane Equations, cubic Bezier curves, B-spline, Octrees**,** 3D – transformations : Translation, Rotation, Rotation about an arbitrary point. Projections: Perspective projections and parallel projections. Visible surface detection: Back faced detection, Z-buffer Algorithm, Depth sorting Algorithm, Area subdivision Algorithm.

TEXT BOOK: M. Pauline Baker, Computer Graphics, C-Version, Prentice Hall of India, second edition, 1995.

M.Sc II yr Semester IV

Automata Theory, Language &Computation-Paper IIIA

Subject Code: MCS 553(A)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

UNIT I:
Introduction Symbol, Alphabet, String ,Prefix && Suffix of Strings, Sets, Operations onsets, Finite& infinite sets Formal Language- Relation, Equivalence Relation (reflexive ,transitive and symmetric closures).

UNIT II: Regular Languages Regular Expression: Definition Examples,& Identities,FiniteAutomata:Concept,DFA:Definition&examples,NFA:Definition,examples,LanguageacceptedbyFA,NFAwithεmoves,RegularExpressiontoFA:MethodandProblems,NFAwithεmovestoNFA,NFAtoDFA:MethodProblems,MinimizationofDFA:ProblemusingTable, Method-FAm with output: Moore & Mealy Machines: Definition and their requivalence, Closure Properties:Union, Intersection, Concatenation, Complement.

UNITIII:
ContextFreeLanguagesChomskyHierarchy,CFG:Definition&examples,AmbiguousGrammar:Concept&ExamplesSimplificationofCFG:RemovingUseless,Symbols,removingunitproductionsandremovingNullablesymbols:Methods&Problems,NormalForms:CNF&GNF:Method&Problems,Regular Grammar: Definition, Equivalence of FA& Regular Grammar.

UNITIV: PropertiesofContextFreeLanguagesPumpingLemmaforCFL:methods&problems,ClosurePropertiesofCFL's.TuringMachineRecursive&recursivelyenumerablelanguage,IntroductiontoLBA(BasicModel)&CSG.,DefinitionOfTM,Designof TM for language recognition, Types of Turing

Suggested readings:
1. DanielI.A.Cohen,"IntroductiontoComputerTheory",Wiley2ndEd.
2.JohnE.Hopcroft,RajeevMotwani,JeffreyD.Ullman,"IntroductiontoAutomata Theory,LanguagesandComputation",Pearsoneducation2ndEd
K.L.P.Mishra&N.Chandrasekaran,"TheoryofComputerScience(AutomataLanguagesAndComputation)",PHI2ndEd.
4.ThomasA.Sudkamp,"AnIntroductiontotheTheoryofComp.Sci .Languages&Machine",(3rdEd.Pearsoneducation)
5. Lutz and Ascher - "Learning Python", O'Reilly.

M.Sc II yr Semester IV

Machine Intelligence-Paper III (B)

Subject Code: MCS 553(B)	
No. of credits	**4**
Instructional hours	**4 hrs/wk**
Duration of Internal Assessment	**1 hr**
Marks for Internal Assessment	**20 marks**
Duration of Semester Examination	**3 Hrs**
Marks for Semester Examination	**80 marks**
Max.marks	**100(80 + 20)**

Unit I: Learning-Standard Linear methods

Statistical Learning: What Is Statistical Learning, Assessing Model Accuracy. Linear Regression: Simple Linear Regression, Multiple Linear Regressions, Other Considerations in the Regression Model, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors. Classification: An Overview of Classification, Why Not Linear Regression? Logistic Regression, Linear Discriminant Analysis, ,A Comparison of Classification Methods.

Unit II: Selection and improvements of linear learning methods

Resampling Methods: Cross-Validation, The Bootstrap. Linear Model Selection and Regularization: Subset Selection, Shrinkage Methods, Dimension Reduction Methods, Considerations in High Dimensions.

Unit III: Non-Linear Learning methods

Polynomial Regression, Step Functions, Basis Functions, Regression Splines, Smoothing Splines, Local Regression, Generalized Additive Models, Tree-Based Methods: The Basics ofDecision Trees. Bagging, Random Forests, Boosting.

Unit IV: Support Vector machines, Principle Component Analysis and Clustering

Support Vector Machines: Maximal Margin Classifier. Support Vector Classifiers: Support Vector Machines, SVMs with More than Two Classes Relationship to Logistic Regression. Unsupervised Learning: The Challenge of Unsupervised Learning, Principal Components Analysis, Clustering Methods: K-Means Clustering, Hierarchical Clustering, Practical Issues in Clustering.

Text book:

An Introduction to Statistical Learning with Applications in R: Gareth James, Daniela Witten, TrevorHastie, Robert Tibshirani, Springer 2013.

The Elements of Statistical Learning: Data Mining, Inference, and Prediction (Second Edition) : TrevorHastie, Robert Tibshirani, Jerome Friedman, Springer (2008).

Reference:

1. Introduction to Machine Learning (Second Edition): EthemAlpaydın, The MIT Press (2010).
2. Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006)
3. Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press (2012)
4. Machine Learning: The Art and Science of Algorithms that Make Sense of Data: Peter Flach, CambridgeUniversity Press (2012)
5. Machine Learning for Hackers: Drew Conway and John Myles White, O'Reilly (2012)
6. Machine Learning in Action: Peter Harrington, Manning Publications (2012).
7. Machine Learning with R: Brett Lantz, Packt Publishing (2013)

DEPARTMENT OF MATHEMATICS
OSMANIA UNIVERSITY
M.Sc. (Mathematics with computer science)
Elementary Number Theory Paper – III (C)

Subject Code	**MCS 553(C)**
No.of credits	**6**
Instruction	**4 Hrs/Week**
Duration of Semester Examination	**3 Hrs**
Duration of Sessional Examination	**1 Hr**
Semester Examination	**80 Marks**
Sessional Examination	**20 Marks**
Max.Marks	**100(80+20)**

Unit I

The Division Algorithm – Number Patterns- Prime and Composite Numbers- Fibonacci and Lucas' numbers- Fermat Numbers- GCD-The Euclidean Algorithm- The Fundamental Theorem of Arithmetic- LCM- Linear Diophantine Equations.

Unit II

Congruences- Linear Congruences- The Pollard Rho Factoring Method- Divisibility TestsModular Designs- Check Digits- The Chinese Remainder Theorem- General Linear Systems- 2X2 Systems.

Unit III

Wilson's Theorem- Fermat's Little Theorem- Pseudo primes- Euler's Theorem- Euler's Phi function Revisisted- The Tau and Sigma Functions- Perfect Numbers- Mersenne Primes- The Mobius Function.

Unit IV

The Order of a Positive Integer- Primality Tests- Primitive Roots for Primes- Composites with Primitive roots- The Algebra of Indices- Quadratic Residues- the Legendre Symbol- Quadratic Reciprocity- the Jacobi Symbol.

Text Books: 1. Thomas Koshy, Elementary Number Theory with Applications.