THIRUVALLUVAR UNIVERSITY

CHOICE BASED CREDIT SYSTEM (CBCS)

Degree of Master of Computer Application [M.C.A]

[Effective from the Academic year 2017- 2018]

REGULATIONS

CBCS

Choice-Based Credit System is a flexible system of learning. 'Credit' defines the quantum of contents / syllabus prescribed for a course and determines the number of hours of instruction required. The distinguishing features of CBCS are the following:

It permits the students to:

- learn at their own pace
- Choose electives from a wide range of elective courses offered by the departments of the affiliated colleges
- undergo additional courses and acquire more than the required number of credits
- adopt an inter - disciplinary approach in learning
- make best use of the expertise of available faculty

1. Conditions for Admission:

A Candidates who have passed the under mentioned degree examinations of this University or an examination of other institution by this University as equivalent thereto provided they have undergone the course under 10+2+3 or 11+1+3 or 11+2+2 pattern shall be eligible for admission to the M.C.A. Degree Course.

(a) B.C.A./B.E.S./B.Sc. in Computer Science/Mathematics/Physics/ Statistics / Applied Sciences OR (b) B.Com / Bachelor of Bank Management /B.B.A/B.L.M/B.A Corporate Secretary-ship / B.A. Economics/ any other Bachelor's Degree in any discipline with Business Mathematics and Statistics Or Mathematics /Statistics in Main/Allied level or (c) B.Sc. Chemistry with Mathematics and physics as allied Subjects or (d) B.E/B.Tech/M.B.A or (e) A Bachelor's Degree in any discipline with Mathematics as one of the subjects at the Higher Secondary level (i.e. in +2 level of the 10+2 pattern)

2. Eligibility for the Award of Degree:

A Candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than three academic years and passed the examinations of all the Six Semesters prescribed earning 140 credits and fulfilled such conditions as have been prescribed therefor.

3. Duration of the Course:

The Course duration shall be three years consisting of six semesters.

4. The Course of Study and the Scheme of Examinations:

Year / Semester	Subject	Paper	Title of the Paper	Ins. Hrs./ Week	Credit	Exam Hrs.	Max. Marks		
							CIA	Uni. Exam.	Total
I Year I Semester	Core	Paper I	Digital Logic and Design	5	4	3	25	75	100
	Core	Paper II	Programming in C	4	3	3	25	75	100
	Core	Paper III	Web Design	4	3	3	25	75	100
	Core	Paper IV	Data Base Management Systems	4	3	3	25	75	100
	Core	Practical I	Programming in C Lab	3	2	3	25	75	100
	Core	Practical II	Web Design Lab	3	2	3	25	75	100
	Core Practical	Practical III	Data Base Management Systems Lab	3	2	3	25	75	100
	Elective	Paper I	***(to choose either A or B or C)*** A. Computer organization and Architecture B. Principles of Information Technology C. Principles of Programming Language	4	4	3	25	75	100
				30	23				800
I Year II Semester	Core	Paper V	Computer Graphics	4	4	3	25	75	100
	Core	Paper VI	Object Oriented Programming using C++	4	3	3	25	75	100
	Core	Paper VII	Data Structures	4	3	3	25	75	100
	Core	Paper VIII	Open Source Technologies	4	3	3	25	75	100
	Compulsory paper		Human Rights	2	2	3	25	75	100
	Core	Practical IV	C++ Lab	3	2	3	25	75	100
	Core	Practical V	Data Structures Lab	3	2	3	25	75	100
	Core	Practical	Open source Technologies Lab	2	2	3	25	75	100
	Elective	Paper II	***(to choose either A or B or C)*** A. Resource Management Technique B. Discrete Mathematics C. E- Commerce	4	4	3	25	75	100
				30	25				900
II Year III Semester	Core	Paper IX	Computer Networks	5	5	3	25	75	100
	Core	Paper X	Operating Systems	4	3	3	25	75	100
	Core	Paper XI	Programming with Java	4	3	3	25	75	100
	Core	Paper XII	Desktop application using C#	4	3	3	25	75	100
	Core	Practical	Programming with Java Lab	3	2	3	25	75	100
	Core Practical	Practical VIII	Desktop application using C# Lab	3	2	3	25	75	100
	Core	Practical IX	Operating Systems Lab	3	2	3	25	75	100
	Elective	Paper III	***(to choose either A or B or C)*** A. Software Testing B. Decision Support Systems C. Multimedia and Animation	4	4	3	25	75	100
				30	24				800

Year / Semester	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam Hrs.	Max. Marks		
							CIA	Uni. Exam.	Total
II Year IV Semester	Core	Paper XIII	Design and Analysis of Algorithms	5	5	3	25	75	100
	Core	Paper XIV	Mobile Computing	4	3	3	25	75	100
	Core	Paper XV	Advanced Java Programming	4	3	3	25	75	100
	Core	Paper XVI	Web application using C#	4	3	3	25	75	100
	Core	Practical X	Advanced Java Programming Lab	3	2	3	25	75	100
	Core	Practical XI	Mobile Computing Lab	3	2	3	25	75	100
	Core	Practical XII	Web application using C# Lab	3	2	3	25	75	100
	Elective	Paper IV	***(to choose either A or B or C)*** A. Cloud Computing B. Big Data C. Object Oriented Analysis and Design	4	4	3	25	75	100
				30	24				800
III Year V Semester	Core	Paper XVII	Software Engineering	5	5	3	25	75	100
	Core	Paper XVIII	Compiler Design	4	3	3	25	75	100
	Core	Paper XIX	Enterprise Java Programming	4	3	3	25	75	100
	Core	Paper XX	Enterprise application using C#	4	3	3	25	75	100
	Core Practical	Practical XIII	Enterprise Java Programming Lab	3	2	3	25	75	100
	Core Practical	Practical XIV	Enterprise application using C# Lab	3	2	3	25	75	100
	Core Practical	Practical XV	Mini Project	3	2	3	25	75	100
	Elective	Paper V	***(to choose either A or B or C)*** A. Enterprise Resources Planning B. Distributed Operating System C. Software Project Management	4	4	3	25	75	100
				30	24				800
III Year VI Semester			Project Work *	30	20		80	120	200
			Total	180	140				4300

** For **LATERAL ENTRY MCA** students Human Rights Paper is Compulsory for completing the Course. The subject is written during their Fourth Semester.

Subject	Papers	Credit	Total Credits	Marks	Total marks
MAIN	20	3-5	68	100	2000
ELECTIVE	5	4	20	100	500
MAIN PRACTICAL	14	2	28	100	1400
COMPULSORY PAPER	1	2	2	100	100
MINI PROJECT	1	2	2	100	100
PROJECT WORK	1	20	20	200	200
TOTAL	42	-	140	-	4300

5. Structure of the Course and Evaluation Pattern:

The duration of University examination for theory and practical subjects shall be 3 hours. The maximum mark for each theory is 100 with 25 for Continuous Internal Assessment (CIA) and 75 for University Examination.

CIA Theory Exam		
I	Two tests	15 Marks
II	Assignment /Seminar	5 Marks
III	Attendance	5 Marks
	Total	**25 Marks**

The maximum marks for each practical is 100 with 25 for Internal Assessment and 75 for University Examination.

CIA Practical Exam		
I	One test	20 Marks
II	Attendance	5 Marks
	Total	**25 Marks**

Semester Practical Exam		
1.	Experiment 1	25 Marks
2.	Experiment 1	25 Marks
3.	Record	10 Marks
4.	Viva – Voce	15 Marks
	Total	**75 Marks**

6. Passing Requirements:

a) For all subjects the passing requirement is as follows: i) candidate secures not less than 50% of marks in University examination and not less than 50% in aggregate of the total maximum marks prescribed in each theory and practical, and in Project work minimum 50% each in dissertation and Viva-voce examination and not less than 50 % aggregate of the total maximum marks prescribed, shall be declared to have passed in the respective subject.

7. Classification of successful candidates:

Candidates who secured not less than 60% of aggregate marks (Internal + External) in the whole examination shall be declared to have passed the examination in the First Class.

All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate (Internal + External) shall be deemed to have passed the examination in First Class with Distinction, provided they pass all the examinations (theory papers, practicals, project and Viva-voce) prescribed for the course in the First appearance.

8. Requirement to take the Examinations:

a) A candidate will be permitted to take the University Examination for any Semester, if

i) He / she secures not less than 75% of attendance out of the 90 instructional days during the Semester.
(In the case of married women students the minimum attendance requirement shall be 55% of the total instructional days).

ii) He / she earns a progress Certificate from the Head of the Institution of having satisfactorily completed the Course of Study prescribed in the subjects as required by the Regulations and his / her conduct has been satisfactory.

Provided that it shall be open to the Syndicate or any authority delegated with such powers by the Syndicate to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed for any valid reason(s) subject to the usual conditions.

b) A candidate who has secured attendance less than 75% but 65% and above shall be permitted to take the Examination on the recommendation of the Head of the Institution to ignore the lack of attendance as well as on the payment of the prescribed fees to the University.

c) A candidate who has secured attendance less than 65% but 55% and above in any Semester, has to compensate the shortage of attendance in the subsequent Semester besides, earning the required percentage of attendance in that Semester and take the Examination of both the Semester papers together at the end of the latter Semester.

d) A candidate who has secured less than 55% of attendance in any Semester will not be permitted to take the regular Examinations. He / she has to re-do the course after the completion of the final semesters by rejoining the Semester in which the attendance is less than 55%.

e) A candidate who has secured less than 65% of attendance in the final Semester has to compensate his / her attendance shortage in a manner to be decided by the Head of the Department concerned after rejoining the Course.

9. Grading System:

In addition to the above marking system, grading system is also adopted as detailed below:

(a) The marks (sum of IA and UE marks) in each course is assigned with a letter grade on a five point scale using the following letter grade, grade points and ranges of marks.

SEVEN POINT SCALE (As per UGC notification 1998)

Marks	Grade Point	Letter Grade	Class
95-100	7.00	H	First Class with Distinction
90-94	6.00	O	First Class with Distinction
75-89	5.50	D	First Class with Distinction
60-74	4.75	A	First Class
55-59	4.00	B	Second Class
50-54	3.5	C	Second Class
Below 50	3.00	F	Fail

From the second semester onwards, the total performance within a semester and continuous performance starting from the first semester are indicated respectively by Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). These two are calculated by the following formulae:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

Where 'C_i' is the Credit earned for the Course i in any semester; 'G_i' is the Grade point obtained by the student for the course i and 'n' is the number of courses passed in that semester.

CGPA = GPA of all the courses starting from the first semester to the last semester.

10. Ranking:

Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction.

Provided in the case of Candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations 7. (iii) Supra are only eligible for Classification / Distinction.

11. **The Medium of Instruction and Examinations**

The medium of instruction and Examinations shall be in English.

