LECTURE PLAN

MCA

SEMESTER III

FOR PRIVATE CIRCULATION

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LECTURE PLAN

THEORY OF COMPUTATION

MCA 201

COURSE OUTLINE
MCA - III SEMESTER
THEORY OF COMPUTATION – MCA 201

L - 4 Credits - 04

OBJECTIVE:

The objective of the course is to introduce and study abstract mathematical models of computation such as Turing machines, formal grammars and recursive functions. These abstract computation models are used to study the ability of solving computational problems by identifying both the intrinsic limitations of computing devices and the practical limitations due to limited availability of resources i.e. space and time. The course will help the students to understand formal definitions of machine models and formalize mathematical models of computations.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS:

SECTION A **(12 hours)**

- Overview of theoretical computer science
- Introduction to System software
- Modules / Phases in design of a compiler
- Finite State Machine
- Chomsky Classification
- Types of languages and Grammars
- Regular Language
- Kleen's Theorem and Regular Expression
- Regular Grammar
- Right and Left Linear Grammar
- Closure property of Regular Languages
- Pumping Lemma
- Properties of Regular expressions
- DFA, NFA and their equivalence
- Identifying non regular languages
- Pumping lemma
- Myhill-Nerode theorem
- Use of regular expressions in design of scanner
- Introduction to JFLAP simulation

SECTION B **(12 hours)**

- Context free Language and Grammar
- Derivation tree
- Left most and right most derivation
- Parsing and ambiguity
- Push Down Automata (deterministic & Non- deterministic)
- Equivalence of CFGs & PDAs
- Pumping Lemma
- Properties of CFL including closure property
- PDA, NPDA as recognizer of CFL
- Parsing

SECTION C **(10 hours)**

- Turing machine and thesis
- Non Deterministic Turing Machine
- Universal Turing Machine
- Equivalence of various Turing machine Formalisms
- Computability and Decidability
- Halting Problem of TM
- Reducibility
- Recursion theorem

SECTION D **(6 hours)**

- Computational Complexity theory
- Time and space measures
- Hierarchy theorems
- Complexity classes
- Introduction to P and NP complete
- Savitch theorem
- L, NL, PSPACE complexity
- Post correspondence problem
- Probabilistic computation

STUDY MATERIAL FOR THE SUBJECT

➢ TEXT BOOK

1 **Author's Name(s):** John C. Martin
Title: Introduction to Theory of formal Languages and Automata
Edition: IV **Year:** 2013
Publisher: Tata McGraw Hill (ibid 1)

➢ REFERENCE BOOKS

1 **Author's Name(s) :**K L P Mishra and Chandrashekharan
Title: Theory of Computer Science
Edition: III **Year:** 2012
Publisher: PHI (ibid 2)

2. **Author's Name(s) :** Daniel I.A. Cohen
Title: Introduction to Computer Theory
Edition: II **Year:** 2012
Publisher: John Wiley & Sons (ibid 3)

3. **Author's Name(s) :** Linz
Title: Introduction to Formal languages and Automata
Edition: V **Year:** 2012
Publisher: Jones & Bartlett Learning (ibid 4)

4. **Author's Name(s):** Kamala Krithivasan and Rama R.
Title: Introduction to Formal Languages, Automata Theory and Computation
Edition: I **Year:** 2009
Publisher: Pearson Education (ibid 5)

5. **Author's Name(s): Shyamalendukandar**
Title: Introduction to Automata Theory, Formal Languages and Computation
Edition: II Year:2014
Publisher: Pearson (ibid 6)

➢ PERIODICALS

1. Proc. Of the Tenth Annual IEEE symposium on switching and Automata theory, Waterloo, Canada
2. SIAM Journal of Control. Volume 4,Issue3
3. Journal of ACM, Volume16, Issue 1
4. SIAM Journal of Computing,Volume**5**, Issue 4

LECTURES 1-3

REVIEW OF BASIC CONCEPTS

OBJECTIVE:

The main objective of these lectures is to review basic concepts of automata and language theory. Language theory has an important role in the compiler construction as result students should have a clear understanding of these concepts.

CONTENTS:

- Automata & Language theory
  - Languages
  - Grammar
  - Automata
- Applications of Automata

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q1- 4
2 Refer Unit I Section III Q1-10
3 Refer Unit I Section III Q45-47

OTHER ASSIGNMENT:

1 ibid 1, Page No. 13-16 Q1-34
2 ibid 5, Page No. 52-53 Q1-10
3 ibid 6, page No. 17-20 Q1-Q4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 9-15

REFERENCE BOOKS:

1 ibid 4, Page No. 16-34
2 ibid 5, Page No. 19-30

ARTICLES:

1 Thomas Schwentick, "XML Schema Management: A Challenge for Automata Theory", 7th International Conference, LATA 2013, Bilbao, Spain, April 2-5, 2013. Proceedings

2 Security Applications of Formal Language Theory, Systems Journal, IEEE, Volume 7 , Issue 3, Sept. 2013, pp 489 - 500
3 Chomsky, N, "Formal properties of grammars", Handbook of Mathematical Psychology, Vol. 2, pp. 323-418, New York: John Wiley and Sons.

LECTURES 4-6

FINITE STATE MACHINES

OBJECTIVE:

The lectures will help the students to understand the basics of compiler design, finite state machines, languages and regular languages. They are able to form machines that generate the given language.

CONTENTS:

- Introduction to System Software
  - Phases of a compiler
  - Grouping of phases
  - Compiler construction tools

- The Theory of Automata
  - Definition of automation
  - Description of finite automata
  - Transition systems
  - Properties of transition functions
  - Acceptability of a string by a finite automaton

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q20-29
2 Refer Unit I Section III Q11-21, 43-44

OTHER ASSIGNMENTS:

1 ibid 2, Page No. 104 Q3.1-3.4
2 ibid 4, Page No. 27-30 Q2-23
3 ibid 5, Page No. 109 Q8-9
4 ibid 6, Page No. 128-130 Q4 - Q12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 71-79

REFERENCE BOOKS:

1 ibid 4, Page No. 16-26
2 ibid 5, Page No. 57-90

ARTICLES:

1 Wan HengFonget. al. , Automata representation for Abelian groups, AIP Conf. Proceedings 1522, 875 (2013); http://dx.doi.org/10.1063/1.4801221 , 18–20 Dec 2012, Malaysia
2 Pettersson Mikael, "A Term Pattern-Match Compiler Inspired by Finite Automata Theory", International Workshop on Compiler Construction (CC'92),www. classes. cs.uchicago.edu/archive/2011/.../paperspettersson92.pdf

LECTURES 7-10

MINIMIZATION OF MACHINES

OBJECTIVE:

The lectures will help the students to understand the conversion from NDFA to a DFA, working of Mealy and Moore machines and Minimization of Finite Automata.

CONTENTS:

- The Theory of Automata
    - Non deterministic finite state machines
    - Deterministic finite state machines
    - The equivalence of DFA and NDFA
    - Conversion of NDFA to DFA
    - Mealy Machines
    - Moore Machines
    - Minimization of finite automata
    - Various questions on above mentioned topics

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section III Q22-40
2 Refer Unit I Section II Q35-36

OTHER ASSIGNMENTS:

1 ibid 4, Page No. 68-69 Q1-5
2 ibid 2, Page No. 104-106 Q3.5-3.16
3 ibid 6, Page No. 219-221 Q4 - Q12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 140-144

REFERENCE BOOKS:

1 ibid 2, Page No. 78-102
2 ibid 4, Page No. 37-68
3 ibid 5, Page No. 100-109

ARTICLE:

1 ChristofLöding, "Unambiguous Finite Automata", Developments in Language Theory, 17th International Conference Proceedings, DLT 2013, Marne-la-Vallée, France, June 18-21, 2013

WEBSITE:

1 http://www.informatik.uni-bremen.de/agbs/lehre/ss05/pi2/hintergrund/minimize_dfa.pdf

LECTURES 11-13

LANGUAGES

OBJECTIVE:

The objective of the lectures is to make student understand the basics of formal languages, Chomsky classification and operation on languages. Chmosky divided the languages into four types depending upon the production rules of the grammar.

CONTENTS:

- Formal Languages
  - Basics definitions and examples
  - Chomsky classification of languages
  - Languages and their relation
  - Operations on languages
    - Union
    - Intersection
    - Concatenation
    - Star
    - closure

- Languages and automata

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I Section II Q15-19, Q37-39

OTHER ASSIGNMENTS:

1 ibid 2, Page No. 134-135 Q4.1-4.17
2 ibid 5, Page No. 142-143 Q3, Q4
3 ibid 6, Page No. 346-348 Q1 – Q4

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 2, Page No. 107-132
2 ibid 5, Page No. 111-123

ARTICLES:

1 J. Almeida , M. Zeitoun, "An Automata-Theoretic Approach to the Word Problem for ω-terms over R", www.cmup.fc.up.pt
2 Fischer, MJ, "Two characterizations of the context-sensitive languages", Proc. Of the Tenth Annual IEEE symposium on switching and Automata theory, pp. 157-165, Waterloo, Canada, Oct 15-17.

LECTURES 14-18

REGULAR EXPRESSION

OBJECTIVE:

The objective of the lectures is to make student understand the basics of regular expression, regular grammars and equivalence between regular expressions and finite automata.

CONTENTS:

- Regular Sets and Regular Grammars
  - Regular expressions
  - Finite automata and regular expressions
  - Pumping lemma for regular sets
  - Applications of pumping lemma
  - Closure properties of regular languages

- Left linear grammar
- Right linear grammar
- Properties of regular expression
- Regular sets
- Regular grammars

➢ Myhill-Nerode theorem
➢ Use of RE in design of lexical analyzer

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I Section II Q5-14
2 Refer Unit II Section II Q23-24

OTHER ASSIGNMENTS:

1 ibid 2 Page No. 176-179 Q5.1-5.24
2 ibid 3 Page No. 204-205 Q 4-10
3 ibid 4 Page No. 96-97 Q1-13, Page No. 122-124 Q3 -7 ,Q13-18
4 ibid 5 Page No. 96 Q8-11
5 ibid 6, Page No. 272-278 Q1 – Q9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 71-79

REFERENCE BOOKS:

1 ibid 2 Page No. 136-174
2 ibid 3 Page No. 196-203
3 ibid 4 Page No. 71-96, 100-121

ARTICLES:

1 Jean-Marc Champarnaud, Eric Laugerotte, FaissalOuardi , DjelloulZiadi,"From Regular Weighted Expressions to Finite Automata" , International Journal of Foundations of Computer Science, www.cmi.univ-mrs.fr/~fouardi/pubs/wei_ijfcs.pdf
2 Steven M. Kearns, "Accelerated Finite Automata Enable Regular Expression Searching in Sublinear Time", Aug 2013, Cornell University ArXiv, http://arxiv.org/abs/1308.3822

LECTURES 19-21

CONTEXT FREE LANGUAGES

OBJECTIVE:

These lectures introduce the concept of context free languages and grammars. These languages are basically designed to formalize grammatical properties of natural languages and considered to be the most suitable for the formal description of the syntax of programming languages.

CONTENTS:

- Context-free languages
  - Parsing
  - Derivation tree
  - Left most derivation
  - Right most derivation
  - Ambiguous grammar
  - Simple grammar
  - Various examples of CFL

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q1- 7 11-20
2 Refer Unit II Section III Q1-2, Q7-10
3 Refer Unit II Section IV Q 1-7
4 Refer Unit II Section Q25-27

OTHER ASSIGNMENTS:

1 ibid 4, Page No. 144-145 Q1-13
2 ibid 2, Page No. 224-225 Q6.1-6.10
3 ibid 5, Page No. 190 Q3-8
4 ibid 6, Page No. 363-367 Q23 – Q29

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No.163-174

REFERENCE BOOKS:

1 ibid 2, Page No. 180-201
2 ibid 4, Page No. 126-144
3

ARTICLES:

1. Tanner Swett, Edward Aboufadel, "Ordinary Generating Functions of Context Free Grammars" (2014), Undergraduate Research, Grand Valley State University

2. Jean-Marc Champarnaud, Eric Laugerotte, FaissalOuardi , DjelloulZiadi,"From Regular Weighted Expressions to Finite Automata" , International Journal of Foundations of Computer Science, www.cmi.univ-mrs.fr/~fouardi/pubs/wei_ijfcs.pdf

WEBSITE:

1 http://www.cs.ucr.edu/~jiang/cs150/slides4week6_Parsing+Ambiguity.pdf

LECTURES 22-24

SIMPLIFICATION OF CONTEXT FREE GRAMMARS AND NORMAL FORMS

OBJECTIVE:

The main aim of these lectures is to study several transformations and substitutions that will be useful in simplification of context-free grammars and also to investigate normal forms for context-free grammars.

CONTENTS:

- Simplification of CFG
  - Methods of transforming grammars
    - Removing useless productions
    - Removing λ-productions
    - Removing unit productions
- Two Normal forms
  - Chomsky normal form
  - Greibach normal form

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q9-10
2 Refer Unit II Section III Q9-10, Q11-12, and Q15
3 Refer Unit II Section IV Q11-16

OTHER ASSIGNMENTS:

1 ibid 2, Page No. 225-226 Q6.12-6.23
2 ibid 4, Page No. 161-162 Q1-13, Page No. 169-170 Q1-15
3 ibid 6, Page No. 356-362 Q15 – Q22

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 2, Page No. 201-222
2 ibid 4, Page No. 150-169

WEBSITE:

1 http://www.cse.msstate.edu/~hansen/classes/3813spring05/slides/10NormalForms.pdf

LECTURES 25-27

PUSHDOWN AUTOMATA

OBJECTIVE:

In the following lectures the connection between pushdown automata and context-free languages is explored. It also includes that how a pushdown automaton acts non-deterministically resulting in a class of automata that accepts exactly the family of context-free languages.

CONTENTS:

- Non deterministically pushdown automata
- The language accepted by pushdown automata
- Pushdown automata and CFL
- CFG for pushdown automata
- Deterministic pushdown automata and deterministic CFL
- Grammars for deterministic CFL

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section III Q3-6
2 Refer Unit II Section IV Q8-10, 17-20
3 Refer Unit III Section II Q-25, 27-28

OTHER ASSIGNMENTS:

1 ibid 2, Page No.265-266 Q7.1-7.10
2 ibid 4, Page No. 203 Q1-9
3 ibid 5, Page No. 162-163, Q1-5
4 ibid 6, Page No. 409-424 Q1 – Q17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 198-215

REFERENCE BOOKS:

1 ibid 2, Page No. 227-264
2 ibid 4, Page No. 176-203

ARTICLES:

1 Baeten, Cuijpers, Tilburg," A Context-Free Process as a Pushdown Automaton",www.win.tue.nl/~pvantilb/papers/CFP-Pushdown_CONCUR08.pdf
2 Ginsburg, S and EH Spanier, "Finite turn Pushdown Automata", SIAM J. Control. 4: 3, pp. 429-453.

LECTURES 28-31

PROPERTIES OF CONTEXT-FREE LANGUAGES

OBJECTIVE:

The lectures aim to study the relationship between language families and to exhibit their similarities and differences. They also investigate the major properties of various families.

CONTENTS:

- Pumping lemma for CFL
- Applications of pumping lemma
- Pumping lemma for linear languages
- Closure properties for CFL
    - Union
    - Concatenation
    - Star-closure
    - Intersection
    - Complementation
- Some decidable properties of CFL
- Parsing
    - LL(1) parsing Method
    - SLR Parsing Method
    - LR(1) Parsing Method

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II Section III Q7&8

OTHER ASSIGNMENT:

1 ibid 4, Page No. 219-220 Q1-23

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 4, Page No. 205-219
2 ibid 5, Page No. 165-175

ARTICLE:

1 Schutzenberger, "On Context Free languages and Push Down Automata", Information and Control", Volume 6(3), 1963, Page 246-264, genome.univ-mlv.fr/~berstel/Mps/Travaux/.../1963-5CflPdaInfCtl.pdf

LECTURES 32-34

TURING MACHINES

OBJECTIVE:

The lectures introduce the basics of Turing machine followed by its mechanism. The discussion culminates in the Turing thesis, which maintains that any computational process, such as those carried out by present day computers can be done on a Turing machine.

