

# **Ranchi Women's College, Ranchi**

**(An Autonomous Unit of Ranchi University from 2012)**



**COURSES OF STUDY**

For

**B.A./B.Sc./B.Com Computer Application (Honours)**

**Choice Based Credit System**

**2021-2024**

Under

**Department of Computer Application**

**Number of Semester: 6**

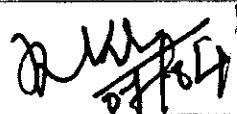
**(Papers- CC:14 SEC:4 GE:8 DSE:4 AECC:2)**

## Minutes of Meeting

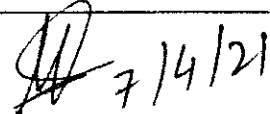
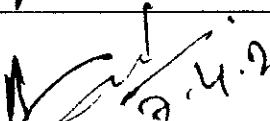
A meeting of **Board of Studies** was held in the Department on 07-04-2021 at 03:00 pm onwards to review the syllabus of B.A. / B.Sc. / B.Com (Computer Application) Hons.

The members present were:-

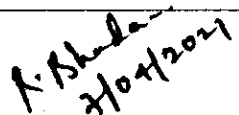
**University Nominee:-**

S. No.	Name	Designation	Signature
1.	Dr. Rajesh Kumar	Assistant Professor, University Department of Physics, DSPMU, Ranchi	

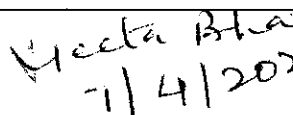
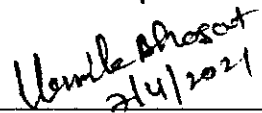
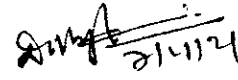
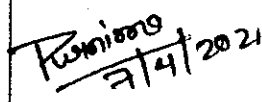

**Subject Experts:-**

2.	Dr. Madhumita Singh Niyogi	Associate Professor, Department of Computer Technology, XISS, Ranchi	
3.	Dr. Birendra Goswami	Assistant Professor, Dept. of Computer Science, ICFAI, Ranchi.	

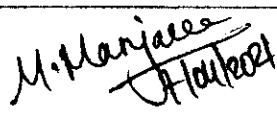
**Coordinator:-**

4.	Dr. Reena Bhadani (Computer Application)	Coordinator, Computer Application, Ranchi Women's College, Ranchi	
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**Faculties:-**

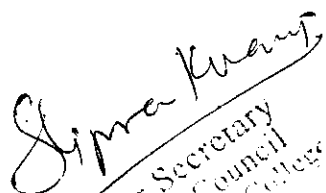
5.	Dr. Meeta Bhatia (Computer Application)	Lecturer, Dept. of Computer Application, Ranchi Women's College, Ranchi	
6.	Ms. Urmila Bhagat (Computer Application)	Lecturer, Dept. of Computer Application, Ranchi Women's College, Ranchi	
7.	Ms. Dolly Kumari (Information Technology)	Lecturer, Dept. of Information Technology, Ranchi Women's College, Ranchi	
8.	Ms. Purnima Kumari Srivastava (Information Technology)	Lecturer, Dept. of Information Technology, Ranchi Women's College, Ranchi	
9.	Ms. Mamata Pandey (Information Technology)	Lecturer, Dept. of Information Technology, Ranchi Women's College, Ranchi	

**Representative from Industry/Allied Field:-**

10.	Ms. Meghna Manjaree	Associate Senior Software Engineer, Cerner Corporation, Bangalore	
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**Agenda: Discussion and approval of the syllabus based on CBCS Guidelines.**

**Resolution : CBCS Syllabus was approved with minor changes.**

  
Member Secretary  
Academic Council  
Ranchi Women's College

  
CHAIRPERSON  
ACADEMIC COUNCIL  
RANCHI WOMEN'S COLLEGE

**Department of Computer Application**  
**SCHEME FOR CHOICE BASED CREDIT SYSTEM IN**  
**(Syllabus for 3 yr Degree Course: B.Sc./B.A./B.Com Computer Application (H))**

A meeting of board of Studies was held in the Department of Computer Application, Ranchi Women's College, Ranchi on 07-04-2021 at onwards to review the syllabus of B.A/B.Sc./B.Com. (Computer Application) Hons. The Resolution Passed in the meeting was regarding modification and review of syllabus in Sem-I to Sem-VI.