12. **Submission of Record Notebooks for Practical Examinations**

Candidates taking the Practical Examinations should submit bonafide Record Note Books prescribed for the Practical Examinations. Otherwise the candidates will not be permitted to take the Practical Examinations. However, in genuine cases where the students could not submit the record note books may be permitted to take the Practical Examinations provided the Head of the Department concerned from the institution certifies that the candidate has performed the experiments prescribed for the Course. For such candidates who do not submit Record Note Books, zero (o) marks will be awarded for record note books.

13. **Improvement of Marks in the subjects already passed**

Candidates who have passed in theory paper / papers are allowed to appear again for theory paper / papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such Candidates are allowed to improve within a maximum period of 6 Semesters counting from his/her first semester of his/her admission. If candidate improves his marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. If the Candidate does not show improvement in the marks, his previous marks will be taken into consideration.

No candidate will be allowed to improve marks in the Practicals, Mini Project, Viva-voce, Field work.

14. **Evening College**

The above Regulations shall be applicable for candidates undergoing the respective Courses in the Evening Colleges also.

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THIRUVALLUVAR UNIVERSITY

MASTER OF COMPUTER APPLICATION

SYLLABUS

UNDER CBCS

(with effect from 2017-2018)

SEMESTER – I **CORE PAPER - I** **5H/4C**

DIGITAL LOGIC AND DESIGN

UNIT - I

Number systems - Efficiency of number system, Decimal, Binary, Octal, Hexa decimal conversion from one to another- Binary addition, subtraction, multiplication and division, representation of signed numbers, addition and subtraction using 2's complement and I's complement- Binary codes - BCD code, Excess 3 code, Gray code, Alphanumeric code, Error detection codes, Error correcting code.

UNIT - II

Logic Gates - Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, truth table and timing diagrams - Boolean Algebra - Basic laws and theorems , Boolean functions, truth table, minimization of boolean function using K map method, Realization using logic gates and universal gates.

UNIT - III

Combinational circuits - Half adder, Full Adder, Parallel binary adder, Subtracter, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Parity bit generator, PLA.

Sequential circuits - Flip Flops – RS, JK, T and D Flip Flops, Edge triggered Flip Flops, Master slave Flip Flops.

UNIT - IV

Registers - Serial in serial out, Serial in Parallel out, Parallel in serial out, Parallel in Parallel out registers, Bidirectional shift registers, universal shift registers- Counters - Synchronous and asynchronous counters, UP/DOWN counters, Modulo-N Counters, Cascaded counter, Programmable counter, Counters using shift registers, application of counters.

UNIT - V

Processor Organization – Arithmetic Logic Unit – Design of Arithmetic Circuit – Design of Arithmetic Logic Unit –Status Register – Microcomputer and processor Organization – Instruction and Addressing Modes – Stack , Subroutines, and Interrupt – Memory organization –I/O interface – Direct Memory Access.

TEXT BOOK

1. M. Morris Mano - Digital logic and computer design PHI – 1994

REFERENCES

1. M.M.Mano and C.R. Kime, Logic and Computer fundamentals, 2nd Edition Pearson Education, 2001.
2. Thomas C.Barteei, "Digital Computer Fundamentals ", 6/e, Tata McGrawHill.
3. Rajaraman V and Radhakrishnan, "Digital logic and Computer Organization", PHI, 2007.
4. John M. Yarbrough, "Digital Logic Applications and Design", Paperback, 2006.

SEMESTER – I **CORE PAPER - II** **4H/3C**

PROGRAMMING IN C

UNIT - I

C fundamentals Character set - Identifier and keywords - data types - constants - Variables - Declarations - Expressions - Statements - Operators in C- Type Conversion and typecasting- Library function.

UNIT - II

Data input output functions - Simple C programs - Flow of control - if, if-else, while, do-while, for loop, Nested control structures - Switch, break and continue, go to statements - Comma operator.

UNIT - III

Functions -Definition - prototypes - Passing arguments – Function within a function- Recursion.

UNIT - IV

Arrays - Defining and Processing –One dimensional and Two dimensional arrays - Multi-dimension arrays - Structures -Self-referential Structures Union – Stings – Storage Classes- Pointers.

UNIT-V

Pointers - Declarations - Operation on Pointers - Files: Creating, Processing, Opening and Closing a data file- Detecting End of File- Error handling during file operations- Accepting Command line arguments- Functions for selecting a record randomly – removing the file- creating a Temporary file.

TEXT BOOK

1. Reema Thareja , "Introduction to C Programming", Oxford University Press, Second Edition, 2015

REFERENCES

1. R.S.Bichkar, " Programming with C" , University Press, 1st Edition, 2012.
2. H. Schildt, "C: The Complete Reference", 4th Edition, TMH Edition, 2000.
3. Kanetkar Y., "Let us C", BPB Pub., New Delhi, 1999.
4. M.T.Somashekara , "Problem Solving in C" ,PHI, 2009.

SEMESTER – I **CORE PAPER - III** **4H/3C**

WEB DESIGN

UNIT - I

Introduction to Internet - Computers in business, Networking, Internet, E-mail, Resource sharing, Gopher, World Wide Web, Usenet, Telnet, Bulletin Board Service, Wide Area Information Service, search engines.

UNIT - II

Internet Technologies – Modem, Internet Addressing, Physical Connections, Telephone Lines. Internet Browsers - Internet Explorer, Netscape Navigator.

UNIT - III

How Computers Communicate, Understanding Network Topologies – Star Topology, Ring Topology, Bus Topology, Comparing Network Topologies, Understanding Token passing, Connecting Computer Networks – Repeater, Bridge, Understanding layering, Understanding Network protocols, Understanding TCP/IP.

UNIT - IV

Introduction to HTML – History of HTML, HTML Documents, Anchor Tag, Hyper Links. Head and body sections – Header Section – Title, Prologue, Links, Colorful Web Page, Comment Lines – Designing Body Sections – Heading printing, Aligning the headings, Horizontal rule, Paragraph, Tab Settings, Lists, Unordered Lists, Ordered Lists.

UNIT - V

Table Handling: Tables – Tables creation in HTML – Width of the Table and Cells – Cells Spanning Multiple Rows/Columns – Coloring Cells – Column Specification. Frames: Frameset Definition – Frame Definition – Nested Framesets.

TEXT BOOK

1. C. Xavier , "World Wide Web Design with HTML", Tata McGraw-Hill Publishing.19th Reprint, 2008.

REFERENCES

1. Wendy Willard, “Web Design – A beginners Guide”, Tata McGraw Hill

2. Thomas A. Powell, “The Complete Reference Web Design”, Tata McGraw Hill.

3. John Mocy ,“Mastering Web Design”, BPB Publications.

4. Aaron Gustafson, “Adaptive Web Design”, Easy Readers.

SEMESTER – I **CORE PAPER - IV** **4H/3C**

DATABASE MANAGEMENT SYSTEMS

Unit - I

Introduction – purpose of database systems – Data Abstraction – Data models – Instances and schemes – Data independence – DDL – DML – Database users – ER model – Entity sets – Keys – ER diagram – relational model – Structure – Relations Algebra – Relational Calculus – Views.

Unit - II

SQL – QBE – QUEL – Basic structure – various Operations – Relational database design problems in the relational data base design – Normalisation – normalization using functional, Multi value and join dependencies.

Unit - III

File and system structure – overall system structure – file Organization – data dictionary – Indexing and hashing – basic concept B and B+ tree indices – Static and Dynamic hash functions.

Unit - IV

Recovery and atomicity – failures classification and types – Transaction model and Log based recovery, schedules – serial and non-serial types – Serialization of schedules and views – testing for seriability – lock based protocols – time based protocols – validation techniques – multiple Granularity – multiversion schemes – insert and delete Operations.

Unit - V

Distributed data bases – structure of distributed databases – Trade offs in Distributing the database – Transparency and autonomy – distributed query processing – recovery in distributed systems – commit protocols – security and integrity violations–authorization and views – security specification – encryption – Statistical databases.

TEXT BOOKS

1. Henry F.Korth, and Abraham Silberschatz , Sudarshan “Database system Concepts”, McGraw Hill, 4th Edition, 2002
2. Singh. S. K., “Database Systems – Concepts, Design and Applications”, Pearson Education Publications, New Delhi, 2006.

REFERENCES

1. Pipin C. Desai, "An Introduction to data base systems", Galgotia Publications Private Limited, 1991.

2. Ramez Elamassri and Shankant B-Navathe, "Fundamentals of Database Systems",Sixth Edition, Pearson Education Delhi, 2010.

3. Raghu Ramakrishnan, Johannes Gehrke , "Database management systems" McGraw Hill, 2003.

4. C.J. Date, "An Introduction to Database Systems", 3rd Edition, Addison Wesley 1983.

SEMESTER – I **CORE PRATICAL PAPER - I** **3H/2C**

PROGRAMMING IN C LAB

1. Control structures.
2. Linear array.
3. Two dimensional Arrays.
4. Functions.
5. Structures.
6. Pointers with Functions and Arrays.
7. Pointers and structures.
8. Data file Handling.
9. Text File Handling.
10. Command Line Arguments

SEMESTER – I **CORE PRATICAL PAPER - II** **3H/2C**

WEB DESIGN LAB

1. Using at least 20 HTML Tags, Create a screen with a string "WEB DESIGN".

2. Create a small paragraph about 10 lines. Try to use FONT, TITLE and Head Tags. Apply different sizes and colors using Tags.

3. a) Create Tables with rows and columns and split them using Row span and Cols pan.
   b) Divide a page in 3 or more frames.

4. Create a web page for the front page of a newspaper using Text links. Align the text with colors.

5. Create a web page that acts like a Book. The Book should have 10 chapters. Chapter links should be from both the navigator Bar and from individual pages.

6. Develop a picture gallery having at least 3 pages. Each of them is having several pictures.

7. Develop a single page advertisement for a shop to be opened shortly.

8. Develop a web page for job recruitment Agency in an IT industry.

9. Design a web page advertisement for a new product.

10. Design and Publish a web page for a college.

SEMESTER – I **CORE PRATICAL PAPER - III** **3H/2C**

DATABASE MANAGEMENT SYSTEMS LAB

1. Simple Queries using DDL, DML and DCL

2. SQL Aggregate Functions

3. SET Operations

4. Views and Snapshots

5. Multiple Tables and Nested Queries PL/SQL

6. PL/SQL Block

7. Function and Procedures

8. Subprograms and Packages

9. Triggers

10. Cursors

SEMESTER – I **ELECTIVE PAPER - I** **4H/4C**

(to choose either A or B or C)

A. COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT - I

Instruction Codes : Stored Program Organization – Indirect Address - Computer Registers : Common Bus System - Computer Instructions : Instruction Set Completeness - Timing and Control - Instruction Cycle : Fetch and Decode – Determine the Type of Instruction – Register-Reference Instructions – Memory-Reference Instructions – Input-Output and Interrupt.

UNIT – II

Machine Language - Assembly Language Assembler – Program Loops – Arithmetic and Logic operations – Subroutine – Input – Output Programming –Micro Programmed Control : Control Memory Address Sequencing – Micro-program Example – Design of Control Unit.