CONTENTS:

- The standard Turing machine
- Turing machine as language accepters
- Examples of TM
- Turing machines as transducers
- Combining Turing machines for complicated tasks
- Turing's thesis
- A universal Turing machine

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q1-10, 13 , Q17-20
2 Refer Unit IV Section IV Q1-10, 13-15 ,17

OTHER ASSIGNMENTS:

1 ibid 4, Page No. 236-238 Q1-20, Page No. 242 Q1-5
2 ibid 3, Page No. 531-534 Q1-20
3 ibid 5, Page No. 225, Q 11-15.

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 257-266

REFERENCE BOOKS:

1 ibid 3, Page No. 494-531
2 ibid 4, Page No. 223-248
3 ibid 5, Page No. 193-222
4 ibid 6, Page No. 451-459 Q1 – Q9

ARTICLES:

1. Rosen, "The Turing Machine Revisited", www.theassc.org/files/assc/turing.pdf
2. Hopcroft, JE and JD Ullman, "Some results on tape-bounded Turing Machines.", J. ACM 16: 1, 168-177.
3. Edward E. Ogheneovo, **"**Universal Turing Machine: A Model for all computational problems", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 2, Issue 5, May 2014

LECTURES 35-38

LIMITS OF ALGORITHMIC COMPUTATION

OBJECTIVE:

These lectures explain the concept of decidability and computability and also discuss the various undecidable problems.

CONTENTS:

- Computability and decidability
- Undecidable Problems
    - The Turing machine Halting problem
    - The post correspondence problem
    - Undecidable problems for context-free languages
    - Undecidable problems for recursively enumerable languages

- Reducing one undecidable problem to another

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q11-12, Q14-16
2 Refer Unit IV Section IV Q11-12

OTHER ASSIGNMENT:

1 ibid 4, Page No. 305 Q3-7 , Page No. 309 Q1-8 , Page No. 315 Q1-4
2 ibid 5, Page No. 274 Q4-5
3 ibid 6, Page No. 500-502 Q10.3 - Q10.11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No. 337-349

REFERENCE BOOK:

1 ibid 4, Page No. 300-322

ARTICLES:

1 VesaHalava, TeroHarju, "New proof for the undecidability of the circular PCP", ActaInformatica, Volume 50, Issue 5-6 ,pp 331-341
2 Lawrence S. Moss, "The Undecidability of Iterated Modal Relativization", StudiaLogica, 79(3):373–407, 2005, www.math.wisc.edu/~jmiller/Papers/iterated.pdf

LECTURES 39-45

COMPUATIONAL COMPLEXITY

OBJECTIVE:

The following lectures explain the concept of computational complexity which is the study of efficiency of algorithms.

CONTENTS:

- Efficiency of computation
    - Time and space measures
    - Hierarchy theorems
- Turing machine models and complexity
- The complexity classes

- P classes
- NP classes

- Some NP problems
- NP completeness
- Open question on NP completeness
- Savitch Theorem
- The complexity classes
    - L classes
    - NL classes
    - PSPACE complexity
- Post Correspondence problem
- Probabilistic computation

OTHER ASSIGNMENT:

1 ibid 1, Page No. 361-362 Q1-4
2 ibid 5, Page 305, Q4-5
3 ibid 6, Page No. 576-579 Q1 – Q4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1 Page No.413-428

REFERENCE BOOKS:

1 ibid 1, Page No. 500-510
2 ibid 4, Page No. 311-317, 346-363
3 ibid 5, Page No. 277-300

ARTICLES:

1 ParthaGuchhait, Manas Kumar Maiti, "A fuzzy lifetime-based particle swarm optimisation with varying swarm size to solve a production inventory model", Int. J. of Computational Complexity and Intelligent Algorithms, 2016 Vol.1, No.1, pp.68 – 98.

WEBSITE:

1. http://www2.isye.gatech.edu/~ctovey/tovey.tutorial.pdf
2. Garey, MR, DS Johnson and RE Tarjan, "The planar Hamiltonian circuit problem is NP Complete.", SIAM J. Comput. 5: 4, pp. 704-714.

LECTURE PLAN

COMPUTER GRAPHICS

MCA 203

COURSE OUTLINE
MCA-III SEMESTER
COMPUTER GRAPHICS - MCA 203

L - 4 Credits - 04

OBJECTIVE:

Today the frontiers of graphics are moving very rapidly as evidenced by the computer generated commercials. The purpose of this course is to familiarize the students with the same and help them in developing graphics based applications. Computer graphics is used in diverse applications from the visualization of complex scientific data to the special effects in computer games. The objective of this course is to introduce the programming principles of computer graphics. The course will cover practical programming through C, and mathematical and theoretical foundations. In this course various scan conversion techniques, projections, various line drawing, circle and ellipse drawing techniques will be covered. Bezier curves and their implementation will also be taught.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15marks
2. Class Test-II - (Written Test) 15marks
3. Class Assessment + Attendance 10marks

COURSE CONTENTS:

1. TRANSFORMATION, PROJECTIONS, AND CLIPPING ALGORITHMS (12Hours)

- DDA Line Algorithm
- Bresenham'sor Midpoint Line Drawing Algorithm
- Bresenham's Circle and Ellipse algorithm
- Homogeneous Coordinate System for 2D and 3D
- Various 2D and 3D Transformation matrices
- Rotation about an arbitrary point (2D)
- Rotation about an arbitrary axis (3D)
- Computing location of V.P
- Clipping Algorithms
- Sutherland-Cohen Clipping Algorithm

2. CURVES AND SURFACES (12 Hours)

- Bezier Curves
- 4 point and 5 point Bezier curves using Bernstein Polynomials
- Conditions for smoothly joining curve segments
- Bezier bi-cubic surface patch
- B-Spline Curves
- Cubic B-Spline curves using uniform knot vectors

- Testing for first and second order continuities
- Effect of multiple control points at same location
- Geometrical Construction
- Computing control points given end slopes for a specified curve segment

3. PROJECTION AND SOLID MODELLING (12Hours)

- Parallel Projection
- Oblique Projection on xy plane
- Isometric Projection
- Perspective Projection
- One Vanishing Point (V.P.) projection from a point on z axis
- Generation of 2 V.P. Projection
- Isometric Projection
- Perspective Projection
- One vanishing Point (VP)
- Projection from 0 point on z axis
- Generation of 2 VP
- Projector & Projections
- Solid Modeling
- Sweeping a polygon or a surface patch along a path to form solids
- Boundary Representation (B-Rep)
- Octrees
- CSG – Constructive Solid Geometry

4. SHADING AND HIDDEN SURFACE REMOVAL (14 Hours)

- Shading
- Illumination Model for diffused Reflection
- Effect of ambient lighting distances
- Specular Reflection Model
- Computing Reflection Vector
- Curved Surfaces
- Polygonal Approximations
- Gouraud Shading
- Phong Model
- Hidden Surface Removal
- Floating Horizon Method
- Back Face Detection
- Depth Buffer (Z-Buffer, A-Buffer) Method
- Scan Line Method
- Depth Sorting Method
- BSP-Tree Method
- Area Subdivision Method.

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Computer Graphics and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOK**

1. **Author's Name(s):** Foley
   Title: Computer Graphics Principles and Practice
   Edition: 2nd **Year:** 2013
   Publisher: Pearson Education (ibid 1)

- **REFERENCE BOOKS**

1. **Author's Name(s):** ZhigangXiang , Roy Plastock
   Title: Schaum's Outlines Computer Graphics
   Edition: 2nd **Year:** 2015
   Publisher: Tata McGraw Hill (ibid 2)

2. **Author's Name(s):** David F. Rogers
   Title: Procedural Elements for Computer Graphics
   Edition: 2nd**Year:** 2013
   Publisher: Tata McGraw Hill (ibid 3)

3. **Author's Name(s):** Donald Hearn, M. Pauline Baker
   Title: Computer Graphics
   Edition: 2nd **Year:** 2013
   Publisher: Prentice Hall of India (ibid 4)

4. **Author's Name(s):** ITL Education Solutions Limited
   Title: Computer Graphics and Multimedia
   Edition: 2nd Year: 2013
   Publisher: Pearson (ibid 5)

- **JOURNALS**

- The IUP Journal of Information Technology
- Journal of Computer Graphics Techniques
- International Journal of Computer Theory and engineering

LECTURES 1-4

LINE DRAWING ALGORITHMS

OBJECTIVE:

The objective of these lectures is to discuss the various line drawing algorithms.

CONTENTS:

- Basic concepts about lines and their mathematical formulation
- Scan Converting Lines
  - DDA or Basic Incremental line algorithm
  - Breshnham's Or Mid-Point line algorithm
- Derivation and algorithm
- Practical Problems based on algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q1, Q 15, 19, 20, 21, 22,24,25,29,30,31,32
2 Refer to Unit II Section III Q1, Q2

OTHER ASSIGNMENT:

1 ibid 2, Page No. 72, Q 3.1,3.2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 98-102

REFERENCE BOOKS:

1 ibid 2, Page No. 37-42
2 ibid 3, Page No. 65-77
3 ibid 4, Page No. 115-117
4 ibid 5, Page No. 31-40

ARTICLES:

1 Hery , Ramamoorthi, "Importance Sampling of Reflection from Hair Fibers", Journal of Computer Graphics Techniques (JCGT), Vol. 1, No. 1, Page 1-17, June ,2012, http://jcgt.org/published/0001/01/01/

2 Sutopo,Hadi, "Bresenham's Lines Algorithm Visualization Using Flash", International Journal of Computer Theory and engineering, Vol. 3, No. 3, June 2011, http://www.ijcte.org/papers/342-G863.pdf.

WEBSITES:

1 www.cs.toronto.edu/~smalik/418/tutorial2_bresenham.pdf.
2 http://www.cs.helsinki.fi/group/goa/mallinnus/lines/bresenh.html

LECTURES 5-6

BRESENHAM'S CIRCLE AND ELLIPSE DRAWING ALGORITHM

OBJECTIVE:

The objective of these lectures is to extend the line algorithms and discuss the circle and ellipse drawing algorithms.

CONTENTS:

- Basic concepts about circles and their mathematical formulation
- Eight way symmetry
- Midpoint or Bresenham's algorithm
  - Scan converting circle
  - Scan converting ellipse
- Derivation and algorithm
- Practical Problems based on algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q 23, 24, 25
2 Refer to Unit II Section III Q2-5

OTHER ASSIGNMENT:

1 ibid 2, Page No. 72-85, Q3.36, 3.40
2 ibid 5, Page No. 41-68

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 105-112

REFERENCE BOOKS:

1 ibid 2, Page No. 42-46
2 ibid 3, Page No. 79-87
3 ibid 4, Page No. 118-119

WEBSITES:

1 www.cs.toronto.edu/~smalik/418/tutorial2_bresenham.pdf
2 http://www.geocities.ws/xuanhui_wu/publication/paper/cg_journal.pdf

LECTURES 7 - 13

HOMOGENOUS CO-ORDINATE SYSTEM

OBJECTIVE:

The objective of the lectures is to develop an understanding about the homogeneous co-ordinate system for 2D and 3D objects. Various techniques of rotating an object in the 2D and the 3D will be explained. Geometric and coordinate transformations will be taught and numerical related to this topic will be discussed.

CONTENTS:

- Basic Geometric Transformations
  - Translation
  - Scaling
  - Rotation
- Matrix Representation for each transformation
- Homogeneous Co-ordinate representation for each transformation
- Shearing
  - Shearing along X axis
  - Shearing along Y axis
- Composite Transformation
  - Translation
  - Rotation
  - Scaling
- Transformation of 3D objects
  - Translation
    - Matrix representation in case of translation
  - Scaling
    - Matrix representation
    - Steps that need to be followed for scaling
  - Rotation
    - With respect to z axis

        - With respect to y axis
        - With respect to x axis
        - Matrix representation for each
- Reflection
    - Concept of reflection
    - Matrix representation
    - Reflection with respect to X axis
    - Reflection with respect to Y axis
- Window to view port transformation
    - Concept of window
    - Concept of view port
    - Deriving the matrix for this transformation
- Computing location of V.P.
- Practical Problems

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q 2-8,16,17,26
2 Refer to Unit I Section III Q11,21
3 Refer to Unit II Section III Q 7-22

OTHER ASSIGNMENT:

1 ibid 2, Page No. 101-108, Q4.3, 4.10, 4.11, 4.12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 225-250

REFERENCE BOOKS:

1 ibid 2, Page No. 89-99
2 ibid 4, Page No.204-215
3 ibid 5, Page No.69-78

ARTICLES:

1 Paula Martins, Samuel Silva, Catarina Oliveira, Carlos Ferreira, Augusto Silva, António Teixeira, "Polygonal Mesh Comparison Applied to the Study of European Portuguese Sounds", International Journal of Creative Interfaces and Computer Graphics, 3(1), Page 28-44,January-June2012.

2 ManmohanChandraker, Ravi Ramamoorthi **,** **"**What An Image Reveals About Material Reflectance" , International Conference on computer vision, pages 1-8, June 2011, http://graphics.berkeley.edu/papers/Chandraker-WAI-2011-11/index.html.

WEBSITES:

1 www.cs.toronto.edu/~smalik/418/tutorial3_2D_OpenGL_transforms.pdf
2 http://www.tutorialspoint.com/computer_graphics/2d_transformation.htm

LECTURES 14-16

CLIPPING ALGORITHMS

OBJECTIVE:

Clipping refers to an optimization where the computer only draws things that might be visible to the viewer. The objective of these lectures is to familiarize the students with the concept of clipping and its various algorithms.

CONTENTS:

- Clipping Lines
  - Clipping endpoints
  - Clipping lines by solving equations
- Cohen Sutherland Line Clipping Algorithm
  - Introduction
  - Performing region checks
  - Checking a segment for trivial acceptance or rejection
  - Algorithm
  - Practical problems

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q8,9, 11,12,14,28
2 Refer to Unit I Section III Q 17,18,25,26

OTHER ASSIGNMENT:

1 ibid 2, Page No. 134-139, Q5.5,5.6,5.8,5.9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 134-148

REFERENCE BOOKS:

1 ibid 2, Page No. 121-123
2 ibid 3, Page No. 175-186
3 ibid 4, Page No. 244-250

ARTICLES:

1 R. Kodituwakku, K. R. Wijeweera, "An Efficient Line Clipping Algorithm for 3D Space", International Journal of Advanced Research in Computer Science and Software Engineering, Vol.2,Issue5,May,2012, http://www.ijarcsse.com/docs/papers/May2012/Volum2_issue5/V2I500437.pdf
2 Bimal Kumar Ray, "A Line Segment Clipping Algorithm in 2D",International Journal of Computer Graphics, Vol. 3, No. 2, November, 2012 http://www.sersc.org/journals/IJCG/vol3_no2/3.pdf

WEBSITES:

1 www.cs.csi.cuny.edu/.../ClippingExercise/Clipping%20Algorithms.pdf
2 https://www.cs.helsinki.fi/group/goa/viewing/leikkaus/lineClip.html

LECTURES 17-19

CURVES AND SURFACES

OBJECTIVE:

Smooth curves and surfaces must be generated in many computer graphics applications. The objective of the lectures is to familiarize the students with the same. Various continuity conditions and their calculation will be taught. Continuity conditions are used to smoothen out the curve.