The details in the modification in the syllabus of Sem-I to Sem-VI are as follows:

Semester	Old (2020)			New(2021)			Remarks
	PAPER CODE	Course Name	Credits	PAPER CODE	Course Name	Credits	
I	AECC	Alternate English / MIL Hindi	2	AECC	Alternate English / MIL Hindi	2	No change
	CC - I	Programming Fundamentals using C/C++	4	CC - I	Programming Fundamentals using C/C++	4	No change
	CC - I Practical	Programming Fundamentals using C/C++ Lab	2	CC - I Practical	Programming Fundamentals using C/C++ Lab	2	No change
	CC - II	Computer System Architecture	4	CC - II	Computer System Architecture	4	No change
	CC - II Practical	Computer System Architecture Lab	2	CC - II Practical	Computer System Architecture Lab	2	No change
	GE - I	GE-1 (Maths/Bot/BM/Eco)	4/5	GE - I	GE-1 (Maths/Bot/BM/Eco)	4/5	No change
	GE - II	GE-2 (Physics/Zoo/BM/Eco)	4/5	GE - II	GE-2 (Physics/Zoo/BM/Eco)	4/5	No change
II	AECC	Environmental Science	2	AECC	Environmental Science	2	No change
	CC - III	Programming in JAVA	4	CC - III	Programming in JAVA	4	No change
	CC - III Practical	Programming in JAVA Lab	2	CC - III Practical	Programming in JAVA Lab	2	No change
	CC - IV	Discrete Structures	5	CC - IV	Discrete Structures	5	No change
	CC - IV Tutorial	Discrete Structures Tutorial	1	CC - IV Tutorial	Discrete Structures Tutorial	1	No change
	GE - III	GE-3 (Maths/Bot/BM/Eco)	4/5	GE - III	GE-3 (Maths/Bot/BM/Eco)	4/5	No change
	GE - IV	GE-4 (Physics/Zoo/BM/Eco)	4/5	GE - IV	GE-4 (Physics/Zoo/BM/Eco)	4/5	No change
III	CC - V	Data Structures with C	4	CC - V	Data Structures with C	4	No change
	CC - V Practical	Data Structures with C Lab	2	CC - V Practical	Data Structures with C Lab	2	No change
	CC - VI	Operating Systems	4	CC - VI	Operating Systems	4	No change
	CC - VI Practical	Operating Systems Lab	2	CC - VI Practical	Operating Systems Lab	2	No change
	CC - VII	Computer Networks	4	CC - VII	Computer Networks	4	No change
	CC - VII Practical	Computer Networks Lab(HTML,DHTML,CSS)	2	CC - VII Practical	Computer Networks Lab(HTML,DHTML,CSS)	2	No change