UNIT - III

General Register Organization : Control Word – Examples of Micro-operations - Stack Organization- Instruction Formats : Three-Address, Two-Address, One-Address, Zero-Address and RISC Instructions - Addressing Modes : Example – Data Transfer and Manipulation – Program Control – Reduced Instruction Set Computer.

UNIT - IV

Peripheral Devices - Input /Output Interface - Asynchronous Data Transfer - Modes of Transfer - Direct Memory Access - Input Output Processor (Excluding IBM and Intel) – Serial Communication.

UNIT - V

Memory Hierarchy - Main Memory - Auxiliary Memory - Associative Memory - Cache Memory - Virtual Memory – Memory Management Hardware.

TEXT BOOK

1. Morris Mano M., "Computer System Architecture", New Delhi: Prentice Hall of India, 1997.

REFERENCES

1. M. Morris Mano, "Digital Logic and Computer Design", New Delhi: Prentice-Hall of India, 1991.

2. William Stallings , "Computer Organization and Architecture: Designing for Performance", Paper Back, 2013.

3. V. Radhakrishnan, T. Rajaraman, "Computer Organization and Architecture", Kindle Edition, 2007

4. John Hayes, "Computer Architecture and Organization", Paperback, 2012

SEMESTER – I **ELECTIVE PAPER - I** **4H/4C**

(to choose either A or B or C)

B. PRINCIPLES OF INFORMATION TECHNOLOGY

UNIT - I

Introduction to computer systems: Introduction to computers - Classification of computers - Anatomy of a digital computer.

UNIT - II

Computer Memory Units: Auxiliary storage devices – Input devices - Output Devices.

UNIT - III

Computer Software: Introduction to computer software - Operating systems - Programming languages. Database management systems: Data Processing - Introduction to Data base management systems.

UNIT - IV

Communications: Introduction to Telecommunications - Computer networks - Communication system - Internet & World Wide Web.

UNIT - V

Recent Trends: Introduction to Multimedia - Multimedia tools - Introduction to virtual reality – E-Commerce - Data Warehouses and data Marts - Data Mining – OLAP - GIS.

TEXT BOOK

1. Alexis Leon and Mathews Leon, "Fundamentals of Information Technology", 2nd Edition, Vikas Publishing, 2009.

REFERENCES

1. ITL Education Solutions Ltd, “Introduction to Information Technology”, Pearson Education, 2007.

2. Rajaraman V, “Introduction to Information technology”, PHI, 2005.

3. IIBF, "Information Technology", Paperback, 2010

4. Sushila Madan, "Information Technology", Paperback, 2007

SEMESTER – I **ELECTIVE PAPER - I** **4H/4C**

(to choose either A or B or C)

C. PRINCIPLES OF PROGRAMMING LANGAUGES

UNIT - I

Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT - II

Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures - selection, iterations, branching, guarded Statements

UNIT - III

Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT - IV

Object - orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling

UNIT - V

Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, - Programming with ML,

TEXT BOOKS

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.

2. Allen B Tucker, Robert E Noonan, ”Programming Langugaes, Principles & Paradigms”, 2ed, TMH.

REFERENCES

1. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.

2. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.

3. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.

4. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

SEMESTER – II **CORE PAPER - V** **4H/4C**

COMPUTER GRAPHICS

UNIT - I

Video Display devices - Raster scan systems - Input devices - Hard copy devices - Graphics software - Output primitives - Attributes of output primitives.

UNIT - II

Two - Dimensional Transformation - Clipping - Window - View port mapping.

UNIT - III

User dialogue - Input of Graphical Data - Input functions - Input device parameters - Picture construction Techniques - Virtual Reality Environments.

UNIT - IV

Three Dimensional concepts - 3D Transformations -3D Viewing.

UNIT - V

Visible - Surface Detection : Back - Face Detection - Depth - Buffer method - Scan Line Method - A Buffer method - Properties of Light - Infinitive color concepts - RBG color Models - Computer Animation.

TEXT BOOK

1. D.Hearn and M.P.Baker, “Computer Graphics”, Second Edition-PHI-1996.

REFERENCES

1. W.M.Newman and R.F.Sproull, “Priciple of Interactive computer Graphics”, McGraw Hill 1979.

2. Foley,Van Dan, Feiner,Hughes, “Computer Graphics”, Addison Wesley-2000.

3. ISRD Group, “Computer Graphics”, TMG, 2006.

4. Zhigang Xiang , Roy Plastock ," Computer Graphics ", Paperback, 2006

SEMESTER – II **CORE PAPER - VI** **4H/3C**

OBJECT ORIENTED PROGRAMMING USING C++

UNIT - I

What is Object Oriented Programming – C++ Console I/O- C++ comments- Classes: Some difference between C and C++ - Introducing Function Overloading - Constructor and Destructor Functions- Constructors take parameters- Introducing Inheritance – Object Pointers – In line Functions – Automatic in lining.

UNIT - II

Assigning Objects – Passing Object to Functions – Returning Object from Functions- An Introduction to friend functions- Arrays of objects – Using Pointers to Objects – Using new & delete – More about new & delete – references – Passing references to objects - Returning references- Independent References and restrictions.

UNIT - III

Overloading Constructor Functions- Creating and Using a Copy constructor- Using default arguments- Overloading and ambiguity – Finding the address of an overload function- the basics of operator overloading- overloading binary operators-overloading the relational and logical operators- overloading a Unary operator – using friend operator functions- a closer at the assignment operator- overloading the subscript() operator.

UNIT - IV

Base class access control –using protected members- Constructors, destructors and inheritance - multiple inheritance- virtual bas classes- Some C++ I/O basics- formatted I/O using width(), precision () and fill() – using I/O manipulators- Creating your own inserters- creating extractors.

UNIT - V

Creating your own manipulators- File I/O basics- unformatted, binary I/O- more unformatted I/O functions- random access- checking the I/O status- customized I/O and files- Pointers and derived classes- Introduction to virtual functions- more about virtual functions- applying polymorphism- Exception handling.

TEXT BOOK

1. Herbert Schildt, "Teach Yourself C++", III edition, Tata McGraw Hill 5th Reprint 2000.

REFERENCE

1. Reema Thareja , "Object Oriented Programming with C ++", Oxford University Press, 2015

2. Hubbard ,"Programming with C++", 2/e, Schaum Outline Series,TMH, 2006.

3. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley Publications, Second Edition, 1991.

4. Sarang Proonachandra, "Object Oriented Programming with C++",PHI, 2006.

SEMESTER – II **CORE PAPER - VII** **4H/3C**

DATA STRUCTURES

UNIT-I

Abstract Data Types – Arrays - Representation of Arrays - Operations on Arrays - OrderedList- Polynomial: Representation, Addition, Multiplication -Sparse Matrices.

UNIT-II

Singly Linked Lists - Circular Linked Lists - Doubly Linked Lists - General Lists- Stacks –Queues - Evaluation of Expressions-Multiple Stacks and Queues.

UNIT-III

Trees - Binary Trees - Binary Tree Traversals - Binary Tree Representations - Binary Search Trees - Threaded Binary Trees – Additional Binary Tree Operations- Heaps – Selection Trees - Set Representation.

UNIT-IV

Representations of Graphs - Graphs Implementation - Graph Traversals- Application of Graph- Traversals - Minimum Cost Spanning Trees - Shortest path Problems – Activity Networks.

UNIT-V

Symbol Table – Static Hashing : Hash Tables – Hashing Functions – Overflow Handling AVL Trees – 2-3 Trees - Red-Black Trees – B-Trees - Splay Trees.

TEXT BOOKS

1. E.Horwitz, S. Sahni and Mehta, “Fundamentals of Data Structures in C++”, Galgotia,1999.
2. Gregory L. Heileman, “Data Structures, Algorithms and object Oriented Programming” McGraw Hill International Edition, 1996.

REFERENCES

1. Robert Kruse & ClovisTondo, "Data Structures and Program Design in C"**,** Prentice Hall,2nd Edition, 1991.

2. Weiss, "Data Structures and Algorithm Analysis in C", Addison Wesley, 2nd Edition, 1997.

3. Mark Allen Weiss,"Data Structures and Algorithm Analysis in C", Paperback, 2011.

4. Mark A. Weiss, "Data Structures and Algorithm Analysis in C++", Kindle Edition.

SEMESTER – II **CORE PAPER - VIII** **4H/3C**

OPEN SOURCE TECHNOLOGIES

UNIT - I

Evolution & development of OST and contemporary technologies - Factors leading to its growth - Open Source Initiative (OSI), Free Software Foundation and the GNU Project - principle and methodologies - Indian Contexts of OST - Applications, Pros and cons of OST - The MIT License, The BSD License, The Apache License, v1.1 and v2.0 - The Academic Free License - Application and Philosophy of MIT and BSD Licenses, GNU General Public License, GNU Lesser General Public License, The Mozilla Public License, Application and Philosophy of GNU GPL and GNU LGPL, Artistic and Creative Commons Licenses

UNIT - II

Introduction – Web Server – PHP – Apache - Installation and Configuration - Installation on Linux systems - Installation on Windows systems - Data Types - Literals and Variables - Operators and Control Statements - Functions - Arrays - Cookies - Sessions - COM/DOM Functions - XML Parsing - CURL, Client URL Library Functions - Date and Time Functions - Directory Functions- String Functions - Unicode Functions - Classes and Objects (PHP 5) - Security (Magic Quotes, Using Register Globals - User Submitted Data) – Web Services handling – Validations – Send Mails – CMS Systems

UNIT - III

Introduction MySQL –Features – Functions references – Statements and Syntax – Commands – PHP MySQL Functions – Connections – Fetch , Display, Close Connection – Database driven applications

UNIT- IV

Introduction – Installation and Configuration (Windows / Unix) – Get Started – Ruby – Features – Socket Programming Usage of TCP Server and TCP Socket Classes for Date and Time - Basic Networking - Port - Internet Addresses - Sockets - Socket classes - The Date Time Server and Client – Web Services – Ruby with MySQL, SMTP class – Ruby on Rails Introduction

UNIT -V

Getting Started - Architecture of Rails Applications - Installing and Configuration Rails - Building an Application - The Rails Framework - Web Services on Rails - The Basics - Relationships between Tables - Object Life Cycle - The Web, V2.0 - Action Mailer – Securing Your Rails Application - Deployment and Production

TEXT BOOKS

1. Andrew M. St. Laurent, " Understanding Open Source and Free Software Licensing - By, Oreily Media". (e-Resource available at: http://oreilly.com /openbook/ osfreesoft/book/ index.html)

2. Steven D. Nowicki, Alec Cove, Heow Eide-goodman , "Professional PHP", Wrox Press, 2004.

3. Dave Thomas and David Heinemeier Hansson, with Leon Breedt, Mike Clark, James Duncan Davidson, Justin Gehtland, and Andreas Schwarz, ''Agile Web Development with Rails", Second Edition, The Pragmatic Programmers, 2006.