CONTENTS:

- Common representation for 3D surfaces
  - Polygon mesh
  - Parametric curves
  - Parametric surfaces
  - Quadric surfaces

- Polygon mesh
    - Collection of edges , vertices and polygons
    - Representing Polygon meshes
        - Explicit representation
        - Pointers to edge list
        - Pointers to vertex list
- Parametric curves
    - Parametric representation for curves
    - Computing the tangent vector
    - Parametric continuity
        - G^0
        - G^1
    - Geometric continuity
        - C^0
        - C^1
        - C^2
    - Testing for first and second order continuities

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit II Section II Q 4, 5,8,9,15,25
2 Refer to Unit II Section III Q1, 6, 7

OTHER ASSIGNMENT:

1 ibid 1, Page No. 554-555, Q11.8, 11.27

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 497-552

REFERENCE BOOKS:

1 ibid 4, Page 316-321
2 ibid 5,Page 167-175

ARTICLES:

1 João Rodrigues, Roberto Lam, Hans du Buf, “Cortical 3D Face and Object Recognition Using 2D Projections ”, International Journal of Creative Interfaces and Computer Graphics, 3(1), 45-62, January-June 2012 45, Curless, Brian. "Parametric curves." (2013).
2 Curless, Brian. "Parametric curves." (2013).

WEBSITES:

1 www.inf.ed.ac.uk/teaching/courses/cg/Web/intro_to_curves.pdf
2 https://courses.cs.washington.edu/courses/csep557/13wi/lectures/param-curves.pdf

LECTURES 20-22

HERMITE AND BEZIER CURVES

OBJECTIVE:

The objective of the lectures is to tell the students about the various types of curves available i.e. Hermite and Bezier. Bezier curves have a wide application in the animation where smooth curve are to be produced.

CONTENTS:

- Hermite curves
  - Introduction
  - Deriving basis matrix
  - Deriving Hermite Geometry Vector
  - Deriving blending function
- Bezier curves
  - Introduction
  - Forming the basis matrix
  - Deriving the geometry vector
  - Deriving the Bernstein polynomial
  - Conditions for smooth joining
  - Concept of convex hull

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit IISectionII Q2, 3, 10,11,14,19,20,22,23, 24, and 25
2 Refer to Unit II Section III Q 4, 5, 11, 15,17,18,19

OTHER ASSIGNMENT:

1 ibid 1, Page No. 554-555, Q11.11, 11.13

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 507-515

REFERENCE BOOKS:

1 ibid 4, Page No. 324-339
2 ibid 5,Page 176-186

ARTICLES:

1 Sohel, Ferdous A., Karmakar, Gour C, "A Beziercurve-based generic shape encoder". IET Image Processing, 4(2), pp. 92–102, 2011.
2 Farin, G. E. (2002). Curves and surfaces for CAGD: a practical guide. Morgan Kaufmann.

WEBSITES:

1 www.cs.uiuc.edu/class/sp06/cs418/notes/10-MoreSplines.pdf
2 https://www.cs.helsinki.fi/group/goa/mallinnus/curves/curves.html

LECTURES 23-24

B-SPLINES

OBJECTIVE:

These lectures introduce the students with B-splines, Parametric and Quadric Surfaces. These curves are widely used in animations. Curves can be constructed if we know the control points of the same.

CONTENTS:

- B-Splines
  - Introduction
  - Concept of knot and determining it's value
  - Uniform knots
  - Forming Base matrix
  - Deriving Geometry Vector
  - Deriving Blending Function
  - Non Uniform non rational splines
  - Effect of multiple control points
  - Computing Control Points
- Parametric surfaces
  - Hermite surfaces
  - Bezier surfaces
  - B-spline surfaces
  - Bicubic surfaces
- Quadric Surfaces
  - Introduction

- Matrix representation

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q 1, 6, 12, 16, 17, 18,21,24,25
2 Refer to Unit II Section III Q2, 3,9,10,11,13,16,17,18,19

OTHER ASSIGNMENT:

1 ibid 1, Page No. 554-555, Q11.9, 11.14
2 ibid 5,Page 187-210

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 515-524

REFERENCE BOOK:

1 ibid 4, Page No. 334-345

ARTICLES:

1 Rhadamés Carmona, Héctor Navarro, "An Image-Space Approach for Collision Detection Between Multiple Volumes and a Surface " , International Journal of Creative Interfaces and Computer Graphics, 3(1), 16-27, January-June 2012, http://www.irma-international.org/viewtitle/65079/

2 Chunfeng Liu, Xiaojun Men, "Generalized B-spline curve surface and its properties", Journal of Chemical and Pharmaceutical Research, 6(3):64-70 2014.

WEBSITES:

1 www.cs.wisc.edu/graphics/Courses/559-f2004/docs/cs559-splines.pdf
2 http://mathworld.wolfram.com/B-Spline.html

LECTURES 25-30

PROJECTIONS

OBJECTIVE:

Projections transform 3D objects onto a 2D projection plane. The objective of these lectures is to study what projection is, the mathematics behind projection and how they can be used in current graphics subroutine packages.

CONTENTS:

- Projection
  - Introduction
  - Types of projection
    - Planar
    - Curved
- Planar geometrical projection
  - Perspective
  - Parallel
- Vanishing points
  - One
  - Two
  - Three
- Perspective projection
  - One point
  - Two point
  - Three point
- Parallel Projection
  - Orthographic
    - Axonometric
      - Isometric
      - Dimetric
      - Trimetric
    - Multiview orthographic
  - Oblique
    - Cabinet
    - Cavalier
- Mathematics behind planar geometric projections

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit III Section II Q1-4, 5, 7-9
2 Refer to Unit III Section III Q1-6, 11, 12, 13

OTHER ASSIGNMENT:

1 ibid 2, Page No. 174-185, Q7.9, 7.11, 7.14
2 ibid5,Page No.147-157

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 254-277

REFERENCE BOOKS:

1 ibid 2, Page No. 166-171
2 ibid 4, Page No. 458-463

ARTICLES

1 Bouaziz, S., Martin, S., Liu, T., Kavan, L. and Pauly, M., 2014. Projective dynamics: fusing constraint projections for fast simulation. *ACM Transactions on Graphics (TOG)*, *33*(4), p.154.
2 Bouaziz, S., Deuss, M., Schwartzburg, Y., Weise, T. and Pauly, M., 2012, August. Shape-Up: Shaping Discrete Geometry with Projections. In *Computer Graphics Forum* (Vol. 31, No. 5, pp. 1657-1667). Blackwell Publishing Ltd.

WEBSITES:

1 robotics.ee.uwa.edu.au/courses/ips205/tutorials/tute7.pdf
2 http://www.cs.unc.edu/Research/stc/publications/Majumder_Eurographics01.pdf

LECTURES 31-36

SOLID MODELLING

OBJECTIVE:

The objective of these lectures is to familiarize the students with the various representations of solid modeling. Solid modeling is used to model the surfaces that have three dimensional view but need to represent in two dimensional view.

CONTENTS:

- Representing Solids
- Properties to represent solids
    - Domain
    - Unambiguous

    - Complete
    - Unique
    - Accurate
    - Compact
- Regularized Boolean set operators
    - Union
    - Intersection
    - Difference
    - Difference between ordinary and regularized operators
    - Finding closure
- Primitive instancing
    - Introduction
- Sweep representation
    - Translational
    - Rotational
    - General
- Boundary Representation (B-reps)
    - 2-manifold structure
    - Polyhedron
    - Euler's formula
    - Winged edge representation
- Spatial Partitioning
    - Cell decomposition
    - Spatial Occupancy Enumeration
    - Octrees
    - Boolean set operations and transformations
    - BSP trees
- Constructive Solid Geometry (CSG)
    - Introduction
    - Properties
- Comparison of representations

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit ISection II Q 6, 10-15
2 Refer to Unit II Section III Q 7-10

OTHER ASSIGNMENT:

1 ibid 1, Page No. 586, Q12.1, 12.4, 12.7, 12.8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 558-582

REFERENCE BOOK:

1 ibid 4, Page No. 376-382

ARTICLES:

1 Anwer, N., Schleich, B., Mathieu, L. and Wartzack, S., 2014. From solid modelling to skin model shapes: Shifting paradigms in computer-aided tolerancing. *CIRP Annals-Manufacturing Technology*, *63*(1), pp.137-140.
2 Wang, B. and O'Brien, J., 2013. CS-184: Computer Graphics. *University of California, Berkeley*, pp.07-1.

WEBSITES:

1 https://smartech.gatech.edu/bitstream/handle/1853/3375/99-09.pdf
2 http://escience.anu.edu.au/lecture/cg/surfaceModeling/printCG.en.html

LECTURES 37-42

ILLUMINATION AND SHADING

OBJECTIVE:

These lectures discuss how to shade surfaces based on position, orientation and characteristics of the surfaces and the light surfaces illuminating them. Illumination gives the image a three dimensional view thereby various techniques related to it will also be explained.

CONTENTS:

- Illumination models
  - Ambient light
    - Introduction
    - Illumination equation
    - Introduction to ambient light
    - Deriving illumination equation with respect to ambient light
    - Determining ambient reflection coefficient
  - Diffuse reflection
    - Lambertian reflection
    - Forming the diffuse illumination equation
    - Diffuse reflection coefficient
    - Reforming illumination equation by incorporating vectors and ambient light's equation.
    - Incorporating light source attenuation in illumination equation
    - Forming the final illumination equation by adding values for object's diffuse color.

- Atmospheric attenuation
  - Depth cueing
  - Computing the scale factor for atmospheric attenuation
- Specular reflection
  - Observed for shiny surfaces
  - Understanding the concept behind specular reflection
- Phong illumination model
  - Model for non perfect reflectors
  - Understanding specular reflection exponent
  - Forming the illumination equation
  - Analysis using different values for cos £
  - Reforming illumination equation by adding value of object's specular color.
  - Calculating the reflection vector
  - The halfway vector
- Multiple light sources
  - Deriving illumination equation when there are m light sources

➢ Shading models
- Constant shading
  - Simplest model
  - Also known as flat shading
  - Assumptions
- Interpolated shading
  - Introduction
  - Assumptions
- Polygon mesh shading
  - Introduction
  - Mach band effect
- Gouraud shading
  - Intensity interpolated shading
  - Computing vertex normals
  - Find vertex intensities
  - Finding the difference equation
- Phong shading
  - Also called normal vector interpolated shading
  - Interpolates surface normal vector
  - Introduction
  - Comparison between Gouraud and phong model

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit ISection II Q6, 9, 12, 13, 22-25
2 Refer to Unit II Section III Q 15, 20,23,26,27

OTHER ASSIGNMENT:

1 ibid 2, Page No. 310-315, Q11.9, 11.10, 11.11, 11.12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 746-784

REFERENCE BOOKS:

1 ibid 2, Page No. 289-299
2 ibid 3, Page No. 457-482
3 ibid 4, Page No. 517-528, 543-545
4 ibid5, Page No.227-237

ARTICLES:

1 VeronikaŠoltészová, Daniel Patel, "A Multidirectional Occlusion Shading Model for Direct Volume Rendering", IEEE-VGTC Symposium on Visualization,Vol 29,Nov 3,2010
2 Zoran, Daniel, Dilip Krishnan, Jose Bento, and Bill Freeman. "Shape and illumination from shading using the generic viewpoint assumption." In Advances in Neural Information Processing Systems, pp. 226-234. 2014.

WEBSITES:

1 http://www.cg.tuwien.ac.at/research/publications/2010/solteszova-2010-MOS/solteszova-2010-MOS-Paper.pdf
2 www.inf.ed.ac.uk/teaching/courses/cg/lectures/slides5.pdf

LECTURES 43 - 50

HIDDEN SURFACES

OBJECTIVE:

Sometimes there is a need to determine which lines or surface of the objects are visible given a set of 3D objects. A variety of algorithms have been designed for this purpose. The objective of the following lectures is to study these algorithms.

CONTENTS:

- Hidden surface removal
  - Introduction
  - Use

- Mathematical aspect
- Floating horizon method
  - Introduction
  - Upper horizon
  - Lower horizon
  - Algorithm
  - Finding surface function
  - Cross hatching
- Back face detection
  - Introduction
- Depth buffer
  - Z buffer
    - Introduction
    - Algorithm
    - Derivation
  - A buffer
    - Introduction
    - Algorithm
- Scan line method
  - Introduction
  - Algorithm
- Depth sorting method
  - Paint polygons in frame buffer in order of decreasing distance from viewpoint
  - Introduction
  - Algorithm
  - Performing various tests
- BSP tree method
  - Introduction
  - Algorithm
- Area subdivision method
  - Based on divide and conquer
  - Warnock's algorithm
    - Introduction
    - Analysis

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q1-5, 7, 8-11, 14-19, 20, 21
2 Refer to Unit II Section III Q1-14, 16-19, 21, 22, 24, 25, 28-33s

OTHER ASSIGNMENT:

1 ibid 2, Page No. 270-287, Q10.2,10.3,10.4,10.10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 675-704

REFERENCE BOOKS:

1 ibid 2, Page No. 255-267
2 ibid 3, Page No. 289-402
3 ibid 4, Page No. 471-485
4 ibid5,Page No.238-257

ARTICLES:

1 Francisco J. R. Prados, Alejandro León Salas, Juan Carlos Torres, "Haptic Interaction with Elastic Volumetric Structures" International Journal of Creative Interfaces and Computer Graphics, 3(1), 63-73, January-June 2012, www.irma-international.org/ viewtitle/65082/
2 Sharma, Rajat, and AmitAgarwal. "An innovative approach to show the hidden surface by using image inpainting technique." In *Proceedings of the 3rd International Conference on Frontiers of Intelligent Computing: Theory and Applications (FICTA) 2014*, pp. 395-403. Springer International Publishing, 2015.

WEBSITES:

1 http://www.tutorialspoint.com/computer_graphics/visible_surface_detection.htm
2 http://www.viz.tamu.edu/faculty/parke/ends489f00/notes/sec7_1.html

LECTURE PLAN

JAVA PROGRAMMING

MCA 205

COURSE OUTLINE
MCA-III SEMESTER
JAVA PROGRAMMING – MCA 205

L - 4 Credits – 04

OBJECTIVE:

Java has evolved from a simple language providing interactive dynamic content for web pages to a predominant enterprise-enabled programming language suitable for developing significant and critical applications. Today, Java is used for many types of applications including Web based applications, financial applications, gaming applications, embedded systems, distributed enterprise applications, mobile applications, image processors, desktop applications and many more. The objective of the course is to teach the students a truly object oriented language to write safe and powerful code for the wide range of applications.

INTERNAL ASSESSMENT AND ASSIGNMENT	**40 Marks**
1. Class Test-I – (Written Test)	15 marks
2. Class Test-II - (Written Test)	15 marks
3. Class Assessment + Attendance	10 marks

COURSE CONTENTS:

UNIT-I **(12 Hours)**

1. Introduction to Java:

- Importance and features of Java
- Keywords, constants, variables and Data Types
- Operators and Expressions
- Decision Making
- Branching and Looping
    - If..else
    - switch
    - ?: operator
    - While
    - Do
    - for statements
    - labeled loops
- jump statements
    - break
    - continue
    - Return.
- Introduction to JVM and its architecture including set of instructions
- Overview of JVM Programming
- Internal and detailed explanation of a valid .class file format
- Overview of class loaders

- Sandbox model of security

2. Introducing classes, objects and methods

- defining a class
- adding variables and methods
- creating objects
- constructors
- Class inheritance.

3. Arrays and String

- Creating an array
- One and two dimensional arrays
- String array and methods

4. Classes

- String and String Buffer classes
- Wrapper classes
- Using super
- Abstract and final classes
- Object class
- Packages and interfaces,
- Access protection

UNIT-II **(10 Hours)**

5. Exception Handling

- Fundamentals exception types
- Uncaught exceptions
- throw, throws and final keywords
- Built in exceptions
- Creating your own exceptions

6. Multithreaded Programming

- Fundamentals
- Java thread model
    - Priorities
    - Synchronization
    - Messaging
- Thread classes and Runnable interface
- Inter thread Communication
- Suspending, resuming and stopping threads.