	SEC- 1	Android Programming	2	SEC- 1	Android Programming	2	No change
	GE – V	GE-5 (Maths/Bot/BM/Eco)	4/5	GE – V	GE-5 (Maths/Bot/BM/Eco)	4/5	No change
	GE – VI	GE-6 (Physics/Zoo/BM/Eco)	4/5	GE – VI	GE-6 (Physics/Zoo/BM/Eco)	4/5	No change
IV	CC – VIII	VB.Net	4	CC – VIII	VB.Net	4	No change
	CC – VIII Practical	VB .Net Lab	2	CC – VIII Practical	VB .Net Lab	2	No change
	CC – IX	Software Engineering	4	CC – IX	Software Engineering	4	No change
	CC – IX Practical	Software Engineering Lab	2	CC – IX Practical	Software Engineering Lab	2	No change
	CC – X	Database Management Systems	4	CC – X	Database Management Systems	4	No change
	CC – X Practical	Database Management Systems Lab	2	CC – X Practical	Database Management Systems Lab	2	No change
	SEC- II	PHP Programming	2	SEC- II	PHP Programming	2	No change
	GE - VII	GE-7 (Maths/Bot/BM/Eco)	4/5	GE - VII	GE-7 (Maths/Bot/BM/Eco)	4/5	No change
	GE - VII	GE-8 (Physics/Zoo/BM/Eco)	4/5	GE - VII	GE-8 (Physics/Zoo/BM/Eco)	4/5	No change
V	CC – XI	Internet Technologies	4	CC – XI	Internet Technologies	4	No change
	CC – XI Practical	Internet Technologies Lab	2	CC – XI Practical	Internet Technologies Lab	2	No change
	CC – XII	Theory of Computation	5	CC – XII	Theory of Computation	5	No change
	CC – XII Tutorial	Theory of Computation Tutorial	1	CC – XII Tutorial	Theory of Computation Tutorial	1	No change
	DSE – I	DSE-1 (Microprocessor)	4	DSE – I	DSE-1 (Microprocessor)	4	No change
	DSE – I Practical	DSE-1 Lab	2	DSE – I Practical	DSE-1 Lab	2	No change
	DSE – II	DSE-2 (Programming in Python)	4	DSE – II	DSE-2 (Programming in Python)	4	removed unit 1 & unit 2 and add some topics like Function, Classes and objects , File Handling
	DSE – II Practical	DSE-2 Lab	2	DSE – II Practical	DSE-2 Lab	2	No change
VI	CC – XIII	Artificial Intelligence	4	CC – XIII	Artificial Intelligence	4	No change
	CC – XIII Practical	Artificial Intelligence Lab(Prolog)	2	CC – XIII Practical	Artificial Intelligence Lab(Prolog)	2	No change
	CC – XIV	Computer Graphics	4	CC – XIV	Computer Graphics	4	No change
	CC – XIV Practical	Computer Graphics with C/C++	2	CC – XIV Practical	Computer Graphics with C/C++	2	No change
	DSE- III	DSE-3 (Data Mining, Warehousing & Big Data)	4	DSE- III	DSE-3 (Data Mining, Warehousing & Big Data)	4	No change
	DSE – III Practical	DSE-3 Lab	2	DSE – III Practical	DSE-3 Lab	2	No change
	DSE – IV	DSE-4(Project)	4	DSE – IV	DSE-4(Project)	4	No change
	DSE – IV Practical	DSE-4(Job Training)	2	DSE – IV Practical	DSE-4(Job Training)	2	No change
Total							140

## **Program Specifics Outcomes**

- To excel in software development skills coveted in the IT industry.
- To be well prepared for pursuing higher studies in related fields of teaching and research.
- develop programming skills, networking skills, learn applications, packages, programming languages and modern techniques of IT
- get skill and info not only about computer and information technology but also in common, organization and management
- Learn programming language such as C,Java, C++, HTML,CSS, JavaScript, PHP, .NET, Android, Python, SQL, etc...
- Information about various computer applications and latest development in IT and communication system is also provided
- Gives overview of the topics in IT like networking, computer graphics, web development, trouble shooting, and hardware and software skills.
- A few of them being like software programmer, system and network administrator, web designer faculty for computer science and computer applications