REFERENCES

1. Dave Thomas, Chad Fowler, Andy Hunt , "Programming Ruby'', Second Edition, The Pragmatic Programmers, 2004..

2. Bruce Tate, "From Java To Ruby: Things Every Manager Should Know'', The Pragmatic Programmers, 2006.

3. Kevin Tatroe, "Programming PHP", Paperback,2013.

4. Troy Dimes, "PHP: Learn PHP Programming, Quick & Easy", Kindle Edition.

SEMESTER – II **COMPULSORY PAPER** **2H/2C**

HUMAN RIGHTS

UNIT-I

Definition of Human Rights - Nature, Content, Legitimacy and Priority - Theories on Human Rights - Historical Development of Human Rights.

UNIT-II

International Human Rights - Prescription and Enforcement upto World War II - Human Rights and the U .N .O. - Universal Declaration of Human Rights - International Covenant on Civil and Political Rights - International Convenant on Economic, Social and Cultural Rights and Optional Protocol.

UNIT-III

Human Rights Declarations - U.N. Human Rights Declarations - U.N. Human Commissioner.

UNIT-IV

Amnesty International - Human Rights and Helsinki Process - Regional Developments - European Human Rights System - African Human Rights System - International Human Rights in Domestic courts.

UNIT-V

Contemporary Issues on Human Rights: Children's Rights - Women's Rights - Dalit's Rights - Bonded Labour and Wages - Refugees - Capital Punishment.
Fundamental Rights in the Indian Constitution - Directive Principles of State Policy - Fundamental Duties - National Human Rights Commission.

TEXT BOOKS

1. International Bill of Human Rights, Amnesty International Publication, 1988.
2. Human Rights, Questions and Answers, UNESCO, 1982
3. Mausice Cranston - What is Human Rights
4. Desai, A.R. - Violation of Democratic Rights in India
5. Pandey - Constitutional Law.
6. Timm. R.W. - Working for Justice and Human Rights.

SEMESTER – II **CORE PRATICAL PAPER - IV** **3H/2C**

C++ LAB

1. Classes and objects
2. Function overloading
3. Constructors
4. Friend function
5. Inline function
6. Operator overloading
7. Conversion function
8. Inheritance
9. Polymorphism
10. Files

SEMESTER – II **CORE PRATICAL PAPER - V** **3H/2C**

DATA STRUCTURE LAB

1. Implementation of arrays
2. Implementation of stacks
3. Implementation of queues
4. Singly linked list
5. Circular linked list
6. Implementation of circular queue.
7. Evaluation of expressions
8. Binary tree traversal
9. Binary search tree
10. Shortest path (Dijkstra)

SEMESTER – II **CORE PRATICAL PAPER – VI** **2H/2C**

OPEN SOURCE TECHNOLOGIES LAB

1. Control Statements

1. Functions

2. Email Function

3. File handling

4. Errors handling

5. Classes and Objects

6. Database Application with MYSQL

7. Socket Programming

8. Ruby with MYSQL

10. Web Services

SEMESTER –II **ELECTIVE PAPER – II** **4H/4C**

(to choose either A or B or C)

A. RESOURCE MANAGEMENT TECHNIQUES

UNIT - I

Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Variants of Simplex method

UNIT - II

Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem

UNIT - III

Formulation – Gomory's IPP method – Gomory's mixed integer method – Branch and bound technique.

UNIT - IV

Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling

UNIT - V

Characteristics of Queuing Models – Poisson Queues - (M / M / 1) : (FIFO / ∞ /∞), (M / M / 1) : (FIFO / N / ∞), (M / M / C) : (FIFO / ∞ / ∞), (M / M / C) : (FIFO / N / ∞) models.

TEXT BOOK

1. Taha H.A., "Operations Research : An Introduction " 7th Edition, Pearson Education, 2004.

REFERENCES

1. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education, Asia, 2005.

2. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, 3rd Edition , 2003.

3..John C. Maxwell, "Team Work", Paperback,2010.

4..R.K. Gupta, "Operation Research", Paperback, 2014.

SEMESTER – II **ELECTIVE PAPER - II** **4H/4C**

(to choose either A or B or C)

B. DISCRETE MATHEMATICS

UNIT - I

Matrices : Introduction - Matrix operations - Inverse of a Square Martix - Elementary Operations and Rank of a Matrix - Simultaneous Equations - Inverse by Partitioning - Eigen Values and Eigen Vectors.

UNIT - II

Set Theory : Introduction - Sets - Notations and Description of Sets - Subsets - Venn-Diagram - Operations on Sets - Properties of Set Operations - Verification of the Basic Laws of Algebra by Venn Diagrams - The Principles of Duality - Relations: Cartesian Product of Two sets - Relations - Representation of a Relation - Operations on Relations - Equivalence Relation - Closure and Warshall's algorithm - Partitions and Equivalence Classes - Functions: Function and Operators - One-to-one, Onto Functions - Special Types of Functions - Invertible Functions - Composition of Functions.

UNIT - III

Logic : Introduction - TF Statements - Connectives - Atomic and Compound Statements - Well Formed Formulae - Truth Table of a Formula - Tautology - Tautology Implications and Equivalence of Formulae - Replacement Process - Functionally Complete Sets of Connectives and Duality Law - Normal Forms - Principles of Normal Forms - Theory of Inference - Open Statements - Quantifiers - Valid Formulae and Equivalence - Theory of Inference for Predicate Calculus - Statements involving more than one Quantifier.

UNIT - IV

Finite Automata - Definition of Finite Automation - Representation of Finite Automaton - Acceptability of a String by Non-Deterministic Finite Automata - Equivalence of FA and NFA - Procedure for finding an FA equivalent to a given NFA - Properties of Regular Sets - Finite State Machines - The monoid of a Finite State Machine - The Machine of a Monoid - Phrase Structured Grammars.

UNIT - V

Chomsky Hierarchy of Languages - Finite Automata and Regular Languages - Derivation Trees for Context-free Grammars - Normal Forms for Context-free Grammars - Ambiguity, Polish Notation - Simple Precedence Grammar - Pushdown Automation - Instantaneous Description of a PDA - Important Properties of Move Relation - Acceptance by PDA - Equivalence of two types of a Acceptance by PDA - Context-free Languages and PDAs - Turing Machines - The Language accepted by a TM - Turing Machine as a Computer Integer Functions - Techniques for Turing Machine Construction.

TEXT BOOKS

1. Discrete Mathematics - Venkatraman M K, Sridharan N, Chandrasekaran N, "The National Publishing Company", Chennai, 2000.

2. Somasundaram RM," Discreate Mathematical Structures",PHI,2003.

REFERENCES

1. Hopcraft and Ullman, "Introduction to Automata Theory, Languages & Computation", 2nd Edition, Pearson Education.

2. Tremblay and Menorah, "Discrete Mathematical structures with applications to computer science" , Tata McGraw Hill.
3. Ramaswamy, "Discrete Mathematical Structures with Applications to Combinatorics", University Press, 2006.

4. Veerarajan T, "Discrete mathematics with graph theory and combinatorics", TMG, 2007.

SEMESTER – II **ELECTIVE PAPER - II** **4H/4C**

(to choose either A or B or C)

C. E-COMMERCE

UNIT - I

Electronic Commerce Environment and Opportunities : Background - Electronic Commerce Environment - Electronic Marketplace Technologies - Modes of Electronic Commerce : Overview - Electronic Data Interchange - Migration to open EDI - Electronic Commerce with WWW/Internet – Commerce Net Advocacy.

UNIT - II

Approaches to Safe Electronic Commerce : Secure Transport Protocols - Secure Transactions - Secure Electronic Payment Protocol - Secure Electronic Transaction - Certificates for Authentication - Security on Web Servers & Enterprise Networks - Electronic Cash and Electronic Payment Schemes : Internet Monetary Payment and Security Requirements - Payment and Purchase Order Process - On-line E-Cash.

UNIT - III

Internet/Intranet Security Issues and Solutions : Need for Computer Security - Specific Intruder Approaches - Security Strategies - Security Tools - Encryption - Enterprise Networking and Access to the Internet - Antivirus Programs - Security Teams.

UNIT – IV

MasterCard/Visa Secure Electronic Transaction: Introduction - Business Requirements - Concepts - Payment Processing - E-mail and Secure E-mail Technologies for Electronic Commerce: Introduction - The means of Distribution - A Model for Message Handling - How Does E-mail Work - MIME: Multipurpose Internet Mail Extensions - MOSS: Message Object Security Services - Comparisons of Security Methods - MIME and Related Facilities for EDI over the Internet.

UNIT - V

Internet &Website Establishment: Technologies for Web Servers - Internet Tools Relevant to Commerce - Internet Applications for Commerce - Internet Charges - Internet Access & Architecture - Searching Internet. Applications: EP - Web Based EP - Intellectual Property Issues in EP, Multimedia/Hypermedia Development.

TEXT BOOK

1. Daniel Minoli & Emma Minoli," Web Commerce Technology Handbook", Tata McGraw Hill Publishing Company Ltd., New Delhi : 1999.

REFERENCES

1. Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Peasrson Education Pvt. Ltd., New Delhi : 2006.

2. Joseph P.T.,"E- commerce – Indian Perspective",2nd Edition, PHI, 2006.

3. Henry Chan, Raymond Lee and Tharam Dilion, Elizabeth Chang, "E-Commerce, Fundamental and Applicatin", Paper Back, 2007.

4.. K.K. Bajaj and Debjani Nag, "E-Commerce: The Cutting Edge of Business", Hardcover,2005

SEMESTER – III **CORE PAPER - IX** **5H/5C**

COMPUTER NETWORKS

UNIT - I

Introduction to networks and communication media: Uses – network hardware – network software – Reference models – example networks – network standardization – basis for data communication – transmission media – wireless transmission – telephone systems – satellite Communication.

UNIT - II

Data link layer: Data link layer design issues – error detection and correction methods – elementary data link protocols – sliding window protocols – verification methods – channel allocation – multiple access protocols – IEEE 302 standards.

UNIT - III

Network layer: Network design issues – routing algorithms – congestion control algorithms – internetworking – network layer in the internet.

UNIT – IV

Transport layer: Transport service – transport protocols – Internet transport protocols UDP – TCP – performance issues.

UNIT - V

Application layer: Application layer design issues – domain name system – electronic mail – WWW – multimedia – other applications – network security – basic cryptography – DES - RSA.

TEXT BOOK

1. Andrews S.Tanenbaum, ‑Computer Networks‖, 4th Edition, Prentice Hall of India / Pearson Education, 2003.

REFERENCES

1. Behrouz Forouzan, ‑Data communication and Networking‖, 2nd Edition, Tata McGraw Hill, 2006.
2. William Stallings, ―Data and Computer Communications‖, 2nd Edition, Prentice Hall of India, Pearson Education, 2006.
3. Kundu Sudakshina, ‑Computer Networks‖, Prentice Hall of India, 2006
4. ISRD Group, ‑Data communication and Computer Networks‖, Prentice Hall of India, 2006.
5. Singh Brijendra, ‑Data Communications and Computer Networks‖, 2nd Edition, Prentice Hall of India, 2006.