7. Input/output Programming

- Basics
- Streams: Byte and Character Stream

- Reading and writing from console and files

8. Using Standard Java Packages (lang, util, io, net)

9. Networking

- Basics
- Networking classes and interfaces
- Using java.net package
- TCP/IP and Data-gram Programming

UNIT-III **(09 Hours)**

10. Event Handling

- Different Mechanism
- The Delegation Event Model
- Event Classes
- Event Listener Interfaces
- Adapter and Inner Classes

11. Working with windows, Graphics and Text,

- using AWT controls
- Layout managers and menus
- handling Image, animation, sound and video
- Java Applet

12. The Collection Framework

- The Collection Interface
- Collection Classes
- Working with Maps & Sets

13. JDBC

- Introduction to DBMS & RDBMS
- DBC API
- JDBC Application Architecture
- Obtaining a Connection
- JDBC Models: Two Tier and Three Tier Model

UNIT-IV **(11 Hours)**

14. RMI (Remote Method Invocation)

- Introduction
- Steps in creating a Remote Object
- Generating Stub & Skeleton
- RMI Architecture
- RMI packages

15. Java Bean

- Introduction
- Bean Architecture
- Using the Bean Development Kit
- Creating simple bean-properties, methods and events
- Packing beans- the manifest & the jar
- Java bean package

16. Swing

- Introduction to JFC (Java Foundation Classes)
- Features of Swing
- Comparison with AWT
- Advanced Control

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Java Programming, and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOKS**

1. **Author's Name(s):** Herbert Schildt
   Title: Java: The Complete Reference
   Edition: IX**Year:** 2014
   Publisher: TMH (ibid 1)

2. **Author's Name(s):** H.M. Deitel, P.J. Deitel
   Title: Java: How to Program
   Edition: X **Year:** 2014
   Publisher: Pearson Education Pvt. Ltd. (ibid 2)

- **REFERENCE BOOKS**

1. **Author's Name(s):** E Balagurusamy
   Title: Programming with Java
   Edition:V**Year:** 2015
   Publisher: TMH (ibid 3)

2. **Author's Name(s):** Y.Daniel Liang
   Title: Introduction to Java Programming
   Edition: IX Year**:** 2015
   Publisher: Pearson Education Pvt. Ltd. (ibid 4)

- **PERIODICALS**

1. ACM SIGPLAN Notices
2. Current Trends in Technology and Science
3. Science of Computer Programming
4. Issues and Challenges in Intelligent Computing Techniques (ICICT)
5. Advanced Materials Research
6. ISMM '14 Proceedings of the 2014 International symposium on Memory management
7. International Journal of Engineering Mathematics and computer science
8. IEEE Transactions
9. Journal of Software
10. International Journal of Computer, Information, Mechatronics, Systems Science and Engineering
11. International Journal of Emerging Engineering Research and Technology

LECTURE 1

INTRODUCTION TO JAVA

OBJECTIVE:

The objective of the lecture is to make the students understand the reasons that drove Java's creation, the forces that shaped it and the legacy that it inherits.

CONTENTS:

- Introduction to Java
- Java's Lineage
- Creation of Java
- Java Virtual Machine
- The Bytecode

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I Section II Q28-31

OTHER ASSIGNMENT:

1 ibid 4, Page 31, Q 1.1, 1.2, 1.3, 1.4, 1.8, 1.9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 4-12

REFERENCE BOOK:

1 ibid 4, Page No. 40-42

ARTICLES:

1 Sheng Liang, GiladBracha, "Dynamic class loading in the Java Virtual Machine", ACM SIGPLAN Notices, Volume 33, Issue 10, Page No. 36-44, http://portal.acm.org/citation.cfm?id=286945
2 Sophie Limou, Andrew M. Taverner and Cheryl A. Winkler, "Ferret: a user-friendly Java tool to extract data from the 1000 Genomes Project", Oxford University Press Journal 2016.
3 M. N. Agu, B. O. Ogbuokiri., B. O. Okwume.,"Comparison of python and java for use in instruction in first course in computer programming", http://transylvanianreview.org/index.php/Trr/article/view/191, Vol 24, No 7 (2016)

LECTURE 2

FEATURES OF JAVA

OBJECTIVE:

The objective of this lecture is to make student understand the features of Java and the object oriented paradigm on which it is based.

CONTENTS:

- Java Buzzwords
  - Simple
  - Secure
  - Portable
  - Robust
  - Multithreaded
  - Architecture-neutral
  - Interpreted
  - Distributed
- Object Oriented features
  - Encapsulation
  - Inheritance
  - Polymorphism

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q13,14,15
2 Refer Unit I Section III Q 8

OTHER ASSIGNMENT:

1 ibid 3, Page No. 8, Q 1.3,1.6, Page No. 22, Q 2.1,2.2

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 12-24

REFERENCE BOOK:

1 ibid 3, Page No. 10-19

ARTICLE:

1. Manoj Kumar Srivastav*, Dr.AsokeNath," A Mathematical Modeling of Object Oriented Programming Language : a case study on Java programming language ",Current Trends in Technology and Science, ISSN: 2279-0535. Volume: 3, Issue: 3, 2014.

LECTURE 3

KEY WORDS AND DATA TYPES

OBJECTIVE:

The objective of this lecture is to develop an understanding amongst the students about the keywords, constants, variables and the various types of data types being used in Java.

CONTENTS:

- The Java Keywords
- Variables
  - Declaring variable
  - Assigning values to variables
  - Dynamic Initialization
  - The Scope and Lifetime of A variable
- Data Types
  - Built in types
    - Integer
      - ✓ Byte
      - ✓ Short
      - ✓ Long
      - ✓ Int
    - Floating-Point
      - ✓ Float
      - ✓ Double
    - Characters
    - Booleans
- Type Conversions

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q 1,3,11
2 Refer Unit I Section III Q 1,2

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 45, Q 3.4, 3.5, 3.6
2 ibid 4, Page No. 75, Q 2.1, 2.2, 2.4, 2.7, 2.8, 2.9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 42-60

REFERENCE BOOKS:

1 ibid 3, Page No. 46-58
2 ibid 4, Page No. 50-65

ARTICLES:

1 Guillermo L. Taboada, Sabela Ramos, Roberto R. Exp´osito, Juan Touri˜no, Ram´onDoallo," Java in the High Performance Computing Arena: Research, Practice and Experience ",Science of Computer Programming, May 14, 2011. www.researchgate.net/...Java...Research.../d912f50bcd85221409.pdf
2 Jain, Vaibhav; ArdeshirMahdavi, "Implementation of simulation-based virtual sensors using Radiance and Java", Applied Mechanics &Materials .2016, Vol. 824, p740-747.

LECTURE 4

OPERATORS AND CONTROL STRUCTURES

OBJECTIVE:

The lecture will help students gain an insight over the various operators and control structures available in Java.

CONTENTS:

- Operators
  - Arithmetic Operators
    - Basic Arithmetic Operators
    - The modulus Operator
    - Arithmetic Assignment Operators
    - Increment and Decrement Operators
  - Bitwise Operators
    - Bitwise logical Operators
    - The left and right shift Operators
  - Relational Operators
  - Boolean logical Operators

- The Assignment Operator
- The ternary Operator
- Operator precedence

- Control structures
  - Selection statements
    - If….else
    - Switch
  - Iteration statements
    - While
    - Do-while
    - For
    - Nested loops
  - Jump Statements
    - Using Break
    - Using Continue
    - Return

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q4,5,6
2 Refer Unit I Section III Q12

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 79, Q 5.1,5.4,5.5, Page No. 100, Q6.3,6.5, Page No. 123, Q 7.1,7.4,7.10
2 ibid 4, Page No. 105, Q 3.25, 3.28, 3.30

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 74-95, 100-126

REFERENCE BOOKS:

1 ibid 3, Page No. 60-74, 80-96, 103-119
2 ibid 4, Page No. 82-103

ARTICLE:

1 Goyal, P.K. ; Comput. Sci. & Eng. Dept, ABES Eng. Coll., Ghaziabad, India ; Joshi, G.," QMOOD metric sets to assess quality of Java program", Issues and Challenges in Intelligent Computing Techniques (ICICT), 2014 International Conference, 7-8 Feb. 2014, pages 520 – 533.

LECTURES 5-6

INTRODUCTION TO JVM & CLASS LOADERS

OBJECTIVE:

These lectures will help students gain an insight of the valid .class file format along with the Sandbox model of security.

CONTENTS:

- JVM
  - Introduction
  - Architecture
  - Set of instructions
  - JVM programming
  - Instrumentation of a .class file
  - Byte code engineering libraries
- Overview of class loaders
- Sandbox model of security

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q4, 5, 6
2 Refer Unit I Section III Q12, 23-26

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 74-95, 100-126

REFERENCE BOOK:

1 ibid 4, Page No. 13-23

ARTICLES:

1 Foivos S. Zakkak, PolyviosPratikakis," JDMM: a java memory model for non-cache-coherent memory architectures", ISMM '14 Proceedings of the 2014 international symposium on Memory management, Pages 83-92, ACM New York, NY, USA ©2014
2 K Yu, ZB Chen, W Dong, "Predictive Runtime Verification of Java Programs", Advanced Materials Research, Volume 1078, 2015, pg 333-336.

LECTURES 7-9

INTRODUCING CLASSES

OBJECTIVE:

The class is at the core of Java. The objective of the lectures is to introduce the students to the basic elements of a class and make them learn the functionalities and importance of objects, methods and constructors in classes.

CONTENTS:

- Class fundamentals
- Declaring Objects
    - New Keyword
    - Object Reference Variables
- Adding Methods
- Method Overloading
- Parameter Passing
- Constructors
    - Default constructors
    - Parameterized Constructors
- Constructor Overloading
- This Keyword
- Passing Objects as Parameters
- Recursion
- Static Keyword
- Final Keyword
- Arrays
- Nested and Inner Classes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q2,8,10
2 Refer Unit I Section III Q3,4,6,7,9,11,15

OTHER ASSIGNMENT:

1 ibid3, Page No. 146, Q 8.1, 8.2, 8.3, 8.4, 8.6, 8.13, 8.14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 130-184

REFERENCE BOOK:

1 ibid 3, Page No. 127-149

LECTURE 10

INHERITANCE

OBJECTIVE:

The objective of the lecture is to explain the concept and importance of Inheritance to students as it is one of the corner-stones of object-oriented programming.

CONTENTS:

- Inheritance Basics
- Super Keyword
- Creating hierarchy in inheritance
- Method Overriding
- Dynamic Method Dispatch
- Abstract Classes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q17,18
2 Refer Unit I Section III Q5,13,14

OTHER ASSIGNMENT:

1 ibid 4, Page No. 371, Q 10.1, 10.2, 10.3

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 190-220

REFERENCE BOOK:

1 ibid 3, Page No. 153-175

LECTURE 11

WRAPPER CLASSES

OBJECTIVE:

The objective of the lecture is to make students understand how primitive data types can be converted into object types by using the wrapper classes.

CONTENTS:

- Vectors
- Wrapper classes
  - Concept
  - Example
- String classes
- String Buffer classes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q 16,32
2 Refer Unit I Section III Q10,26,27

OTHER ASSIGNMENT:

1 ibid 3, Page 176, Q 9.11, 9.17, 9.18

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 185-187, 369-376

REFERENCE BOOK:

1 ibid 3, Page No. 180-187

LECTURE 12

PACKAGES AND INTERFACES

OBJECTIVE:

Packages and Interfaces are two of the basic components of a Java program. The objective of the lecture is to make students understand the concept and importance of packages and interfaces.

CONTENTS:

- Packages
    - Defining packages
    - Importing packages
- Access protection
- Interfaces
    - Defining interfaces
    - Implementing interfaces
    - Applying interfaces
    - Extending interfaces

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section II Q7,9,19,20,33,34

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 187, Q 10.2,10.3,10.4
2 ibid 4, Page No. 417, Q 11.4,11.5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 224-246

REFERENCE BOOK:

1 ibid 3, Page No. 190-200

LECTURES 13-14

EXCEPTION HANDLING

OBJECTIVE:

These lectures will help student understand Java's exception handling mechanism. An exception is an abnormal condition that arises in a code sequence at run-time.

CONTENTS:

- Exception Handling fundamentals
- Exception types
- Uncaught Exceptions

- Exception handling Mechanism
    - Try clause
        - Nested Try statements
    - Catch clause
        - Multiple Catch clauses
    - Throw clause
    - Throws clause
    - Finally clause
- Re-throwing an Exception
- Built-in Exceptions in Java
- Creating your own Exceptions
- Chained Exceptions
- Using Exceptions for Debugging
- Exceptions and Inheritance

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q1, 2, 3, 5, 7,8,9,13,14,15,16(f),20,25,
2 Refer Unit II Section III Q1, 5, 8,9,16,17,20,28,29

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 248, Q 13.1,13.2,13.4,13.5
2 ibid 2, Page No. 625, Q 14.2,14.3,14.4

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 250-270
2 ibid 2, Page No. 594-624

REFERENCE BOOK:

1 ibid 3, Page No. 234-248

ARTICLES:

1 Seung Lee, ByungSun Yang, Suhyun Kim, Seongbae Park, SooMookMoon,"Efficient Java Exception Handling in Justin Time Compilation", Proceedings of the ACM 2000 conference on Java Grande, http://portal.acm.org/citation.cfm?id=337453&dl=
2 S Rai, D Gautam, "Teaching of Java Exception Handling", International Journal of Engineering Mathematics and computer science, ijemcs, Vol 4, No 3, 2015

3 Shah, H.B. ; Klaus Adv. Comput., Georgia Inst. of Technol., Atlanta, GA, USA ; Gorg, C. ; Harrold, M.J.," Understanding Exception Handling: Viewpoints of Novices and Experts, Software Engineering, IEEE Transactions on (Volume:36 , Issue: 2), March-April 2010.
4 Xiaoquan Wu ; Technol. Center of Software Eng., Chinese Acad. of Sci., Beijing, China; ZhongxingXu ; Jun Wei," Static Detection of Bugs Caused by Incorrect Exception Handling in Java Programs", Quality Software (QSIC), 2011 11th International Conference on, Page:61 – 66, 13-14 July 2011.

LECTURES 15-17

MULTITHREADING

OBJECTIVE:

Java provides built-in support for multithreaded programming. The lectures will help students in understanding how multithreading enables to write efficient programs that make maximum use of the CPU.

CONTENTS:

- Introduction to multithreading
  - What is a process?
  - What is a thread?
- The Java Thread Model
- Life Cycle of a Thread
- The Main thread
- Creating a thread
- Implementing Runnable Interface
- Extending Thread Class
- Choosing an approach
- Creating Multiple Threads
- Thread Priorities
  - setPriority() Method
  - getPriority() Method
- Synchronization
  - Using Synchronized Methods
  - Using Synchronized statement
- Inter-thread Communication
- Producer-Consumer problem (Case-Study)
- Deadlocks
- Suspending Threads
- Resuming Threads
- Stopping Threads

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q16(c,d,e,h,i), 17,19,22, 23
2 Refer Unit II Section III Q2,18,19

OTHER ASSIGNMENT:

1 ibid 3, Page 230, Q 12.2, 12.3, 12.4

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 274-284, 289-305
2 ibid 2, Page No. 736-763

REFERENCE BOOK:

1 ibid 3, Page No. 203-230

ARTICLE:

1. JorgDomaschka, Franz J. Hauck, Hans P. Reiser, "Deterministic Multithreading For Java-BasedReplicated Objects", Proceedings of the 18th IASTD conference 2006,http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.71.5488&rep=rep1&type=pf

LECTURES 18-19

INPUT/OUTPUT PROGRAMMING
OBJECTIVE:

The objective of the lectures is to make students understand text based console I/O in Java. The lectures will focus on both basic I/O system and File I/O.