## Course Outcomes

Semester	Paper Code & Paper Name	Course Outcomes (After the completion of this course, students will be able to:)
<b>Sem I</b>	CC I - Programming Fundamentals using C/C++	<ul style="list-style-type: none"> <li>• Understand the basic terminology used in computer programming</li> <li>• Be able to explain the difference between object-oriented programming and procedural programming</li> <li>• Design programs involving decision structures, loops and functions.</li> <li>• Understand the dynamics of memory by the use of pointers.</li> <li>• Be able to program using C++ features such as Class, objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.</li> </ul>
	CC II - Computer System Architecture	<ul style="list-style-type: none"> <li>• Understand the major components of a computer including CPU, memory, I/O and storage.</li> <li>• Students will understand the uses for cache memory.</li> <li>• Learn about Primary and Secondary storage System.</li> <li>• Learn about parallel computer structure and Pipelining.</li> <li>• Understand the design of sequential Circuits such as Flip-Flops, Registers, and Counters.</li> <li>• Learning basics of Assembly Language.</li> </ul>
<b>Sem II</b>	CC III - Programming in JAVA	<ul style="list-style-type: none"> <li>• To understand fundamentals of object-oriented programming in Java, including defining classes, methods, using class libraries, exception handling etc.</li> <li>• Demonstrate simple data structures like arrays in a Java program</li> <li>• Understand the concept of package, interface, multithreading and File handling in java.</li> </ul>
	CC IV - Discrete Structures	<ul style="list-style-type: none"> <li>• Learn a number of techniques to model and solve problems in mathematical ways</li> <li>• Be able to reason at multiple levels of detail and abstraction, in particular, of the applicability and limitations of tools from mathematics and theoretical computer science</li> </ul>
<b>Sem III</b>	CC V – Data Structures with C	<ul style="list-style-type: none"> <li>• To access how the choices of data structure &amp; algorithm methods impact the performance of program.</li> <li>• To Solve problems based upon different data structure &amp; also write programs.</li> <li>• Design and analyze the time and space efficiency of the data structure</li> <li>• Apply graph and tree traverse technique to various applications.</li> <li>• Implement Dijkstra's algorithm, binary trees</li> </ul>
	CC VI – Operating Systems	<ul style="list-style-type: none"> <li>• Understand Operating System and its basic functionality.</li> <li>• Learn different types of operating systems along with concept of file systems and CPU scheduling algorithms used in operating system.</li> <li>• Provide students' knowledge of memory management including virtual memory.</li> <li>• Understand Linux Operating system, its basic set of commands and utilities.</li> <li>• Experience Unix shell programming.</li> </ul>
	CC VII - Computer Networks	<ul style="list-style-type: none"> <li>• Explain how communication works in computer networks and to understand the basic terminology of computer networks</li> <li>• Understand design issues in network security and to understand security threats, security services and mechanisms to counter.</li> <li>• Familiar with basic devices like repeaters, bridges, gateways and quality of service</li> <li>• Understand the network security, common threats, firewalls, and cryptography</li> </ul>