SEMESTER – III **CORE PAPER - X** **4H/3C**

OPERATING SYSTEMS

UNIT - I

Introduction – Multiprogramming - Time sharing - Distributed system - Real-Time systems - I/O structure - Dual-mode operation - Hardware protection _ General system architecture - Operating system services - System calls - System programs - System design and implementation. Process Management: Process concept - Concurrent process - Scheduling concepts - CPU scheduling - Scheduling algorithms, Multiple processor Scheduling

UNIT - II

Process Management - Process Synchronization - Critical section - Synchronization hardware - Semaphores, classical problem of synchronization, Interprocess communication. Deadlocks: Characterization, Prevention, Avoidance, and Detection.

UNIT - III

Storage management - Swapping, single and multiple partition allocation - paging - segmentation - paged segmentation, virtual memory - demand paging - page replacement and algorithms, thrashing. Secondary storage management - disk structure - free space management - allocation methods – disk scheduling - performance and reliability improvements - storage hierarchy.

UNIT – IV

Files and protection - file system organization - file operations - access methods - consistency semantics - directory structure organization - file protection - implementation issues - security - encryption

UNIT - V

Case Studies: UNIX and Windows operating systems.

TEXT BOOK

1. A. Silberschatz P.B. Galvin, Gange, 2002, Operating System Concepts, 6th Edn., Addison-Wesley Publishing Co., Boston.

REFERENCES

1. H.M. Deitel, 1990, An Introduction to Operating Systems, Addison Wesley Publishing Co., Boston
2. D.M. Dhamdhare , 2002, Operating System, Tata McGraw-Hill, New Delhi.
3. A.S. Tanenbaum , Operating Systems: Design and Implementation, Prentice-Hall of India, New Delhi.
4. Nutt, 2005, Operating Systems, 3 rd Edition, Pearson Education, Delhi.

SEMESTER – III **CORE PAPER – XI** **4H/3C**

PROGRAMMING WITH JAVA

UNIT - I

Computer and its Languages – Stage, Origin and Features for Java - JDK–OOP;Java Essentials:Program – API - Variables& Literals - Data Types - String Class – Operators - Type conversion - Constants - Scope – Comments - Keyboard Input; Control Statements: Conditional Statements – Looping Statements - Break and Continue Statements;Classes and Objects:Modifiers - Arguments - Constructors - Packages and import - Static Class - Overloaded Methods and Constructors - Returning Objects – toString() - this reference –Enumeration - Garbage Collection.

UNIT – II

Arrays - Three or More Dimensions; Inheritance: Basics - Calling the Superclass Constructor - Overriding Superclass Methods - Inheritance from Subclasses – Polymorphism -Abstract Classes and Methods - Interfaces: Fields - Multiple inheritance - Interface inheritance; Packages: Creating packages – Accessing package from other packages- Access Specifier.

UNIT – III

String Handling: Basics - Operations –String Methods - String Buffer class - String Builder – to String method -String Tokenizer class. Exception Basics: try and catch block - Multiple catch block - Nested try - throws keyword - Throw vs Throws - Final vs Finally vs Finalize - Method Overriding - Custom Exception - Multithreading: Life Cycle - Methods in Thread - thread application – Thread priority – Synchronization - Inter-thread communication - Suspending, Resuming, and Stopping Threads;

UNIT – IV

File Handling–Streams - Byte Streams - Filtered Byte Streams - RandomAccessFile Class - The Character Streams. Applets: Basis - Lifecycle - Applet classes - Application – Graphics; AWT-I: GUI Programming - AWT classes - Windows fundamentals- Creating Windows - Dialog Boxes - Layout Managers - Radio Buttons and Check Boxes – Borders.

UNIT – V

AWT-II**:** Event Handling - AWT Controls – Menus - Text Areas - Lists - Combo Boxes – Graphics classes: Images – Font- Color. Other controls: File Choosers, Color Choosers, Sliders. JDBC - Types of Drivers- Architecture- Classes and Interfaces - Developing JDBC Application - New Database and Table with JDBC - Working with Database Metadata.

TEXT BOOK

1. S. Sagayaraj, R. Denis, P. Karthik & D. Gajalakshmi, “Java Programming“, Universities Press, 2017

REFERENCES

1. Patrick Naughton & Herbert Schildt, "The Complete Reference: Java 2", Tata McGraw Hill, 1999.
2. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
4. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.

SEMESTER – III **CORE PAPER - XII** **4H/3C**

DESKTOP APPLICATION USING C#

UNIT - I

Introduction – The Big Internet – Raising the Bar: Common Infrastructure Problems – The Best Laid Plans – What the Heck Is .Net -.NET Objects – Problem Background – Solution Architecture –What Does It Cost? – Simplest Example – More on .NET Namespaces – Assemblies – Concept of an Assembly – Assemblies and Deployment – Assemblies and Versioning – Object-Oriented Programming Features – Inheritance – Object Constructors - .NET Memory Management – Interoperation with COM – Using COM Objects from .NET – Using .NET Objects from COM – Transactions in .NET – Structured Exception Handling – Code Access Security.

UNIT - II

Windows Form - Problem Background - Solution Architecture - Simplest Example - More Complex Example: Controls and Events - Hosting ActiveX-Controls in Windows Form - Form Enhancements - Drawing - Mouse Handling - Menu Handling - Keyboard Handling - Dialog Boxes.

UNIT - III

Events and Delegates - Problem Architecture - Solution Architecture – Simplest Example - More Complex Example - Delegates. Threads - Problem Background - Solution Architecture - Simplest Threading Example: Using the Process Thread Pool - More Complex Example: Thread Safety - Still More Complex Example: Managing Your Own Threads

UNIT – IV

NET Remoting - Problem Background - Solution Architecture - Simplest Example - Big Simplification: Configuration Files - Activation Types - Lifetime Management - Hosting and Deployment - Security - Performance.- .NET Reflection - Problem Background - Solution Architecture - Simplest Example - More Complex Example: enumerating Types - Still More Complex Example: Object Creation and Method Invocation.

UNIT - V

Handling XML - Problem Background - Solution Architecture - Simplest Example: Basic Serialization - More Complex Example: Controlling Serialization - XML Schemas and Serialization - Generic Parsing.- Data Access in .NET - Data Providers - Creating Connections - Understanding Connections – Creating Connections - Using Connection Properties - Connection Methods - Handling Connection Events- Data Commands and the DataReader - Understanding Data Commands and DataReader - Creating Data Commands - Command Properties - Command Methods- The DataAdapter - Understanding the DataAdapter - Creating DataAdapters - DataAdapter Properties - DataAdapter Methods - Handling DataAdapter Events.

TEXT BOOKS

1. David S.Platt , –Introducing Microsoft .Net‖, Prentice Hall of India, Private Limited - New Delhi.
2. Microsoft ADO .Net Step by Step, Prentice Hall of India Private Limited, New Delhi.

REFERENCES

1. Mathew MacDonald, Adam Freeman and Mario Szpuszta, " Pro ASP.NET 4 in C# 2010",
2. Fourth Edition. Apress.
3. Scott Millett, " Professional ASP.NET Design Patterns",Paperback, 2011.
4. Shivprasad Koriala and Rajesh Pillai, "C# and ASP.NET Projects ",Paperback,2007.

SEMESTER – III **CORE PRATICAL PAPER - VII** **3H/2C**

PROGRAMMING WITH JAVA LAB

1. Handling Primitive Data types, Operators and Control statements
2. Creating Application using Classes and objects, Copy Constructor
3. Developing Package, inheritances and interfaces
4. Implementing Arrays and String Handling methods
5. Exception Handling and I/O File handling
6. Implementing Multithreading
7. Applet and AWT Controls
8. CRUD operation Using JDBC
9. Client Server using TCP and UDP Socket
10. GUI application with JDBC

SEMESTER – III **CORE PRATICAL PAPER - VIII** **3H/2C**

DESKTOP APPLICATION USING C# LAB

1. Namespaces and Assemblies

2. Object Oriented Features

3. Windows Form Controls & Events

4. Menu Handling

5. Events and Delegates

6. Threads

7. Remoting & Reflection

8. XML Schemas and Serialization and parsing

9. ADO.NET Connection

10. Data Command, Reader and Adapter

SEMESTER – III **CORE PRATICAL PAPER – IX** **3H/2C**

OPERATING SYSTEMS LAB

1. C Program for Implementation of System Calls.

2. C Program for File Permissions.

3. C Program for File Operations.

4. C Program for File Copy and Move.

5. C Program for Dining Philosophers Problem.

6. C Program for Producer – Consumer Problem concept.

7. C Program for First In First Serve Algorithm.

8. C Program for Shortest Job First Scheduling Algorithm.

9. C Program for Round Robin Scheduling Method.

10. C Program for Priority Scheduling Algorithm.

SEMESTER – III **ELECTIVE PAPER - III** **4H/4C**
(to choose either A or B or C)

A. SOFTWARE TESTING

UNIT - I

Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs.

UNIT - II

Software testing Fundamentals – Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of Path Testing.

UNIT - III

Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips.

UNIT – IV

Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts – Specifications – States, State Graphs and transition Testing – State Graphs – Good & bad states – state testing Metrics and Complexity.

UNIT - V

Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art of Debugging.

TEXT BOOKS

1. Boris Beizer, Software testing techniques, Dreamtech Press, Second Edition – 2003.
2. Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979
3. Roger.S.Pressman, Software Engineering – A Practitioner‟s Approach ,Mc-Graw Hill, 5th edition, 2001
4. Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007

REFERENCES

1. "Software Engineering – An Engineering Approach", James F Peters and Witold Pedryez, John Wiley and Sons, New Delhi, 2000.

2. "Software engineering", Ian Sommerville, Pearson education Asia, 6th edition, 2000.

3. "Software Engineering Concepts ", Richard E. Fairley, McGraw-Hill edition, 2002.

SEMESTER – III **ELECTIVE PAPER - III** **4H/4C**

(to choose either A or B or C)

B. DECISION SUPPORT SYSTEMS

UNIT - I

Decision Concept-steps-Decision Support System-Components-Characteristics-Classification & Application.

UNIT - II

Models – Modeling Process – Types of Models – Optimization – Simulation – Heuristic – Descriptive – Predictive – Model base – Modeling Languages – Model Directory – Model Base Management System – Model Execution, Integration and command processing – Model Packages.

UNIT - III

Database – Sources of Data – Data Directory – Data Structure and Database Languages – Query Facility – Data Management System – DBMS as DSS Development Tool.

UNIT – IV

User Interface – Graphics – Multimedia – Visual Interactive Modeling – Natural Language Processing – Speech Recognition and understanding – Issues in user interface.

UNIT - V

Development process – Software and Hardware and Data Acquisition – Model Acquisition – Dialog Development – Integration – Testing and Validation – Training and Implementation.

TEXT BOOK

1. Efraim turban and Jay E Aronson, 'Decision Support Systems and Intelligent Systems', Prentice Hall International, 1998.