CONTENTS:

- I/O Basics
  - Streams
    - The Byte Stream
      - Byte Stream Classes
      - Input Stream
      - Output Stream
    - The Character Stream
      - Character Stream Classes
      - Reader

        - Writer
        - The Predefined streams
- Reading Console input
    - Reading Characters
    - Reading Strings
- Writing Console Output
- The PrintWriter Class
- Reading Files
- Writing Files
- FileInputStream() Method
- FileOutputStream() Method
- BufferedInputStream Class
- BufferedOutputStream Class
- BufferedReader Class
- BufferedWriter Class
- Using Stream I/O
- Serialization

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q 10,16(b),21,24,
2 Refer Unit II Section III Q 4,6,7

OTHER ASSIGNMENTS:

1 ibid 3, Page No.330, Q 16.1, 16.3, 16.4, 16.10
2 ibid 4, Page No. 303, Q 8.1, 8.2, 8.3, 8.4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 314-327, 545-572

REFERENCE BOOK:

1 ibid 3, Page No. 294-329

LECTURES 20-21

STANDARD JAVA PACKAGES

OBJECTIVE:

The lectures will help students gain an insight of some standard Java Packages usually used.

CONTENTS:

- Java.lang Package
  - Boolean Class
  - Character Class
  - Math Class
  - Number Class
  - Thread Class
  - Compiler class
  - Cloneable Interface
  - Runnable Interface
- Java.util Package
  - AbstractMap Class
  - ArrayList Class
  - HashSet Class
  - HashMap Class
  - Calendar Class
  - Date Class
  - HashTable Class
  - Dictionary Class
  - Iterator Interface
  - EventListener Interface

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q 11,16(a,g),18
2 Refer Unit II Section III Q 3,10

OTHER ASSIGNMENT:

1 ibid 4, Page No. 399, Q 10.1, 10.3, 10.8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 380-412, 442-456, 512-521

ARTICLES:

1. BrahimBelattar, AbdelhabibBourouis," "Yet another Java Based Discrete-Event Simulation Library", Journal of Software, Vol. 9, No 1 (2014), 82-88, Jan 2014.
2. BrahimBelattar, AbdelhabibBourouis , "A Java Based Discrete Event Simulation Library", International Journal of Computer, Information, Mechatronics, Systems Science and Engineering Vol:7 No:2, 2013.

LECTURE 22

NETWORKING IN JAVA

OBJECTIVE:

The lecture will help students understand how Java provides support for Networking through various classes in java.net package. They will get to know about TCP/IP and Data-gram programming.

CONTENTS:

- Networking Basics
  - Socket Overview
  - Client/Server Architecture
  - Reserved Sockets
  - Proxy Servers
  - Internet Addressing
  - Domain Name Service
- The Networking classes and Interfaces in Java
- Inet Address
- TCP/IP
  - TCP/IP Client Sockets
  - TCP/IP Server Sockets
- HTTP Server
- Datagrams
  - Datagram Packets
  - Datagram Server and Client

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II Q 4,6,12
2 Refer Unit II Section III Q 11,12,13,14,15

OTHER ASSIGNMENT:

1 ibid 2, Page No. 1048, Q 21.13, 21.15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 588-602, 623-624

REFERENCEBOOK:

1 ibid 2, Page No. 1004-1014

ARTICLE:

1 Patrick Tullmann, Mike Hibler, Jay Lepreau, "Janos: A Java-oriented OS for Active Network Nodes", http://www.cs.utah.edu/flux/janos/

LECTURES 23-24

JAVA APPLETS

OBJECTIVE:

Apart from applications, another type of program being developed in Java is applets. The objective of the lectures is to make students understand how to structure and make use of applets.

CONTENTS:

- Applet Fundamentals
- The Applet class
- Applet Architecture
- Lifecycle of an Applet
    - init() method
    - start() method
    - paint() method
    - stop() method
    - destroy() method
- Overriding update() method
- Setting Foreground and Background Colors
- Requesting Repainting
- The HTML Applet tag
- Running the Applet
- Using the Status window
- Passing Parameters to Applets
- Outputting to Console
- Aligning the Display
    - Left
    - Right
    - Top
    - Bottom
    - Baseline
    - Middle
    - Text top
    - Absmiddle

    - Absbottom
- Getting input from the user

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 1,3,4,5,6,8,10,15,16
2 Refer Unit III Section III Q 1,2,5,15

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 271, Q 14.2, 14.3, 14.4, 14.9
2 ibid 4, Page No. 522, Q 14.2, 14.4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 628-647

REFERENCE BOOKS:

1 ibid 3, Page No. 250-270
2 ibid 4, Page No. 296-303

LECTURES 25-27

EVENT HANDLING

OBJECTIVE:

The objective of the lectures is to make students aware of Java's Event Handling Mechanism as events are at the core of successful applet programming.

CONTENTS:

- Event Handling Mechanisms
- The Delegation Event Model
- Events
    - ActionEvent Class
    - AdjustementEvent Class
    - ComponentEvent Class
    - ContainerEvent Class
    - FocusEvent Class
    - KeyEvent Class
    - MouseEvent Class

    - TextEvent Class
- Event sources
    - Button
    - Check Box
    - Choice
    - List
    - Menu Item
    - Scrollbar
    - Text Components
    - Window
- Event Listeners
    - ActionListener Interface
    - AdjustementListener Interface
    - ComponentListener Interface
    - ContainerListener Interface
    - FocusListener Interface
    - KeyListener Interface
    - MouseListener Interface
    - MouseMotionListener Interface
    - TextListener Interface
- Using the Delegation Event Model
- Adapter Classes
- Inner Classes
- Anonymous Inner Classes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 13,14,17,22,23,24,25
2 Refer Unit III Section III Q 9,10,11,12,16

OTHER ASSIGNMENT:

1 ibid 4, Page No. 564, Q 15.1, 15.2, 15.3, 15.5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 654-676

REFERENCE BOOK:

1 ibid 4, Page No. 560-581

LECTURES 28-29

WORKING WITH WINDOWS, GRAPHICS AND TEXT

OBJECTIVE:

The objective of the lectures is to make students learn how to create and manage windows, manage fonts, output text, and utilize graphics using AWT Controls.

CONTENTS:

- AWT Classes
- Window fundamentals
  - Component
  - Container
  - Panel
  - Window
  - Frame
  - Canvas
- Working with Frame Windows
  - Creating a Frame Window in an Applet
  - Handling events in Frame Windows
- Working with Graphics
  - Drawing shapes in graphics
    - Line
    - Rectangles
    - Circles and Ellipses
    - Arcs
    - Polygons
- Working with Color
  - Color Methods
  - Setting the Paint Mode
- Working with Fonts
  - Determining the available Fonts
  - Creating and Selecting a Font
  - Managing Text Output
  - Text Alignment
    - Single-line
    - Multi-line

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 9,18,19,20
2 Refer Unit III Section III Q 7

OTHER ASSIGNMENTS:

1 ibid 3, Page No. 292, Q 15.1,15.2,15.5
2 ibid 4, Page No. 525, Q 14.8,14.15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 688-722

REFERENCE BOOKS:

1 ibid 3, Page No. 275-292
2 ibid 4, Page No. 518-525

LECTURES 30-31

LAYOUT MANAGERS AND MENUS

OBJECTIVE:

Layout Managers automates the task of positioning components within a window while menus provide an easy interface to user to choose options. The objective of lectures is to make student aware of the same.

CONTENTS:

- Adding Controls
- Removing Controls
- Responding to Controls
    - Handling Buttons
    - Handling Check Boxes
    - Handling Choice Lists
    - Handling Scroll Bars
    - Handling Text Fields
- Layout Managers
    - Flow Layout
    - Border Layout
    - Grid Layout
    - Card Layout
- Menu Bars and Menus
    - Adding Menu Items
    - Returning Menu items
- Handling Dialog Boxes
    - File dialog box

- Load
- Save

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 7,21,23,25,26
2 Refer Unit III Section III Q 6(b, c ,d),8

OTHER ASSIGNMENTS:

1 ibid 4, Page No. 484, Q 13.8, 13.9, 13.10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No.736-790.

REFERENCE BOOK:

1 ibid 4, Page No. 480-506

LECTURE 32

HANDLING MULTIMEDIA

OBJECTIVE:

Multimedia (viz. Images, Animation, Sound and Video) are key components of web design. The objective of the lecture is to learn how to implement multimedia components using Java.

CONTENTS:

- Image Fundamentals
  - File formats
  - Loading an Image
  - Displaying an Image
  - Adding Imaging Classes
- Handling Sound in Java
  - Loading audio clips
  - Playing audio clips
- Introduction to Animation in Java

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 24,26
2 Refer Unit III Section III Q 12

OTHER ASSIGNMENTS:

1 ibid 2, Page No. 712, Q 16.3, 16.4, 16.6
2 ibid 4, Page No. 668, Q 17.13, 17.15, 17.16

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 800-805

REFERENCE BOOK:

1 ibid 2, Page No. 775-795

LECTURES 33-34

THE COLLECTION FRAMEWORK

OBJECTIVE:

The objective of lectures is to learn the concepts of collection framework. These are important to be learnt because they allow building complex systems from software components. The collections framework is a unified architecture for representing and manipulating collections. It reduces programming effort while increasing performance.

CONTENTS:

- The Collection Interface
  - Collection interface
  - List interface
  - Set interface
  - SortedSet interface
- Collection Classes
  - AbstractCollection class
  - AbstractList class
  - AbstractSequentialList class
  - LinkedList class
  - ArrayList class
  - AbstractSet class
  - HashSet class
  - TreeSet class
- Working with Maps & Sets
  - Map Interfaces
  - Map Classes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section II Q 2,11,12
2 Refer Unit III Section IV Q 3,4,6(a),13,14

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page No. 886-892, 923-934, 950-952

ARTICLE

1. Rui Pereira, Marco Couto, JoãoSaraiva and Jácome Cunha "The influence of the Java collection framework on overall energy consumption" ACM New York, USA, 2016, pages 15-21

LECTURES 35-37

JDBC

OBJECTIVE:

The objective of lecture is to learn basics of JDBC which make students aware of how to write applications that access relational databases.

CONTENTS:

- Introduction to DBMS & RDBMS
- DBC API
- JDBC application Architecture
- JDBC Models
    - Two tier model
    - Three tier model
- Result set
- Callable statement

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III Section II Q 21,22,27,28,29,30

SUGGESTED READING:

TEXT BOOK:

1 ibid 2, Page No. 886-891

LECTURES 38-40

RMI

OBJECTIVE:

Java RMI (Remote Method Invocation) provides a mechanism for supporting distributed computing. The objective of lectures is to learn basics of activating a method on a remotely running object.

CONTENTS:

- Introduction
- Steps in Creating a Remote Object
- Generating Stub & Skeleton
- RMI Architecture
- RMI Packages

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit IV Section II Q 21,22

SUGGESTED READING:

TEXT BOOK:

1 ibid 2, Page No. 980-990

ARTICLES:

1 HanumantPawar, SujeetPatil, SourabhKarche, UditUpadhayay, Mahesh Channaram,"Distributed Object Computing Using Java Remote Method Invocation", International Journal of Emerging Engineering Research and Technology, Volume 3, Issue 5, May 2015, PP 68-76

2Richard A. Johnson, "JAVA DATABASE CONNECTIVITY USING JAVA DB (APACHE DERBY): A TUTORIAL", International Journal of Information, Business and Management, Vol. 8, No.3, 2016

LECTURES 41-43

JAVA BEAN

OBJECTIVE:

The objective of lectures is to gain an insight of JavaBeans which are reusable software components for Java that can be manipulated visually in a builder tool.

CONTENTS:

- What is Java Bean?
- Bean Architecture
- Using BDK
- Creating simple bean
    - Properties
    - Methods
    - Events
- Packing Beans
    - Manifest file
    - JAR file
- Java Bean Package
- Introduction to NetBean

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q 3,6,23,25
2 Refer Unit IV Section III Q 13, 14
3 Refer Unit IV Section IV Q 11, 13

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page No. 847-857

LECTURES 44-46

SWING

OBJECTIVE:

In these lectures the focus will be on how to create dynamic web pages as the web pages created earlier using HTML were of static nature.

CONTENTS:

- Introduction to JFC
- Features of Swing
- AWT vs. Swing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section II Q 14,15,16,17,19,24
2 Refer Unit IV Section III Q 6,7,15,21

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page No. 859-872

LECTURE PLAN

DATA COMMUNICATION AND NETWORKING

MCA 207

COURSE OUTLINE
MCA-III SEMESTER
DATA COMMUNICATION AND NETWORKING - MCA 207

L - 4 Credits 04

OBJECTIVE:

The purpose of this course is to enable the students to know about the basic concepts of data communications & networking. In this course students will be made familiar with the mobile and PSTN network. This syllabus will help the student to familiarize them with the most vital protocol stack TCP/IP and OSI.

In this course students will be taught about various layers and their functioning. Most important layers that will be covered in this subject are physical layer, data link layer, network layer and application layer.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS:

A. THE BASICS OF DATA COMMUNICATION AND PHYSICAL LAYER (15 Hours)

- Network and its Structures
- OSI and TCP/IP model `
- Transmission Media
- Digital Signal Encoding Formats
- Digital Modulation
- Public Switched Telephone Network(PSTN)
- Mobile Telephone System

B.DATA LINK LAYER AND MAC LAYER **(12 Hours)**

- Design issues
- Error Detection & Error Correction
- Stop & Wait Protocols
- Sliding Window Protocols
- Data Link Layer Protocol(HDLC)
- MAC Protocols(persistent & non persistent)
- Ethernet, WLAN & Bluetooth

C.NETWORK LAYER **(12 Hours)**

- Design issues
- Routing Algorithms(Static and Dynamic)

- Congestion Control(Open loop and Closed loop)
- Internetworking
- Addressing Mechanism(IPv4,Ipv6)

D.TRANSPORT LAYER, APPLICATION LAYER AND NETWORK SECURITY
(11 Hours)

- TCP and UDP
- TCP services and headers
- Connection establishment and termination
- DNS and Multimedia
- Firewalls
- Cryptography

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of computer networks and students are advised to go through the material for thorough understanding of the subject:

- **TEXT BOOKS**

1. **Author's Name(s):** Andrew S. Tanenbaum
   Title: Computer Networks
   Edition: 5th **Year:** 2013
   Publisher: Pearson Education (ibid1)

2. **Author's Name(s):** BehrouzA.Forozoun
   Title: Data Communications and Networking
   Edition: 5th **Year:** 2013
   Publisher: Tata McGraw-Hill (ibid 2)

- **REFERENCE BOOK**

1. **Author's Name(s):** William Stallings
   Title: Data and Computer Communications
   Edition: 8th **Year:** 2013
   Publisher: Pearson Education (ibid 3)

- **PERIODICAL**

1. ACM SIGCOMM Publication
2. SpringerBriefs in Applied Sciences and Technology
3. Mobile Networks and Applications , Springer US
4. Elsevier, Computer Networks
5. Fifth International Conference on Advanced Computing & Communication Technologies (ACCT), IEEEXplore
6. International Journal Of Research In Computer Engineering and Electronics
7. Advances in Intelligent Systems and Computing

LECTURES 1-2

BASIC CONCEPTS OF NETWORKING

OBJECTIVE:

The objective of the lectures is to make the students understand the basic concepts of networking like what is a computer network, what are the uses of a computer network & classification of networks on the basis of distance.