REFERENCES

1. Janakiraman V.S. and Sarukesi. K. 'Decision Support Systems', Prentice Hall of India, 1999.

2. Lofti, 'Decision Support System and Management', McGraw Hill Inc., International Edition, New Delhi, 1996.

3. Durkin.J., “Expert Systems Design and Development”, Prentice Hall, 1994.

4. Ermine.J.I, “Expert Systems: Theory and Practice”, Prentice Hall, 2003.

SEMESTER – III **ELECTIVE PAPER - III** **4H/4C**

(to choose either A or B or C)

C. MULTIMEDIA AND ANIMATION

UNIT - I

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.

UNIT - II

Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand

UNIT - III

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation

UNIT – IV

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT - V

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

TEXT BOOKS

1. Ralf Steinmetz, Klara steinmetz, "Multimedia Computing, Communications and Applications", Pearson education, 2004
2. Donald Hearn and M.Pauline Baker, “Computer Graphics C Version”, Pearson Education, 2003.
3. Prabat K Andleigh and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003.

REFERENCES

1. Siamon J. Gibbs and Dionysios C. Tsichritzis, "Multimedia programming", Addison Wesley, 1995.

2. John Villamil, Casanova and Leony Fernanadez, Eliar, "Multimedia Graphics", PHI, 1998.

3. Judith Jeffcoate, “Multimedia in practice technology and Applications”, PHI,1998.

4. Foley, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”, Pearson Education, second edition 2003.

SEMESTER – IV **CORE PAPER - XIII** **5H/5C**

DESIGN AND ANALYSIS OF ALGORITHMS

UNIT - I

Algorithm Analysis – Time Space Tradeoff – Asymptotic Notations – Conditional asymptotic notation – Removing condition from the conditional asymptotic notation - Properties of big-Oh notation – Recurrence equations – Solving recurrence equations – Analysis of linear search.

UNIT - II

Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack Problem.

UNIT - III

Dynamic Programming: General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Travelling salesperson problem .

UNIT – IV

Backtracking: General Method – 8 Queens problem – sum of subsets – graph coloring – Hamiltonian problem – knapsack problem.

UNIT - V

Graph Traversals – Connected Components – Spanning Trees – Biconnected components – Branch and Bound: General Methods (FIFO & LC) – 0/1 Knapsack problem – Introduction to NP-Hard and NP-Completeness.

TEXT BOOKS

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007. (For Units II to V)
2. K.S. Easwarakumar, Object Oriented Data Structures using C++, Vikas Publishing House pvt. Ltd., 2000 (For Unit I)

REFERENCES

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.

2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd, 2003.

3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, 1999.

SEMESTER – IV **CORE PAPER - XIV** **4H/3C**

MOBILE COMPUTING

UNIT - I

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT - II

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance.

UNIT - III

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

UNIT – IV

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

UNIT - V

MOBILE PLATFORMS AND APPLICATIONS Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

TEXT BOOK

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.

REFERENCES

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
4. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,Tata Mc Graw Hill Edition ,2006.
5. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.
6. Android Developers : http://developer.android.com/index.html
7. Apple Developer : https://developer.apple.com/
8. Windows Phone Dev Center : http://developer.windowsphone.com
9. BlackBerry Developer : http://developer.blackberry.com/

SEMESTER – IV **CORE PAPER - XV** **4H/3C**

ADVANCED JAVA PROGRAMMING

UNIT-I

Design Patterns**:**Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern, Adapter Pattern, Proxy Pattern, Decorator Pattern, Command Pattern, Template Pattern, Mediator Pattern; Collection Framework - ArrayList class - LinkedList class - ArrayListvs Linked List - ListIterator interface - HashSet class, LinkedHashSet class, TreeSet class PriorityQueue class - Map interface, HashMap class, LinkedHashMapclass ,TreeMap class - Comparable interface , Comparator interface, Comparable vs Comparator

UNIT-II

Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets; GUI Application - Dialog Boxes - Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree – Table –Tabbed panels–Progressive bar - Sliders.

UNIT-III

JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java NetworkingBasics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inetaddressclasses.

UNIT–IV

Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – GenericServlet, HttpServlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies; JSP : JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page.

UNIT-V

Client-Side Programming: Client-side programming technologies - Form design using HTML, XHTML and DHTML and CSS - Client side validation Using JavaScript - Content Structuring using XML - Adding Interactivity with AJAX - JQuery Framework; Server-side Programming: Web Servers - Handling request and response - Handling Form data - Session management - Database Access.

TEXT BOOKS

1. S. Sagayaraj, R. Denis, P. Karthik & D. Gajalakshmi, "Java Programming", Universities Press, 2017.

REFERENCES

1. Patrick Naughton& Herbert Schildt, "The Complete Reference: Java 2", Tata McGraw Hill, 1999
2. Bruce W.Perry, "Java Servlet and JSP CookBook", O'Reilly, 2004.

SEMESTER – IV **CORE PAPER - XVI** **4H/3C**

WEB APPLICATION USING C#

UNIT – I

Introduction to ASP.NET: Evolution of .NET – Benefits of .NET – Overview of .NET - ASP.NET overview: Exploring new features of ASP.NET - ASP.NET Technologies- Exploring a ASP.NET 4.0 Web Application – Creating a ASP.NET website.

UNIT – II

Developing a Web Application: Specifying a location for a web application – File types in ASP.NET - Exploring ASP.NET Web pages - ASP.NET Coding Models – Application Structure and State: Structure of an application- The Global.asax Application file – States.

UNIT – III

ASP.NET Controls : Standard Controls: The Control Class – The Web Control class- The Label Control- The Button Control – The Text Box Control - The Image Control - The List Box Control – Navigation Controls: The Tree View Control - Creating Static Menus - Validation Controls: Using the RequiredFieldValidator Control- Using the RangeValidator Control – HTML Controls: HTML Server Controls – HTML Form Class.

UNIT - IV

Accessing Data in ASP.NET : Working with Database Controls: The Grid View Control The Data list control-The Details view control- LINQ Queries: Introducing LINQ Queries-Data Structures in LINQ – Deffered Query Execution and Immediate ExecutionLINQ and Generic Types – ADO.NET Entity Framework: Exploring ADO.NET Entity Framework – Exploring the features of Entity Framework – Working with Files and Streams: Introducing the System.IO Namespace – Working with Drives and Directories- Exploring the Directory class.

UNIT – V

ASP.NET Web Services : Introduction – Infrastructures of ASP.NET web services – Web Service Properties – Security in ASP.NET : Working with Login Controls – Working with User Profiles – Crystal Reports : Understanding Crystal Reports.

TEXT BOOK

1. KOGENT Learning Solutions, "ASP.NET 4.0 (Covers C# 2010 and VB 2010 codes) Black Book", Dream-Tech Press

REFERENCES

1. Pankaj Agarwal "Principles of .NET Framework", Vayu Education of India.

2. Mathew MacDonald, Adam Freeman and Mario Szpuszta, " Pro ASP.NET 4 in C# 2010", Fourth Edition. Apress.

3. Scott Millett, " Professional ASP.NET Design Patterns",Paperback, 2011.

4. Shivprasad Koriala and Rajesh Pillai, "C# and ASP.NET Projects ",Paperback,2007.

SEMESTER – IV **CORE PRATICAL PAPER - X** **3H/2C**

ADVANCED JAVA PROGRAMMING LAB

1. Collections using Set, List and Map interfaces
2. Applet programs
3. AWT Controls
4. CRUD operation Using JDBC
5. Displaying Query Results in a JTable
6. TCP Socket
7. UDP Socket
8. Web application using Servlet and JDBC
9. Cookies and Session tracking
10. Web application using JSP and JDBC

SEMESTER – IV **CORE PRATICAL PAPER - XI** **3H/2C**

MOBILE COMPUTING LAB

1. Create a simple application using Button, TextView and EditText
2. Create an application which uses Radio buttons & Option Group
3. Create an application with Alert Dialog box
4. Create an application with DatePicker Widget
5. Create an application which creates Progress Bar
6. Create an application with Spinner
7. Create an application with Menus and Intents
8. Create an application with File I/O
9. Create an application which connects RDBMS (SQLite / MySQL)
10. Create an application with Phone services (SMS, Call etc.)

SEMESTER – IV **CORE PRATICAL PAPER - XII** **3H/2C**

WEB APPLICATION USING C# LAB

1. Web Configuration File
2. HTML Control Classes, Control Events, Container and Input Control Classes,
3. HTTP Request Classes & Response Classes
4. Web Control Classes & Control Tags
5. Validation Controls
6. Rich Controls
7. Data Access
8. Components
9. Custom Controls
10. User Controls

SEMESTER – IV **ELECTIVE PAPER - IV** **4H/4C**
(to choose either A or B or C)

A. CLOUD COMPUTING

UNIT - I

Fundamentals – Cloud computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why cloud computing Matters – Advantages of Cloud computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

UNIT - II

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services–On-Demandcomputing –DiscoveringCloud Services Development Services and Tools – Amazon Ec2- Google App Engine – IBM Clouds.

UNIT - III

Centralizing Email communications – collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.

UNIT - IV

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing – Collaborating on Databases – Storing and Sharing Files – Evaluating Web MailServices – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis.

UNIT - V

OGSA – Sample Use Cases – OGSA Platform Components – OGSI – OGSA Basic Services. Globus Toolkit – Architecture – Programming Model – High Level Services – OGSI.Net. Middleware Solutions.

TEXT BOOK

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, 2008.

REFERENCES

1. Haley Bear, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Que Publishing, 2009.

2. Thomas Erl, "Cloud Computing", Paperback, 2014.

3. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing : A Handa-on Approach", Universities Press, August 2014.

4. Rajkumar Buyya and James Broberg, " Cloud Computing: Principles and Paradigms",Paperback, 2013

SEMESTER – IV **ELECTIVE PAPER - IV** **4H/4C**
(to choose either A or B or C)

B. BIG DATA

UNIT - I

Big Data in the Enterprise: Search at Scale – Multimedia Content - Sentiment Analysis – Enriching and Contextualizing Data – Data Discovery and Exploratory Analytics – Operational Analytics or Exploratory Analytics – Realizing opportunities from Bid Data – Taming the "Big Data" – New Information Management Paradigm: New Approach to enterprise Information management for Big Data – Implications of Big Data to Enterprise IT – Big Data Implications for Industry: Big Data uses cases by Industry Vertical.

UNIT - II

Scale-Out architecture – Database Workloads – Database Technologies for managing the workloads – Columnar Database - Polyglot persistence: The next generation architecture - Big Data warehouse and analytics – How Hadoop Works – Additional consideration for BDW – Data Quality implications for Big Data.

UNIT - III

Understanding Data Integration Patterns – Big Data Workload Design Approaches – Map reduce patterns, algorithms and use cases, NoSQL Modeling Techniques.

UNIT – IV

Challenges in Big Data Analysis – Big Data Analytics Methodology – Analyze and Evaluate Business Usecase – Develop Business Hypotheses – Setting up Big Data Analytics System – Gathering Data with Apache Flume.