CONTENTS:

- Elements of a communication system
  - Sender
  - Receiver
  - Message
  - Transmission Medium
- Protocols and standard
- Standard organizations
  - Forums
  - Regulatory Agencies
- Uses of Computer Networks
  - Business Applications
  - Home Applications
  - Mobile Users
- Network Structure & Architecture
- Network Hardware
  - LAN
  - MAN
  - WAN

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I- Section II Q1,2,21
2 Refer Unit I- Section III Q 5

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 86, 87 Q 10, 17, 25
2 ibid 2, Page No. 27, Q 4,6,12

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 17-40
2 ibid 2, Page No. 4-22

REFERENCE BOOK:

1 ibid 3, Page No. 7-17

WEBSITE:

1 www.iso.org/iso/isoinbrief_2011.pdf

LECTURES 3-4

OSI AND TCP/IP MODEL

OBJECTIVE:

The objective of the lectures is to explain the different layers of the OSI model, their functions and protocols. The main focus will be on understanding the layered architecture & its advantages.

CONTENTS:

- OSI model(7 layers)
  - Physical layer
    - Representation of Bits
    - Data rate
    - Synchronization of bits
    - Line configuration
  - Data link layer
    - Framing
    - Physical Addressing
    - Flow control
    - Error Control
  - Network layer
    - Logical Addressing
    - Routing
  - Transport layer
    - Service point addressing
    - Segmentation & Reassembly
    - Connection Control
  - Session layer
    - Dialog control
    - Synchronization
  - Presentation layer
    - Translation
    - Encryption
    - Compression
  - Application layer

    - FTAM
    - Mail services
- TCP/IP model
- Comparison of OSI & TCP/IP model
- Network Topologies

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I- Section II Q 7,8,10,11,12,13
2 Refer Unit I- Section III Q1,3,4

OTHER ASSIGNMENT:

1 ibid 2, Page No. 47, Q 1,2,14

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 41-53
2 ibid 2, Page No. 32-45

REFERENCE BOOK:

1 ibid 3, Page No. 24-34

WEBSITE:

1 www.redbooks.ibm.com/redbooks/pdfs/gg243376.pdf

ARTICLE

1 IliasMarinos, Robert N.M. Watson, Mark Handley, "Network stack specialization for performance", SIGCOMM '14 Proceedings of the 2014 ACM conference on SIGCOMM, Pages 175-186, ACM New York, NY, USA ©2014, ISBN 978-1-4503-2836-4

LECTURE 5

DATA COMMUNICATION (Physical Layer)

OBJECTIVE:

The objective of the lecture is to discuss about the transmission impairments like noise , distortion and the attenuation. Also, the Nyquist and Shannon theorem for maximum data rate of communication will be discussed.

CONTENTS:

- Shannon's Theorem(Noiseless Channel)
- Nyquist Theorem(Noisy Channel)
- Transmission impairment

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I- Section II Q 26,27

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 94-95,146
2 ibid 2, Page No. 395,116,76-79

REFERENCE BOOK:

1 ibid 3, Page No. 73-78, 78-81

WEBSITE:

1 www.ingelec.uns.edu.ar/pds2803/.../ShannonTheoremTutorial.pdf

LECTURES 6-7

OBJECTIVE:

The objective of these lectures is to make student understand the basic network topologies that are used for communication. Besides this a detailed discussion of transmission modes for communication will also to be carried out.

CONTENTS:

- Topologies
  - Mesh topology
  - Star topology
  - Tree topology
  - Bus topology
  - Hybrid topology
- Transmission Modes
  - Simplex mode
  - Half duplex mode
  - Full duplex mode

ASSIGNMENTS FROM QUESTION BANK:

1 Refer UNIT I- Section II Q 4, 5, and 6,7,30

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 125-128

REFERENCE BOOK:

1 ibid 3, Page No. 186-187

WEBSITE:

1 www.inetdaemon.com/tutorials/networking/lan/topology.shtml

LECTURES 8-9

TRANSMISSION MEDIA

OBJECTIVE:

The objective of these lectures is to have a detailed study of the various transmission media used for communication purpose. A discussion on types of multiplexing would also be done.

CONTENTS:

- Transmission Medium
  - Guided Media
    - Twisted pair cable
      - STP
      - UTP
    - Coaxial cable
    - Optical fiber
  - Unguided Media
    - Radio waves
    - Microwaves
    - Satellite
- Types of Multiplexing
  - FDM
  - TDM

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I, Section II Q 15,16,17,18,19
2 Refer Unit I, Section III Q 1

OTHER ASSIGNMENT:

1 ibid 2, Page No. 203, Q 2, 5, 8

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 95-135
2 ibid 2, Page No. 185-201

REFERENCE BOOK:

1 ibid 3, Page No. 89-123

WEBSITE:

1 www.ics.uci.edu/~magda/Courses/netsys270/ch7_1_v1.ppt

LECTURES 10-13

OBJECTIVE:

The objective of these lectures is to discuss about analog & digital signals & the various encoding schemes. In these lectures various conversion schemes of converting a digital data to analog signal and vice versa will be done.

CONTENTS:

- Analog data
- Digital data
- Analog signal
- Digital signal
- Periodic signal
- Aperiodic signal
- Time domain
- Frequency domain
- Encoding & Modulating
- Digital Signal Encoding
    - NRZ-L, NRZI

- Digital to Digital Conversion
  - Unipolar
  - Bipolar
- Analog to Digital Conversion
  - PAM
  - PCM
- Digital to Analog Conversion
  - ASK
  - PSK
  - FSK
- Analog to Analog Conversion
  - AM
  - FM
  - PM

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I- Section II Q 22,23,24,25
2 Refer Unit I- Section III Q 6,7,8,9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 96-126,136-149,156-178

REFERENCE BOOK:

1 ibid 4, Page No. 54-78, 124-154

ARTICLE:

1 IrajSadeghAmiri, SayedEhsanAlavi, SeviaMahdalizaIdrus, "Introduction of Fiber Waveguide and Soliton Signals Used to Enhance the Communication Security", Soliton Coding for Secured Optical Communication Link, SpringerBriefs in Applied Sciences and Technology 2015, pp 1-16

LECTURE 14

OBJECTIVE:

The objective of the lecture is to make the students understand the concept Public Switched Telephone Network (PSTN).

CONTENTS:

- Structure of the Telephone System
- Trunks and Multiplexing
- Switching

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I- Section II Q 29
2 Refer Unit I- Section III Q 10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 138-161
2 ibid2 Page No. 994

REFERENCE BOOK:

1 ibid 3 Page No. 282-283

WEBSITE:

1 www.cs.fsu.edu/~breno/CIS-5357/lecture_slides/class14.ppt.htm

ARTICLE

1 JianQiao, Xuemin Sherman Shen, Jon W. Mark, QinghuaShen, "Enabling device-to-device communications in millimeter-wave 5G cellular networks" IEEE Communications Magazine, January 2015, Volume 53, Issue 1, Pages 209 - 215, ISSN 0163-6804

LECTURE 15

The objective of the lecture is to make students understand the Mobile Telephone System. In this lecture student will be explained all the 3 generations of mobile telephony.

CONTENTS:

- First Generation Mobile Phone
- Second Generation Mobile Phone
- Third Generation Mobile Phone
- Roaming and Handoffs

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I- Section II Q 28

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 164-174
2 ibid 2, Page No. 581

REFERENCE BOOK:

1 ibid 3, Page No. 397-400

WEBSITE:

1 www.cs.columbia.edu/~coms6181/slides/13/mobile-telephony.ppt

LECTURES 16-18

DATA LINK LAYER

OBJECTIVE

The lectures will help student understand the various design issues of data link layer and the various methods of error detection and correction like CRC, Hamming code,checksum etc.

CONTENTS:

- Design issues
- Framing
- Errors
  - Single bit
  - Multiple bit
- Error detection
  - LRC
  - VRC
  - Checksum
  - CRC
- Error Correction
  - Hamming Code

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II- Section II: 1,2,3,4,32,33,34,35,36

2 Refer Unit II-Section III: 1,2,4,5,6,8,9,31

OTHER ASSIGNMENT:

1 ibid 1, Page No. 252, Q 1,2,3,4,5,10

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No. 194-209
2 ibid 2, Page No 238-248,258-284

REFERENCE BOOK:

1 ibid 3, Page No. 171-186

LECTURES 19-20

FLOW CONTROL

OBJECTIVE:

The objective of these lectures is to explain students about how the flow control is done at the data link layer. Various schemes for flow control such as sliding window, selective repeat will be discussed.

CONTENTS:

- Sliding Window
- Flow control
  - Stop and wait
  - Sliding window
  - Stop and wait ARQ
  - Sliding window ARQ
    - Go Back n
    - Selective reject

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II- Section II Q5,6,7,21,27,28,29,30
2 Refer Unit II- Section III Q3,7

OTHER ASSIGNMENT:

1 ibid 2, Page No. 320, Q 11-4 to 11-11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 294-297,701

WEBSITE:

1 www.cs.columbia.edu/~coms6181/slides/13/sliding-window.ppt

LECTURE 21

HDLC

OBJECTIVE:

The objective of this lecture is to understand the data link layer protocol (HDLC). Various configurations, types of frames related to HDLC will be discussed.

CONTENTS:

- Bit Oriented Protocol
  - Types of Stations
  - Configurations
  - Modes of Communications
  - Types of Frames

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit II- Section II Q 8, 25, 26

OTHER ASSIGNMENT:

1 ibid 2, Page No. 320, Q10, 11, 12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 299-305

WEBSITE:

1 www.cs.columbia.edu/~coms6181/slides/13/frames.ppt

LECTURE 22

LINK LAYER PROTOCOLS

OBJECTIVE:

The objective of this lecture is to explain how the channel allocation is done in the data link layer and also explain various MAC Layer protocols.

CONTENTS:

- Channel Allocation Problem
- Multiple Access Protocols
    - Persistent
    - Non Persistent

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II- Section II Q 15,16,20,22
2 Refer Unit II-Section III Q 1,3

OTHER ASSIGNMENT:

1 ibid 1, Page No.338, Q2, 6

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 258-317
2 ibid 2, Page No. 325-347

WEBSITE:

1 www.cs.wpi.edu/~rek/Undergrad_Nets/B04/MAC.ppt

ARTICLES:

1 In Keun Son, Shiwen Mao, Yihan Li, Min Chen, Michelle X. Gong, Theodore (Ted) S. Rappaport, "Frame-Based Medium Access Control for 5G Wireless Networks", Mobile Networks and Applications , Springer US, Jan 2015
2 HamedHaddadi, Olivier Bonaventure, "Recent Advances in Networking", Volume 1, ACM SIGCOMM eBook, August 2013
3 Xavier Costa, "Latest trends in Telecommunications Standards" ACM SIGCOMM Publication, Vol. 43, Number2, April 2013, Page no-64-71

LECTURE 23

IEEE 802.3

OBJECTIVE:

The objective of this lecture is to understand IEEE 802.3(Ethernet), access method used by the Ethernet and the various frame formats used in it.

CONTENTS:

- Access method
- Addressing
- Electrical Specification
- Frame Formats
- Types

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II, Section II Q17,23,39,40
2 Refer Unit II, Section III Q 10

OTHER ASSIGNMENT:

1 ibid 2, Page No. 384 Q5-11

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 361-381

WEBSITE:

1 www.cs.wpi.edu/~rek/Undergrad_Nets/B04/Ethernet.ppt

ARTICLE

1 G. Enrico Santagati, TommasoMelodia, Laura Galluccio, Sergio Palazzo, "Medium access control and rate adaptation for ultrasonic intrabody sensor networks", Journal IEEE/ACM Transactions on Networking (TON), Volume 23 Issue 4, August 2015, Pages 1121-1134, IEEE Press Piscataway, NJ, USA

LECTURES 24-25

WLAN & BLUETOOTH

OBJECTIVE:

The objective of this lecture is to understand WLANs architecture and the protocol stack. Also, Bluetooth architecture and its protocol stack.

CONTENTS:

- Wireless LANs
- Bluetooth Architecture
- Bluetooth Applications
- Bluetooth Protocol Stack
- Bluetooth Radio Layer
- Bluetooth Baseband Layer
- Bluetooth L2CAP Layer
- Bluetooth Frame Structure

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II- Section II Q 12,13,14
2 Refer Unit II- Section III Q 3

OTHER ASSIGNMENTS:

1 ibid 1, Page No. 352, Q 15,16,17,18
2 ibid 3 ,Page No. 524 Q 1-5

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 320-325
2 ibid 2 Page No. 451-452,436-448

ARTICLE:

1 XenofonFafoutis, Alessio Di Mauro , Madava D. Vithanage , Nicola Dragoni, "Receiver-initiated medium access control protocols for wireless sensor networks", Elsevier, Computer Networks, Volume 76, 15 January 2015, Pages 55–74

LECTURE 26

DATA LINK LAYER SWITCHING

OBJECTIVE:

The objective of this lecture is to understand Data Link Layer Switching. And the working of various bridges will be explained.

CONTENTS:

- Local Internetworking
- Spanning tree bridges
- Remote bridges

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II- Section II Q 6,7,8
2 Refer Unit II- Section III Q 5

OTHER ASSIGNMENT:

1 ibid 1, Page No. 351, Q 39, 40

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 337-340
2 ibid 2, Page No. 607

WEBSITE:

1 web.cs.wpi.edu/~rek/Undergrad_Nets/B04/Bridges.ppt

LECTURE 27

NETWORK LAYER

OBJECTIVE:

The objective of this lecture is to introduce the third layer of the OSI model: Network Layer. Network layer is the important layer used for routing the packets between the sender and the receiver.

CONTENTS:

- Design Issues
- Store and Forward Packet Switching
- Connection Oriented & Connectionless Services
- Virtual Circuit & Datagram Subnet

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III- Section II Q 9

OTHER ASSIGNMENT:

1 ibid 1, Page No.490, Q 1, 2,6,13

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 355-361
2 ibid 2, Page No. 512-517

WEBSITE:

1 www.cs.cornell.edu/home/skeshav/book/.../switching/switching_97.ppt

LECTURES 28-30

ROUTING ALGORITHMS

OBJECTIVE:

The objective of these lectures is to understand the various static & dynamic routing algorithms. Static routing is used when the entire path is known in the beginning whereas dynamic routing is used when the path between the source and destination is not known.

CONTENTS:

- Optimality Principle
- Shortest Path Routing
- Flooding
- Distance Vector Routing
- Link State Routing
- Hierarchical Routing
- Broadcast Routing
- Multicast Routing
- Routing for Mobile Hosts

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III- Section II Q 6,7, 11,12,25
2 Refer Unit III- Section III Q 1,2,4

OTHER ASSIGNMENT:

1 ibid 1, Page No. 490, Q 14, 16

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 362-389
2 ibid 2, Page No. 596-618

WEBSITE:

1 AndrzejBieszczad, Bernard Pagurek, "Mobile Agents for Network Management", http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.56.3251&rep=rep1&type=pdf

ARTICLE:

1 N. Gupta, Priyanka, M.R. Tripathy, "Cellular Signaling Cascade Based Routing in SANET", Fifth International Conference on Advanced Computing & Communication Technologies (ACCT), IEEEXplore, Feb 2015, Pages 334 - 339

LECTURES 31-32

CONGESTION ALGORITHMS

OBJECTIVE:

The objective of these lectures is to understand the various congestion control algorithms. Congestion control algorithms play a vital role in de congesting the traffic between the sender and the receiver when the congestion occurs in the transmission lines.

CONTENTS:

- Principles of Congestion Control
  - Open Loop Algorithm
  - Closed Loop Algorithm
- Congestion Control in VC Subnets
- Congestion Control in Datagram Subnets
- Load Shedding
- Jitter Control

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III- Section II Q14

OTHER ASSIGNMENT:

1 ibid 1, Page No.490, Q24

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 392-401
2 ibid 2 Page No 29,577

WEBSITE:

1 www2.cs.science.cmu.ac.th/person/ekkarat/datacomm/ch24.ppt

ARTICLE

1 Aloizio P. Silvaa, Scott Burleighc, Celso M. Hirataa, Katia Obraczkab, "A survey on congestion control for delay and disruption tolerant networks", Elsevier, Ad Hoc Networks, Volume 25, Part B, February 2015, Pages 480–494, New Research Challenges in Mobile, Opportunistic and Delay-Tolerant Networks

LECTURES 33 – 34

QUALITY & SERVICE OF NETWORKING

OBJECTIVE:

The objective of these lectures is to study how to achieve good Quality of Service & also about Internetworking. Quality of service is related to the connection oriented network where we want a reliable transmission to between the sender and the receiver.

CONTENTS:

- What is Quality of Service
- Techniques to achieve good QoS
- How Networks Differ?
- Concatenated VC
- Tunneling
- Fragmentation

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III- Section II Q 13, 15-18

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 404-421,425-432
2 ibid 2, Page No. 84,453,515

WEBSITE:

1 www.cs.columbia.edu/~coms6181/slides/13/quality-of-service.ppt

ARTICLE:

1 M. AykutYigitela, OzlemDurmazIncelb, CemErsoya, "QoS vs. energy: A traffic-aware topology management scheme for green heterogeneous networks", Elsevier, Computer Networks, Volume 78, 26 February 2015, Pages 130–139, Special Issue: Green Communications

LECTURES 35-37

INTERNET PROTOCOL

OBJECTIVE:

The objective of these lectures is to discuss about the addressing formats used in the Internet and also about the Internet Protocol (IPv4 &IPv6).

CONTENTS:

- IPv4 addresses
  - Address Space
  - Dotted Decimal Notation
  - Classes
- IPv6 addresses
  - Structure
  - Address Space
- IP Protocol(IPv4)
  - Datagram
  - Fragmentation
  - Checksum
  - Options
- IPv6
  - Advantages
  - Packet Format
  - Extension Headers
- Transition from IPv4 to IPv6
- Protocols
  - ARP
  - RARP

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III- Section II Q 1-5,19,20,21-24
2 Refer Unit III- Section III Q3 Section IV Q 1-4

OTHER ASSIGNMENT:

1 ibid 1, Page No. 490, Q 36, 37, 38,46

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 665-684

ARTICLE:

1 Md.MostofaChowdhury, SumontoSarker, AzizulHuq, Nirmal Roy, "A Case Study on Implementation an IPv6 Network over IPv4 using Manually Configured Tunneling", International Journal Of Research In Computer Engineering and Electronics, ISSN 2319-376X, Volume 3, Issue 6, 2014

LECTURES 38-39

UDP

OBJECTIVE:

These lectures will help students understand the transport layer protocols namely UDP & TCP, the various TCP services such as process to process communication, reliable and connection oriented services. These will give a brief about Application Layer Protocols.

CONTENTS:

- User Datagram Protocol
  - Process to Process Communication
  - Checksum Calculation
  - UDP Operation
  - Use of UDP
- Transmission Control Protocol Services
  - Process to process communication
  - Stream delivery service
    - Receiver buffer
    - Sending Buffer
  - Full duplex service
  - Connection oriented service
  - Reliable service
- State Transition Diagram
- Transmission control protocol features
  - Numbering system
    - Sequence number
    - Byte number
  - Flow control
  - Error control
  - Congestion control

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV- Section II Q 1-20
2 Refer Unit IV- Section III Q 1-9

OTHER ASSIGNMENT:

1 ibid 2, Page No. 806, Q 6, 7, 8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 737-790

WEBSITE:

1 www.cs.fsu.edu/~breno/CIS-5357/lecture_slides/class14.ppt.htm

LECTURES 40-41

APPLICATION LAYER

OBJECTIVE:

The objective of the lecture is to make the students understand various services of Application Layer. In the Application layer various important services are assessed by the user such mail, file transfer from one system to another, world wide web etc.

CONTENTS:

- Application Layer Services
  - Client-Server Model
  - DNS
- Electronic Mail
  - User Agent
  - Addresses
  - Mail Transfer Agent
  - Multipurpose Internet Mail Extensions
  - Post Office Protocol
- World Wide Web
  - Hypertext and Hypermedia
  - Brower Architecture
  - Static Documents
  - HTML
  - Dynamic Documents
  - Common Gateway Interface
  - Active Documents
  - Java
- Multimedia

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV- Section IQ 5-7
2 Refer Unit IV-Section IIQ 26-28

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 871-921

LECTURES 42-45

SECURITY ISSUES

OBJECTIVE:

The objective of the lectures is to make the students understand about Network Security. Whenever any vital data is to be transmitted then it has to be done confidentially. Network security deals with authenticating the user; the data is transmitted in a secure manner.

CONTENTS:

- Security Services
  - Confidentiality
  - Integrity
  - Authentication
  - Non repudiation
- Securing data
  - Encryption & Decryption
    - Substitution & Transposition
    - DES
    - RSA
- Symmetric and Asymmetric Cryptography
- Digital Signature
- Firewalls

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV- Section II: 21-25
2 Refer Unit IV- Section III: 10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 1077-1108

ARTICLE:

1 Poonam Sinai Kenkre, AnushaPai, LouellaColaco, "Real Time Intrusion Detection and Prevention System", Proceedings of the 3rd International Conference on Frontiers of Intelligent Computing: Theory and Applications (FICTA) 2014, Advances in Intelligent Systems and Computing, Volume 327, 2015, pp 405-411

LECTURE PLAN

C# PROGRAMMING

MCA 209

COURSE OUTLINE
MCA - III SEMESTER
C# PROGRAMMING-MCA 209

L - 4 Credits - 04

OBJECTIVE:

The purpose of this course is to familiarize the students with .NET framework and C# language. For developers, the .NET Framework provides a comprehensive and consistent programming model for building applications that have visually stunning user experiences and secure communication. The framework has been developed by Microsoft Corporation and C# has been introduced as a de facto language of .NET platform. The course will help the students to design the applications based on component oriented approach and have an in depth knowledge of .NET framework.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS:

SECTION A **(08 hours)**

- Understand the motivation behind the .NET platform,
- Common Language Infrastructure (CLI),
- Role of the Common Type System (CTS),
- Common Language Specification (CLS) and the Common Language Runtime (CLR)
- Understand the assembly, metadata, namespace, type distinction, Contrast single-file and multi-file assemblies
- Know the role of the Common Intermediate Language (CIL), Platform independent
- .NET (Mono / Portable .NET distributions).

SECTION B **(14 hours)**

- Language Fundamentals
- Reference and value Types, primitive types the Nullable and enum types, Classes and objects, Defining classes Creating objects
- Using static members, Garbage Collector, Overloading Methods, Various Constructors. Encapsulating data, access modifiers, properties, indexers arrays and read only fields.
- Handling errors and throwing exceptions
- The Root object class.
- Inheritance and polymorphism specialization and generalization,
- Abstract classes, nesting of classes.
- Structures
- String and DateTime classes.

SECTION C **(10 hours)**

- Delegates and events. Anonymous delegates and lambda expression, FUNC and Action delegates.
- Interfaces, overriding interface implementation. Explicit interface implementation. Collection, IEnumerable, IEnumerator, IList, IComparer and their Generic equivalent. Working with generic List, Stack, Dictionary and Queue.
- The notifies - subscribers paradigm for handling events. .NET framework for handling GUI events. Introduction to WPF and building an WPF application

SECTION D **(10 hours)**

- XML A quick introduction.
- LINQ and C#. Defining and executing a Query.
- Implicitly typed local variables. Anonymous Types, Extension Methods and Lambda Expressions.
- Putting LINQ to work. LINQ to SQL Fundamentals of ADO.NET Updating retrieving and deleting data using LINQ to SQL.

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of C# Programming and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOKS**

1. **Author's Name(s) :**Ian Griffiths
Title: Programming C# 5.0
Edition: 1st **Year:** 2013
Publisher: O'Reilly (ibid 1)

2. **Author's Name(s) :** Paul J. Deitel, Harvey M. Deitel
Title: C# 2010 for Programmers
Edition: 5th**Year:** 2013
Publisher: Pearson (ibid 2)

3. **Author's Name(s) :** Herbert Schildt
Title: C# 4.0
Edition: 1st Year**:** 2012(Reprint)
Publisher: Tata McGraw Hill (ibid 3)

- **REFERENCE BOOKS**

1. **Author's Name(s) :** E Balagurusamy
Title: Programming C#
Edition: 3rd**Year:** 2011
Publisher: Tata McGraw Hill (ibid 4)

2. **Author's Name(s) :** Barbara Doyle
Title: Programming C#
Edition: 1st**Year:** 2013
Publisher: Cengage Learning (ibid 5)

3. **Author's Name(s) :** Joseph Albahari, Ben Albahari
Title: C# 5.0 Pocket Reference
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- **PERIODICALS**
  1. International Journal of Computing and Applications
  2. International Journal of Advanced Research in Computer Science and Software Engineering

LECTURE 1

INTRODUCTION TO COMPONENT ORIENTED PROGRAMMING

OBJECTIVE:

The objective of this lecture is to introduce the concept of component oriented programming and how it is different from object oriented programming. The aim is to get student acquainted with programming paradigm adopted in latest technologies and languages.

CONTENTS:

- Programming Paradigms
  - Structured Programming
  - Modular Programming
  - Procedural Programming
  - Object Oriented Programming
  - Object Based Programming
  - Component Oriented Programming
- Difference between Object Oriented and Component Oriented Programming

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q19, 20
2 Unit I, Section III Q12, 13

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 5, Page No. 1-26

WEBSITE:

1 http://www.google.co.in/url?sa=t&rct=j&q=component%20oriented%20programming&source=web&cd=3&ved=0CFcQFjAC&url=http%3A%2F%2Fcse.spsu.edu%2Fkqian%2FSWE4633%2FCh1_intro.ppt&ei=8GUbUPaMNMO4rAfh2oCgDg&usg=AFQjCNEbpiUHzlGvt4p-odS8I_CSFyhsdA

LECTURES 2-3

INTRODUCTION TO MICROSOFT .NET

OBJECTIVE:

These lectures introduce the .NET technology. The .NET initiative is based on an entirely new architecture in comparison to previous versions of Microsoft tools. It is intended to elevate the development environment to a new level of sophistication, capability and ease of use.

CONTENTS:

- What is .net?
- Tracing the history of .net
- Flavors of .net
- .net as a framework
- Features of .net
- Where does .net fit in?
- Future of .net

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q1, 2, 22, 23
2 Unit I, Section III Q1, 2, 9

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 2, Page No. 2-3
2 ibid 3, Page No. 8

REFERENCE BOOKS:

1 ibid 4, Page No. 1-10
2 ibid 5, Page No. 19-23

WEBSITES:

1 http://download.microsoft.com/download/8/e/7/8e725d96-7ec3-498b-9fa7-86779aed101f/dotnet%20tutorial%20for%20beginners.pdf
2 http://www.visualbuilder.com/dotnet/tutorial
3 https://technet.microsoft.com/en-us/library/bb496996.aspx

LECTURES 4-5

ARCHITECTURE OF .NET FRAMEWORK

OBJECTIVE:

The objective of the lectures is to discuss the architecture of .net framework along with its components. Also the lectures would focus on comparing various frameworks with .net.

CONTENTS:

- Understanding the architecture of .net framework

- Common Language Runtime(CLR)
    - Common Type Systems(CTS)
    - Common Language Specification(CLS)
    - Microsoft Intermediate Language(MSIL)
    - Garbage collector(GC)
    - Code Manager
        - Managed Code
        - Unmanaged Code
- .NET Framework Base Class Library
- Data and XML
- User Interface
- .NET products
- JIT compilation process

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q3, 4, 6,14,15,17, 20, 24, 26, 27, 28
2 Unit I, Section III Q3, 5, 8, 10, 11, 14, 16-19

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 2, Page No. 4-5
2 ibid 3, Page No. 8-9

REFERENCE BOOK:

1 ibid 4, Page No. 11-17

WEBSITES:

1 http://download.microsoft.com/download/8/e/7/8e725d96-7ec3-498b-9fa7-86779aed101f/dotnet%20tutorial%20for%20beginners.pdf
2 http://www.visualbuilder.com/dotnet/tutorial
3 http://www.c-sharpcorner.com/UploadFile/puranindia/NETFrameworkArchitecture06262009024015AM/NETFrameworkArchitecture.aspx
4 http://www.hibernate-training-guide.com/cil.html
5 http://www.devx.com/opensource/Article/31741/1954
6 http://www.codeproject.com/KB/books/CrossPlatDotNetCh05.aspx

ARTICLE:

1 Paul D. Sheriff, "The PDSA .NET Framework", http://www. pdsa.com/ Download/ Framework/ PDSAFrameworkPaper.pdf

LECTURES 6-7

ASSEMBLIES IN .NET APPLICATION

OBJECTIVE:

The objective of the lectures is to discuss the concept of DLL (dynamic link library) and assemblies. Various types of assemblies and components of assemblies would be discussed in detail.

CONTENTS:

- Structure of a .net application
  - Metadata
  - Assembly
    - Assembly Manifest
    - Types of Assembly
      - Private Assembly
      - Global Assembly
      - Satellite Assembly
    - Single file and multi file assembly
  - Modules
  - MSIL

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q 8, 9,10, 11, 12,13, 16, 21, 25, 29
2 Unit I, Section III Q4, 15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Page No. 469

WEBSITES:

1 http://download.microsoft.com/download/8/e/7/8e725d96-7ec3-498b-9fa7-86779aed101f/dotnet%20tutorial%20for%20beginners.pdf
2 http://www.visualbuilder.com/dotnet/tutorial
3 http://www.csharpcorner.com/UploadFile/puranindia/NETFrameworkArchitecture06262009024015AM/NETFrameworkArchitecture.aspx
4 http://www.exforsys.com/tutorials/vb.net-2005/creating-and-managing-.net-assemblies.html
5 https://technet.microsoft.com/en-us/subscriptions/30azhh5b(VS.71).aspx

LECTURE 8

NAMESPACES AND TYPE DISTINCTION

OBJECTIVE:

Naming conflicts are common when working with large number of applications which leads to necessity of having namespaces. Namespaces are the way to organize .NET Framework Class Library into a logical grouping according to their functionality, usability as well as category they should belong to. The objective of the lecture is to explain the concept of namespaces and various types.

CONTENTS:

- Concept of namespaces
- Type distinction in .net

ASSIGNMENT FROM QUESTION BANK:

1 Unit I, Section II Q 5, 7

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 3, Page No. 449-459
2 ibid 1, Page No.77-83

WEBSITES:

1 http://visualcsharp-faiz.blogspot.com/2009/11/assemblynamespacetype-distinction.html
2 http://books.google.co.in/books?id=VGT1_UJzjM0C&pg=PA23&lpg=PA23&dq=namespaces+and+type+distinction++in+.net&source=bl&ots=zrHIVPCFQb&sig=7Fq8hHYfXiU29aDW0L8WEdvc92A&hl=en#v=onePage No. &q&f=false
3 https://msdn.microsoft.com/en-us/library/z2kcy19k.aspx
4 https://msdn.microsoft.com/en-us/library/0d941h9d.aspx

LECTURE 9

COMMON INTERMEDIATE LANGUAGE AND PLATFORM INDEPENDENT .NET

OBJECTIVE:

The objective of the lecture is to explain the role of CIL in .net and how it contributes in making languages like c# platform independent. Also distribution of .NET would be discussed which makes .net compatible with Linux.