UNIT - V

In-Memory Computing Technology: Guidelines – Real Time Analytics and CAP Theorem – Hadoop and NoSQL Conundrum – Using an In-Memory Data Grid for Real time Data Analysis – Map Reduce and real Time Processing – Big Data Workflow – Design Principles for Contextualizing Big Data.

TEXT BOOK

1. Soumendra Mohanty, Madhu Jagadeesh, and Harsha Srivatsa, "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Apress Publication.

REFERENCES

1. Bid Data Now 2012 Edition", O'Reilly, First Edition, 2012
2. Paul Zikopoulos, Thomas Deutsch, Dirk Deroos, David Corrigan, Krishnan Parasuraman and James Giles, "Harness the power of Big Data", McGrawHill, 2013

SEMESTER – IV **ELECTIVE PAPER – IV** **4H/4C**
(to choose either A or B or C)

C. OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT - I

System Development - Object Basis - Development life cycle-Methodologies-Patterns- Frameworks-Unified Approach-UML.

UNIT - II

Use-Case Models-Object Analysis-Object relations-Attributes-Methods-Class and object responsibilities-Case Studies.

UNIT - III

Design Process-Design Axioms-Class Design-Object storage-Object Interpretability-Case Studies.

UNIT - IV

User interface design-View layer classed-Micro-level processes-View Layer Interface-Case Studies.

UNIT - V

Quality Assurance Tests - Testing strategies - Object O riented on Testing - Test Cases - Test Plans - Continuous Testing – Debugging Principles – System usability – Measuring user satisfaction-Case Studies.

TEXT BOOK

1. Ali Bahrami, "Object Oriented Systems Development", McGraw Hill International Edition, 1999

REFERENCES

1. Grady Booch, "Object Oriented Analysis and Design", Pearson Education-2nd Edition
2. Matha,"Object-Oriented Analysis and Design using UML",PHI.
3. Carol Britton and Jill Doake, "Object – Oriented System Development: A Gentel Introdctuion", Paperback, 2012.
4. David West and Brett McLaughlin, "Head First Object-Oriented Analysis and Design", Kindle Edition, 2011.

SEMESTER – V **CORE PAPER - XVII** **5H/5C**

SOFTWARE ENGINEERING

UNIT - I

Introduction –S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) – system engineering – computer based system – verification – validation – life cycle process – development process –system engineering hierarchy.

UNIT - II

Functional and non-functional – user – system –requirement engineering process – Feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping –S/W document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

UNIT - III

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design – transform and transaction mapping – user interface design – user interface design principles. Real time systems – Real time software design – system design – real time executives – data acquisition system – monitoring and control system. SCM – Need for SCM–Version control – Introduction to SCM process – Software configuration
items.

UNIT – IV

Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large. S/W testing strategies – strategic approach and issues – unit testing – integration testing – validation testing – system testing and debugging.

UNIT - V

Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model- Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis – Error Tracking – Software changes – program evolution dynamics – software maintenance – Architectural evolution. Taxonomy of CASE tools.

TEXT BOOKS

1. "Software engineering- A practitioner's Approach", Roger S. Pressman, McGraw-Hill International Edition, 5th edition, 2001.
2. "Software engineering", Ian Sommerville, Pearson education Asia, 6th edition, 2000.
3. "Software Engineering Concepts ", Richard E. Fairley, McGraw-Hill edition, 2002.

REFERENCES

1. "Software Engineering – An Engineering Approach", James F Peters and Witold Pedryez, John Wiley and Sons, New Delhi, 2000.

2. Boris Beizer, Software testing techniques, Dreamtech Press, Second Edition – 2003.

3. Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979

SEMESTER – V **CORE PAPER – XVIII** **4H/3C**

COMPILER DESIGN

UNIT - I

Introduction to Compiling – Compilers - Analysis of the source program - The phases -The grouping of phases - Compiler construction tools. The role of the lexical analyzer - Input buffering Specification of tokens - Recognition of tokens - A language for specifying lexical analyzer.

UNIT - II

Syntax Analysis - The role of the parser – Context - free grammars -Writing a grammar - Topdown parsing – Bottom - up Parsing. Type Checking - Type Systems - Specification of a simple type checker.

UNIT - III

Intermediate languages – Declarations - Assignment statements - Boolean expressions Case statements – Backpatching - Procedure calls.

UNIT – IV

Issues in the design of a code generator - The target machine - Run-time storage management -Basic blocks and flow graphs - Next-use information - A simple code generator - Register allocation and assignment - The dag representation of basic blocks – Generating code from dags.

UNIT - V

Introduction - The principle sources of optimization - Peephole optimization - Optimization of basic blocks - Loops in flow graphs - Introduction to global data - flow analysis – Code improving transformations.

TEXT BOOK

1. Alfred V. Aho, Ravi Sethi Jeffrey D. Ullman, “Compilers- Principles, Techniques, and Tools”, Pearson Education Asia, 2006.

REFERENCES

1. David Galles, “Modern Compiler Design”, Pearson Education Asia, 2007
2. Steven S. Muchnick, “Advanced Compiler Design & Implementation”, Morgan Kaufmann Pulishers, 2000
3. C. N. Fisher and R. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2000

SEMESTER – V **CORE PAPER - XIX** **4H/3C**

ENTERPRISE JAVA PROGRAMMING

UNIT - I

Introduction -Enterprise Architecture Styles - J2EE Architecture - Containers - J2EE Technologies - Developing J2EE Applications - Naming and directory services - Using JNDI - JNDI Service providers Application Servers - Implementing the J2EE Specifications - J2EE packaging and Deployment - J2EE packaging overview - Configuring J2EE packages

UNIT - II

JSP Benefits - Framework roles - Simple JSF application - User Interface Component Model - Navigational Model - Life Cycle of JSF page - Using JSF in JSP Pages – Setting up a page, using core tags - using HTML tags - using localized messages - Using converters.

UNIT - III

Introduction to Enterprise Beans - Session Bean - Entity Bean - Message driven Bean - defining clients access with interfaces - contents of an enterprise Bean - life cycle of enterprise Bean - creation of Enterprise Bean - application client - web client - other Enterprise Bean features- handling exceptions.

UNIT – IV

Struts Architecture - Struts classes - Action Forward, Action Form, Action Servlet, Action classes - Understanding struts - config.xml, Understanding Action Mappings, Struts flow with an example application.

UNIT - V

Hibernate - Architecture of Hibernate - Life cycle of Hibernate Entities- Exploring HQL - Understanding Hibernate O/R Mapping - Collection Mapping - Association Mapping - Relationships in Java and Databases.

TEXT BOOKS

1. Marty Hall, Larry Brown., "Core Servlets and Java Server Pages", 2nd Edition, Pearson Education, 2004
2. Stephanie Bodoffetl., "The J2EE™ Tutorial", Pearson Education, Second Edition, 2005.
3. Minter Dave, Linwood Jeff, "Beginning Hibernate, From Novice to Professional", Apress, Second Edition, 2006
4. http://www.tutorialspoint.com/hibernate/

REFERENCES

1. Patrick Naughton & Herbert Schildt, "The Complete Reference: Java 2", Tata McGraw Hill, 1999
2. Marty Hall,Larry Brown,Yaakov Chaikin, "Core Servlets and JavaServer Pages, Volume 2: Advanced Technologies", 2nd Edition, Prentice Hall,2007.
3. Bruce W.Perry, "Java Servlet and JSP CookBook", O'Reilly, 2004.

SEMESTER – V **CORE PAPER - XX** **4H/3C**

ENTERPRISE APPLICATION USING C#

UNIT – I

Introduction – Creating a Simple Component – Properties and State – Database Components– Consuming the Database Component – Enhancing the Component with Error Handling – Aggregate Information – Data Objects .

UNIT - II

User Controls – Creating a Simple User Control – Visual Studio.NET Custom Control Support – Independent User Controls – Integrated User Controls – User Control Events – Limitations – Deriving Custom Controls.

UNIT - III

Designing for Scalability – Profiling – Caching - Output Caching – Client Side – Query Structuring – Events – Custom Caching Control – Caching with HTTP Cache Policy Class – Fragment Caching – Data Caching – A Simple Cache Test – Caching to Provide Multiple Views.

UNIT – IV

Determining Security Requirements – Restricted File Types – Security Concepts – ASP.NET Security Model – Security Strategies – Certificates – SSL – Forms Authentication –Web.Config Settings – Login Page – User Lists – Protecting User Passwords with Encryption – Custom Roles – Windows Authentication – IIS Settings – Web.Config Setting – A windows Authentication Test.

UNIT – V

Enterprise Library – Developing Applications with Enterprise Library – Design Blocks – Caching – Cryptography – Data Access – Exception Handling – Logging – Policy Injection – Security – Unity – Validation – Deployment Tools – Development of Deployment Tools – Choosing a Deployment Strategy – Clickonce Update Strategy – Deployment and Security.

TEXT BOOK

1. Matthew MacDonald, "The Complete Reference – ASP.NET", Tata McGrawHill, 2002.

REFERENCES

1. Stephen Walther, "ASP.NET2.0 Unleashed" , SAMS Publishing, 2006.

2. Imar Spaanjaars, "Beginning ASP.NET 4.5 in C# and VB",Paperback, 2012.

3. Scott Millett, " Professional ASP.NET Design Patterns",Paperback, 2011.

4. Shivprasad Koriala and Rajesh Pillai, "C# and ASP.NET Projects ",Paperback,2007.

SEMESTER – V **CORE PRATICAL PAPER -XIII** **3H/2C**

ENTERPRISE JAVA PROGRAMMING LAB

1. Simple JSF application using JSP in JSF
2. HTML render kit in JSF
3. Core render kit in JSF
4. Creating Enterprise Bean
5. Creating Web Client
6. Using Session Bean
7. Struts Action
8. Struts Forward Action
9. Object Relational Mapping
10. Collection Mapping

SEMESTER – V **CORE PRATICAL PAPER –XIV** **3H/2C**

ENTERPRISE APPLICATION USING C# LAB

1. Creation and consumption of a simple component and database component and components using aggregate functions.

2. Creation of a Custom control which includes the following operation
   A textboxes that parses the separator and identifies the first name and last name.

3. Create a pop up calendar control that consists of a textbox and calendar control. The calendar control pops up only by clicking the calendar control

4. Cache the output of the page for a specified time using Output Caching

5. Cache the data content of the web page using the Data Caching

6. Cache portion of a web page using Fragment caching

7. Create a simple profile and provide customized settings for the user.

8. Using the Forms Authentication, authenticate the user and encrypt the password using either SHA or RSA algorithm.

9. Implementation of deployment tools (XCOPY or Web Setup wizard)

10. Working with enterprise library tool with various features (Data access, exception, Cryptography, logging).

SEMESTER – V **CORE PRATICAL PAPER - XV** **3H/2C**

MINI PROJECT

REGULATIONS OF PROJECT WORK

a) Students should do their four months Project work in Company / Institutions during Fifth semester.

b) The Candidate should submit the filled in format as given in **Annexure-I** to the department for approval during the 2nd Week of July.

c) Each internal guide shall have maximum of eight Students.

d) Periodically the project should be reviewed minimum three times by the advisory committee.

e) The Students should prepare two copies of the project work and submit the same on the date fixed by the Department for the evaluation. After evaluation one copy is to be retained in the College Library and the student can hold one copy.

f) A Sample Cover page format of the Project Work is enclosed in **Annexure-II**.

g) Format of the **Title page** and **certificate** are enclosed in **Annexure-III.**

h) The Students should use Presentation during their Project Viva voce Examinations.

i) For the project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should compulsorily attend viva-voce examination to secure pass in that paper.