CONTENTS:

- What is Common Intermediate Language(CIL)
- Platform Independence in .net
- Mono /Portable .NET distributions

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q18
2 Unit I, Section III Q6,7

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Page No. 8-9

WEBSITES:

1 http://www.hibernate-training-guide.com/cil.html
2 http://www.devx.com/opensource/Article/31741/1954
3 http://www.codeproject.com/KB/books/CrossPlatDotNetCh05.aspx
4 http://www.developer.am/c-net-platform/?page=the-role-of-the-common-intermediate-language
5 http://www.techopedia.com/definition/24290/intermediate-language-il-net

ARTICLE:

1 Gregory J. Blajian, Maurice Eggen, Roger Eggen, Gerald Pitts, "Mono versus .Net: A Comparative Study of Performance for Distributed Processing", http://www.unf.edu/~ree/netvsmono.pdf

LECTURES 10-11

INTRODUCTION TO C#

OBJECTIVE:

The lecture aims to provide an introduction to the basic concepts of C# language, the fundamental data types and operators. Also distinct features of C# would be discussed in detail.

CONTENTS:

- History of C#
- C# language features

- C# editors and IDEs
- Structure of the C# program
- C# components
  - Namespace and Assemblies
  - Standard Input and Output streams
- Variables
  - Variable Modifiers
  - Accessibility Modifiers
  - Static and Read only variables
- Constants
- Types in C#
  - Value types
    - Simple types
    - Struct type
    - Enum types
  - Reference types
    - Class type
    - Interface type
    - Delegate types
    - Event types
    - Array types
- Type Conversions
  - Implicit conversion
  - Explicit conversion
    - Boxing
    - Unboxing
- Expressions and Operators
  - Unary
  - Binary
  - Ternary
  - Checked and Unchecked operators
  - The is operator
  - Sizeof operator
  - Typeof operator

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q1, 2, 3, 4, 5, 6, 35-38
2 Unit II, Section III Q1, 2, 19-20

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 28-38

2 ibid 2, Page No. 83-84,87-88,142-147
3 ibid 3, Page No. 37-86

REFERENCE BOOK:

1 ibid 4, Page No. 18-30, 34-48

WEBSITE:

1 http://www.c-sharpcorner.com/

ARTICLES:

1 HimaVejella, "Visual Studio 2010 and .NET Framework 4 IDE Enhancements", http://dotnetslackers.com/articles/net/Visual-Studio-2010-and-NET-Framework-4-IDE-Enhancements-Part1.aspx
2 David R. Hanson , Todd A. Proebsting, "A Research C# Compiler", http://research.microsoft.com/pubs/70004/tr-2003-32.pdf

LECTURES 12-13

CONTROL STATEMENTS

OBJECTIVE:

In order for developers to utilize any language to the fullest extent, they need to have a complete and thorough understanding of the code flow structures. These lectures provide an overview of the C# control statements and discuss the appropriate way to use each of them.

CONTENTS:

- Selection structures in C#
  - If…else statement
  - Switch statement
- Repetition structures in C#
  - While
  - Do..while
  - For
  - Foreach
- Goto statement
- Break and continue statement
- Return statement

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q7, 8, 9

2 Unit II, Section III Q3, 4

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 39-54
2 ibid 2, Page No. 95-118, 120-142
3 ibid 3, Page No. 87-107

REFERENCE BOOKS:

1 ibid 4, Page No. 80-95, 102-118
2 ibid 6, Page No. 49-55

WEBSITES:

1 http://www.c-sharpcorner.com/
2 http://www.csharp-station.com/Tutorial/CSharp/lesson03

ARTICLE:

1 Richard Carr, "Console Application Cursor Position", http://www.blackwasp.co.uk/ConsoleCursorPosition.aspx

LECTURES 14-16

CLASSES AND OBJECTS

OBJECTIVE:

C# is an object-oriented programming language, and uses classes to implement types such as Windows Forms, user interface controls, and data structures. It provides many powerful ways of defining classes, such as providing different access levels, inheriting features from other classes, and allowing the programmer to specify what happens when types are instantiated or destroyed. The objective of the lectures is to introduce the concepts of classes, objects, methods, instance variables, constructors and destructors.

CONTENTS:

- Introduction to classes and objects
- Members of a class
  - Methods
    - Method overloading
    - The ref and out parameters
  - Properties

- Events
- Constants
- Fields
- Operators
- Instance constructors
- Static constructors
- Destructors
- Indexers
- Types

➢ Class member accessibility types and scope
➢ Read only fields and properties
➢ Nesting of classes
➢ Garbage Collector

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q10,11,12,22,24,34
2 Unit II, Section III Q6,7,8,9

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 59-101
2 ibid 2, Page No. 66-72, 149-185
3 ibid 3, Page No. 167-218, Page No. 253-272, Page No. 319-242

REFERENCE BOOKS:

1 ibid 4, Page No. 212-230
2 ibid 6, Page No. 60-70

WEBSITES:

1 http://www.c-sharpcorner.com/
2 http://www.codeproject.com/KB/cs/nested_csclasses.aspx
3 http://msdn.microsoft.com/en-us/library/ms973837.aspx

ARTICLE:

1 ArtiChhikara, R.S.Chhillar, SujataKhatri, "Applying Object Oriented Metrics to C#(C Sharp) programs ", Int. J. Comp. Tech. Appl., Vol 2 (3), pp. 666-674, ijcta.com/documents/volumes/vol2issue3/ijcta2011020343.pdf

LECTURES 17-18

INHERITANCE AND POLYMORPHISM

OBJECTIVE:

The lectures focus on specialization, which is implemented in C# through inheritance. It also explains how instances of more specialized classes can be treated as if they were instances of more general classes which is a process known as polymorphism.

CONTENTS:

- Introduction to base class and derived class
- Protected members
- Constructors in derived classes
- Object class
- Introduction to polymorphism
- Abstract classes and methods
- Specialization and Generalization

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q14-20, 23, 25
2 Unit II, Section III Q10-13

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 191-221.
2 ibid 2, Page No. 332-371
3 ibid 3, Page No. 277-317.

REFERENCE BOOKS:

1 ibid 4, Page No. 244-261
2 ibid 6, Page No. 71-78

WEBSITES:

1 http://www.c-sharpcorner.com/
2 http://programcall.com/csnet/4/inheritance-and-polymorphism-in-csnet-with-examples.aspx

LECTURE 19

ARRAYS

OBJECTIVE:

The lecture discusses array programming in C# and .NET. It starts with the discussion of simple arrays and then delves into more complex topics such as jagged and multi-dimensional arrays.

CONTENTS:

- Introduction to arrays
- Declaring and creating arrays
- Passing arrays by value and reference
- Multidimensional arrays
  - Rectangular arrays
  - Jagged arrays

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q13, 28, 29
2 Unit II, Section III Q5
2 Unit II, Section IV Q10-15

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 221-236
2 ibid 2, Page No. 187-231
3 ibid 3, Page No. 139-154

REFERENCE BOOKS:

1 ibid 4, Page No. 145-154
2 ibid 6, Page No. 32-35

WEBSITE:

1 http://www.c-sharpcorner.com/

LECTURES 20

STRUCTURES

OBJECTIVE:

A structure is a collection of variables grouped together under a single name. It provides an elegant and powerful way for keeping related data together. The lecture provides an overview of structures in c#.

CONTENTS:

- Introduction to structures
- Declaring and creating structures
- Structs with methods
- Nested structs

ASSIGNMENT FROM QUESTION BANK:

1 Unit II, Section II Q21

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Page No. 334-339

REFERENCE BOOKS:

1 ibid 4, Page No. 190-203
2 ibid 6, Page No. 83

WEBSITE:

1 http://en.csharp-online.net/struct

LECTURES 21-22

STRING AND DATETIME CLASSES

OBJECTIVE:

The objective of the lectures is to discuss the constructors, methods and properties of string and Date time classes in c#.

CONTENTS:

- Fundamentals of Characters and Strings
- String constructors
- Indexer, property and methods of string class
- String Builder class
- Date Time class
- Date Time methods and properties

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q26-27
2 Unit I, Section III Q17, 18

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 51-62
2 ibid 2, Page No. 504-542
3 ibid 3, Page No. 158-166

REFERENCE BOOK:

1 ibid 4, Page No. 168-179

WEBSITES:

1 http://www.c-sharpcorner.com/
2 http://visualcsharptutorials.com/2010/12/datetime-class/

LECTURE 23

HANDLING ERRORS AND THROWING EXCEPTIONS

OBJECTIVE:

The lecture explores exception handling mechanisms in C#. It describes how C# provides built-in support for handling anomalous situations, known as exceptions, which may occur during the execution of the program.

CONTENTS:

- Exception Handling Overview
- .NET Exception Hierarchy
- Catching Exceptions

- Uncaught Exceptions
- Throwing exceptions using the throw statement
- Finally block

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 30, 31, 32, 33, 39-41
2 Unit II, Section III Q14, 15

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 265-292
2 ibid 2, Page No. 372-398
3 ibid 3, Page No. 345-368

REFERENCE BOOKS:

1 ibid 4, Page No. 352-368
2 ibid 6, Page No. 118-125

LECTURES 24-25

DELEGATES AND EVENTS

OBJECTIVE:

The objective of the lectures is to discuss the functional approach to composition and extensibility through delegates and events. Delegates being a unique feature in C# play an important role when working with events. The lectures would focus on discussing various ways to create delegates and how they are backbone to Event handling.

CONTENTS:

- Overview of delegates
- Calling static functions
- Calling member functions
- Multicasting
- Creating delegates with Lambda expressions
- Action delegates
- Overview of events
- Conventions used with events
- Example using events

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q2-7, 15, 16,19
2 Unit III, Section III Q1, 2, 11

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 143-183
2 ibid 3, Page No. 411-445

REFERENCE BOOKS:

1 ibid 4, Page No. 315-322
2 ibid 6, Page No. 108-117

WEBSITES:

1 http://www.akadia.com/services/dotnet_delegates_and_events.html
2 http://www.codeproject.com/KB/cs/explore_lamda_exp.aspx

ARTICLE:

1 Peter M¨uller, Joseph N. Ruskiewicz, "A Modular Verification Methodology for C# Delegates",http://pm.inf.ethz.ch/publications/getpdf.php?bibname=Own&id=MuellerRuskiewicz07.pdf

LECTURES 26-28

INTERFACES AND GENERIC COLLECTIONS

OBJECTIVE:

The objective of the lectures is to explain the concepts of interfaces and generic collections in C#. Generics give the ability to create generic methods or a generic type by defining a placeholder for method arguments or type definitions.

CONTENTS:

- Overview of interfaces
- Overriding interface implementation
- Explicit interface implementation
- Introduction to Generic Collections
- Generic Interfaces
    - I Collection

- IEnumerable
- Enumerators
- IList
- IComparer

➢ Generic Collections
- List
- Dictionary
- Stack
- Queue

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q1, 8, 9
2 Unit III, Section III Q3, 4, 12, 13

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 133-147
2 ibid 2, Page No. 730-748, 751-776
3 ibid 3, Page No. 507-564

REFERENCE BOOKS:

1 ibid 4, Page No. 275-285
2 ibid 6, Page No. 93-100

WEBSITES:

1 http://www.csharp-station.com/Tutorials/Lesson13.aspx
2 http://www.csharp-station.com/Tutorials/Lesson20.aspx
3 http://en.csharp-online.net/Generic_interfaces

ARTICLE:

1 Ali Bahaloo , "Increasing Accuracy of Speech Recognition Applications on Windows platform using .net framework ", http://speechsearcher.googlecode.com/files/ Research% 20Report.pdf

LECTURES 29-32

PROGRAMMING WINDOWS FORMS APPLICATION

OBJECTIVE:

The lectures explain how to design, develop and deploy Windows based applications by using Visual C#.NET. It covers all characteristics of Windows based programming such as creating

and configuring Windows forms, adding and configuring controls, creating and managing dialog boxes, menus and multiple document interface container applications.

CONTENTS:

- Windows forms
- Event handling
- Control properties and Layout
- Controls
- Mouse Event Handling
- Keyboard Event Handling
- Introduction to Windows Presentation Foundation (WPF)
- Building a WPF

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q10-14
2 Unit III, Section III Q5-10
2 Unit III, Section IV Q5-11

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 795-813
2 ibid 2, Page No. 781-837

REFERENCE BOOK:

1 ibid 4, Page No. 392-418

WEBSITE:

1 http://www.dreamincode.net/forums/topic/57901-introduction-to-wpf-c%23/

LECTURES 33-34

INTRODUCTION TO XML

OBJECTIVE:

The objective of the lectures is to introduce the major concepts of Extensible Markup Language (XML).

CONTENTS:

- Introduction to XML
- Document Type Definitions
- Document Object Model

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q1-4, 16-18
2 Unit IV, Section III Q1, 2, 15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 882-892

WEBSITE:

1 http://www.c-sharpcorner.com/uploadfile/mahesh/readwritexmltutmellli2111282005041517am/readwritexmltutmellli21.aspx

ARTICLES:

1 Mirella M. Moro, Vanessa Braganholo, Carina F. Dorneles, Denio Duarte, RenataGalante, Ronaldo S. Mell, "XML: Some Papers in a Haystack", SIGMOD Record, June 2010 ,Vol. 38, No. 2,http://www.sigmod.org/publications/sigmod-record/0906/ p29.surveys.Moro.pdf

2 Pierre Geneve's, Nabil Layaida, Vincent Quint,, "Impact of XML Schema Evolution", ACM Transactions on Internet Technology, Vol. 11, No. 1, Article, http://delivery.acm.org/10.1145/2000000/1993087/a4-geneves.pdf?ip=203.76.180.210&acc=AUTHOR%2DIZED&CFID=161721967&CFTOKEN=11638843&__acm__=1348303958_6c691d2d12348b41133f5ad3c1554fcd

LECTURES 35-40

INTRODUCTION TO LINQ

OBJECTIVE:

Language-Integrated Query (LINQ) is a set of features introduced in Visual Studio that extends powerful query capabilities to the language syntax of C#. The objective of the lectures is to introduce the Language Integrated Query for writing structured type safe queries.

CONTENTS:

- Introduction to LINQ

- Defining and Executing a Query
- Implicitly typed Local Variables
- Anonymous types
- Lambda Expressions
- Extension Methods
- LINQ to XML

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q5, 6
2 Unit IV, Section III Q3, 4, 5,12,20,21

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 265-297
2 ibid 3, Page No. 565-591

REFERENCE BOOK:

1 ibid 6, Page No. 142-165

LECTURES 41-45

INTRODUCTION TO ADO.NET AND LINQ TO SQL

OBJECTIVE:

LINQ to SQL is part of the ADO.NET family of technologies. It is based on services provided by the ADO.NET provider model. LINQ can be mixed to SQL code with existing ADO.NET applications and migrate current ADO.NET solutions to LINQ to SQL. The lectures aim to discuss the fundamentals of ADO.NET and how LINQ is associated with SQL.

CONTENTS:

- Introduction to ADO.NET
  - Data providers
  - ADO.NET Objects
- LINQ to SQL
  - Extracting Information from a Database
  - Complex LINQ queries and data binding
  - Retrieving data from multiple tables with LINQ
  - Updating and deleting data using LINQ to SQL

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q7-15
2 Unit IV, Section III Q6-10, 13, 14, 16-19

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 563-571, 539-544
2 ibid 2, Page No. 902-920
3 ibid 3, Page No. 594-603

WEBSITES:

1 http://visualcsharptutorials.com/2010/12/ado-net-fundamentals/
2 http://www.csharp-station.com/Tutorials/AdoDotNet/Lesson01.aspx
3 http://www.codemag.com/Article/0707051
4 http://www.codeproject.com/Articles/18116/LINQ-Introduction-Part-Of
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6 http://www.codeproject.com/Articles/18751/XLINQ-Introduction-Part-Of

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2 Samrat O Khanna, Mijal A Mistry, " Information Management System using LINQ over ADO.Net", International Journal of Advanced Research in Computer Science and Software Engineering,Volume 2, Issue 1, January 2012,http:// ijarcsse.com /docs/papers /january 2012/V2I1078.pdf