ANNEXURE - I

THIRUVALLUVAR UNIVERSITY

College Name :

Course :

Student Name :

Register Number :

Title of the Project :

Name of the Internal Guide :

Qualification :

Teaching Experience :

Place :

Date : Signature of Internal Guide

Name of the HOD :

Designation :

Place:

Date : Signature of the HOD
(with seal)

ANNEXURE-II

COLLEGE BONAFIDE CERTIFICATE

COMPANY ATTENDANCE

CERTIFICATE ACKNOWLDGEMENT

ABSTRACT
TABLE OF CONTENTS
TABLE OF FIGURES

CONTENTS

Title Page No.

APPENDICES

A. DATA FLOW DIAGRAM

B. TABLE STRUCTURE

C. SAMPLE CODING

D. SAMPLE INPUT

E. SAMPLE OUTPUT

ANNEXURE-III

a. Format of the Cover Page

TITLE OF THE MINI PROJECT WORK

Mini Project work submitted in partial fulfillment of

the requirements for the degree of

Master of Computer Applications

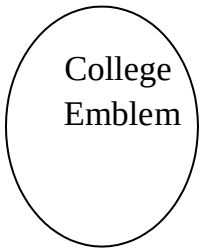
to the

Thiruvalluvar University, Serkkadu, Vellore - Pincode

By

STUDENT NAME REG.

NO.



MONTH – YEAR

COLLEGE NAME

(AFFILIATED TO THIRUVALLUVAR UNIVERSITY)

PLACE with Pin Code

b. Format of the certificate

MINI PROJECT WORK

TITLE OF THE MINI PROJECT WORK

Bonafide Work Done by

STUDENT NAME

REG. NO.

Mini Project Work submitted in partial fulfillment

of the requirements for the degree of

Master of Computer Applications

to the **College Name and Address , Affiliated college from Thiruvalluvar University, Serkkadu, Vellore - Pincode.**

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INTERNAL GUIDE HEAD OF THE DEPARTMENT

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

SEMESTER – V **ELECTIVE PAPER - V** **4H/4C**

(to choose either A or B or C)

A. ENTERPRISE RESOURCES PLANNING

UNIT - I

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.

UNIT - II

Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

UNIT - III

Planning Evaluation and selection of ERP systems - Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration. People Organization in implementation-Consultants, Vendors and Employees.

UNIT – IV

Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.

UNIT - V

Extended ERP systems and ERP add-ons -CRM, SCM, Business analytics - Future trends in ERP systems-web enabled, Wireless technologies, cloud computing.

TEXT BOOK

1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2008.

REFERENCES

1. Sinha P. Magal and Jeffery Word, Essentials of Business Process and Information System, Wiley India, 2012.
2. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008
3. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008
4. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009
5. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India, 2006.
6. Summer, ERP, Pearson Education, 2008.

SEMESTER – V **ELECTIVE PAPER - V** **4H/4C**

(To choose either A or B or C)

B. DISTRIBUTED OPERATING SYSTEM

UNIT - I

Evolution – Models – Popularity - Distributed Operating System – Issues – Distributed Computed Environment - Features of a Good Message Passing – Issues- Synchronization – Buffering - – Multidatagram Messages – Encoding and Decoding of Message Data – Process Addressing – Failure Handling – Group Communication.

UNIT - II

The RPC Model – Transparency – Implementation – Stub – Messages – Marshaling - Server Management – Parameter Passing Semantics – Call Semantics – Communication protocols – Complicated – Client server Binding – Exception Handling – Security – Special types – Heterogeneous – Light Weight – Optimization

UNIT - III

Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithms - Process Migration – Threads.

UNIT – IV

Meet Hadoop: Data - Data Storage and Analysis - Comparison with Other Systems - A Brief History of Hadoop - The Apache Hadoop Project – MapReduce: A Weather Dataset - Analyzing the Data with Unix Tools - Analyzing the Data with Hadoop - Scaling Out - Hadoop Streaming - Hadoop Pipes

UNIT - V

The Configuration API - Configuring the Development Environment - Running Locally on Test Data - Running on a Cluster - The MapReduce Web UI - Using a Remote Debugger - Tuning a Job - MapReduce Workflows

TEXT BOOKS

1. Pradeep K. Sinha, ”Distributed Operating System Concepts and Design ”, PHI, New Delhi, 2007.
2. Tom White,” Hadoop: The Definitive Guide”, Published by O’Reilly Media, Third Edition, 2009

REFERENCES

1. Andrew S Tanaenbaum, “Modern Operating System”, PHI, New Delhi, 2001
2. D.M. Dhamdhare , 2002, Operating System, Tata McGraw-Hill, New Delhi.
3. A.S. Tanenbaum , Operating Systems: Design and Implementation, Prentice-Hall of India, New Delhi.
4. Nutt, 2005, Operating Systems, 3 rd Edition, Pearson Education, Delhi.

SEMESTER – V **ELECTIVE PAPER - V** **4H/4C**

(To choose either A or B or C)

C. SOFTWARE PROJECT MANAGEMENT

UNIT – I Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM) – Need Identification – Vision and Scope document – Project Management Cycle – SPM Objectives – Management Spectrum – SPM Framework – Software Project Planning – Planning Objectives – Project Plan – Types of project plan – Structure of a Software Project Management Plan – Software project estimation – Estimation methods – Estimation models – Decision process.

UNIT – II Project Organization and Scheduling

Project Elements – Work Breakdown Structure (WBS) – Types of WBS – Functions – Activities and Tasks – Project Life Cycle and Product Life Cycle – Ways to Organize Personnel – Project schedule – Scheduling Objectives – Building the project schedule – Scheduling terminology and techniques – Network Diagrams: PERT – CPM – Bar Charts: Milestone Charts – Gantt Charts.

UNIT – III Project Monitoring and Control

Dimensions of Project Monitoring & Control – Earned Value Analysis – Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS) – Cost Variance (CV) – Schedule Variance (SV) – Cost Performance Index (CPI) – Schedule Performance Index (SPI) – Interpretation of Earned Value Indicators – Error Tracking – Software Reviews – Types of Review: Inspections – Deskchecks – Walkthroughs – Code Reviews – Pair Programming.

UNIT – IV Software Quality Assurance and Testing

Testing Objectives – Testing Principles – Test Plans – Test Cases – Types of Testing – Levels of Testing – Test Strategies – Program Correctness – Program Verification & validation – Testing – Automation & Testing Tools – Concept of Software Quality – Software Quality Attributes – Software Quality Metrics and Indicators – The SEI Capability Maturity Model CMM) – SQA Activities – Formal SQA Approaches: Proof of correctness – Statistical quality assurance – Cleanroom process.

UNIT – V Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks – Baselines – Plan for Change – Change Control – Change Requests Management – Version Control – Risk – Management: Risks and risk types – Risk Breakdown Structure (RBS) – Risk Management – Process: Risk identification – Risk analysis – Risk planning – Risk monitoring – Cost Benefit – Analysis – Software Project Management Tools: CASE Tools – Planning and Scheduling Tools – MS-Project.

TEXT BOOKS

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press

REFERENCES

1. S. A. Kelkar, Software Project Management, PHI Publication.
2. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.

SEMESTER – VI **CORE PAPER – XXI** **30H/20C**

PROJECT WORK

The objective of the project is to enable the students to work in a project of latest topic / research area / industrial applications.During this semester the students are expected to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. Also during this semester, the students are expected to complete the project and submit a full-fledged report comprising of the complete system developed along with implementation and test results.

REGULATIONS OF PROJECT WORK

a. Students should do their four months Project work in Company / Institutions during Sixth semester.
b. The Candidate should submit the filled in format as given in **Annexure-IV** to the department for approval during the Ist Week of January.
c. Each internal guide shall have maximum of eight Students.
d. Periodically the project should be reviewed minimum three times by the advisory committee.
e. The Students should prepare three copies of the project work and submit the same on the date fixed by the Department for the evaluation. After evaluation one copy is to be retained in the College Library and one copy is to be submitted to the University (Registrar) and the student can hold one copy.
f. A Sample Cover page format of the Project Work is enclosed in **Annexure-V**.
g. Format of the **Title page** and **certificate** are enclosed in **Annexure-VI.**
h. The Students should use Presentation during their Project Viva voce Examinations.
i. For the project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should compulsorily attend viva-voce examination to secure pass in that paper.

ANNEXURE-IV

THIRUVALLUVAR UNIVERSITY

College Name :

Course :

Student Name :

Register Number :

Title of the Project :

Address of Organization / Institution :

Name of the Internal Guide :

Qualification :

Teaching Experience :

Place :

Date : Signature of Internal Guide

Name of the HOD :

Designation :

Place:

Date : Signature of the HOD
(with seal)

Principal

ANNEXURE-V

Title Page
Original Copy of the Approved Proforma of the Project Proposal
Certificate of Authenticated work
Abstract
Acknowledgement
Table of Contents
Table of Figures

CONTENTS

Title Page No.

ANNEXURE-VI

a. Format of the Cover Page

TITLE OF THE PROJECT WORK

Project work submitted in partial fulfillment of the

requirements for the degree of

Master of Computer Applications

to the

Thiruvalluvar University, Serkkadu, Vellore - Pincode

By

STUDENT NAME

REG. NO.

College Emblem

MONTH – YEAR

COLLEGE NAME

(AFFILIATED TO THIRUVALLUVAR UNIVERSITY)

PLACE with Pin Code

b. Format of the certificate

PROJECT WORK

TITLE OF THE PROJECT WORK

Bonafide Work Done by

STUDENT NAME

REG. NO.

Project Work submitted in partial fulfillment of the

requirements for the degree of

Master of Computer Applications
to the **College Name and Address , Affiliated college from Thiruvalluvar University, Serkkadu, Vellore - Pincode.**

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INTERNAL GUIDE HEAD OF THE

DEPARTMENT

Submitted for the Viva-Voce Examination held on _____

Internal Examiner External Examiner

The evaluation of project is as follows:

The maximum mark for each Project is 200 with 80 for Continuous Internal Assessment (CIA) and 120 for External Evaluation.

CIA Project Work		
I	First Review	25 Marks
II	Second Review	25 Marks
III	Report Preparation	30 Marks
	Total	**80 Marks**
Semester Project Work		
1.	Evaluation of Project Work Document	**80 Marks**
2.	Viva – Voce	**40 Marks**
	Total	**120 Marks**

For the conduct of University Examinations in practical subjects and Project work the University will appoint two external examiners.