	SEC I - Android Programming	<ul style="list-style-type: none"> <li>• To understand the Android Operating System</li> <li>• To develop applications using Google's Android open-source platform</li> </ul>
<b>SEM IV</b>	CC VIII - VB.Net	<ul style="list-style-type: none"> <li>• Design, create, build, and debug Visual Basic applications.</li> <li>• Explore Visual Basic's Integrated Development Environment(IDE).</li> <li>• Implement syntax rules in Visual Basic programs.</li> <li>• Explain variables and data types used in program development.</li> <li>• Write and apply operator, decision structures, loop structures to perform tasks.</li> <li>• Write and apply procedures, sub-procedures, and functions to create manageable code.</li> </ul>
	CC IX - Software Engineering	<ul style="list-style-type: none"> <li>• Understand software Engineering and its importance in modern era.</li> <li>• Select and implement different software development process models.</li> <li>• Extract and analyze software requirements specifications for different projects.</li> <li>• Develop some basic level of software architecture/design.</li> <li>• Define the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress.</li> <li>• Understand testing , its types, process and importance.</li> </ul>
	CC X - Database Management Systems	<ul style="list-style-type: none"> <li>• Construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.</li> <li>• Construct unary/binary/set/aggregate queries in relational algebra.</li> <li>• Understand and apply database normalization principles.</li> <li>• Understand principles of database transaction management, database recovery, security.</li> <li>• Analyze Data Base design methodology.</li> <li>• knowledge of SQL Commands</li> </ul>
	SEC II - PHP Programming	<ul style="list-style-type: none"> <li>• Understand process of executing a PHP-based script on a webserver</li> <li>• Understand the syntax and use of PHP object-oriented classes.</li> <li>• Understand the PHP Get and Post methods working difference</li> <li>• Use PHP to access a MySQL database</li> <li>• Understand the paradigm for dealing with form-based data, both from the syntax of HTML forms, and how they are accessed inside a PHP-based script.</li> </ul>
<b>SEM V</b>	CC XI - Internet Technologies	<ul style="list-style-type: none"> <li>• Familiar with Internet</li> <li>• Understand new threats and new opportunities in IT</li> <li>• To understand Green Computing and its scope.</li> </ul>
	CC XII - Theory of Computation	<ul style="list-style-type: none"> <li>• Relate formal languages and mathematical models of computation</li> <li>• Attain knowledge about different types of languages and the corresponding machines</li> <li>• Learn about the pushdown machine, Turing Machine and its role in compiler construction</li> <li>• Analyse classes of P, NP, NP-C and NP-Hard problems</li> </ul>
	DSE I - Microprocessor	<ul style="list-style-type: none"> <li>• Learn about the architecture and programming of the microprocessor 8085 and 8086.</li> <li>• Learn about architecture of Microprocessors including System Bus architecture, Registers memory and I/O interfaces.</li> <li>• Learn about different types of memories, controllers and interfaces.</li> <li>• Learn assembly programming.</li> </ul>
	DSE II - Programming in Python	<ul style="list-style-type: none"> <li>• To introduce various concepts of programming to the students using Python.</li> <li>• Students should be able to apply the problem-solving skills using Python</li> </ul>
<b>SEM VI</b>	CC XIII - Artificial Intelligence	<ul style="list-style-type: none"> <li>• Knowledge of the building blocks of AI</li> <li>• Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game-</li> </ul>

		<p>based techniques to solve them.</p> <ul style="list-style-type: none"> <li>• Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing</li> </ul>
	CC XIV - Computer Graphics	<ul style="list-style-type: none"> <li>• Introduction about Computer Graphics</li> <li>• Understand 2d transformations.</li> <li>• Familiar with techniques of clipping, three-dimensional graphics and three-dimensional transformations.</li> <li>• Familiar with animations</li> </ul>
	DSE III - Data Mining, Warehousing & Big Data	<ul style="list-style-type: none"> <li>• Understand the basic about data mining, classification and major issues</li> <li>• Learn about Data Warehouse and OLAP technology</li> <li>• Learn about cluster Analysis and major clustering methods</li> <li>• Learn how to extract useful information from big database</li> <li>• Concept of Big Data.</li> </ul>
	DSE IV – Project	<ul style="list-style-type: none"> <li>• It makes the student confident in designing an Online Project</li> <li>• Students are trained to meet the requirements of the Industry.</li> </ul>



**Ranchi Women's College, Ranchi**  
**Deptt. of Computer Application**  
**(Syllabus for 3 yr Degree Course: B.Sc./B.A./B.Com Computer Application (H))**

**SCHEME FOR CHOICE BASED CREDIT SYSTEM IN**  
**B.Sc. Computer Application (H)**

Semester	Core Course	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Elective: Discipline Specific (DSE)	Elective: Generic (GE)
I	Programming Fundamental using C/C++ (4+2)	Alt. English / Mil Hindi			GE – 1 Math's/Physics/Bot/ Zoo/BM/Eco GE – 2 Math's/Physics/Bot/ Zoo/BM/Eco
	Computer System Architecture (4+2)				
II	Programming in JAVA (4+2)	Environmental Science			GE – 3 Math's/Physics/Bot/ Zoo/BM/Eco GE – 4 Math's/Physics/Bot/ Zoo/BM/Eco
	Discrete Structures (5+1)				
III	Data Structures with C (4+2)		SEC – 1	Android Programming (2)	GE – 5 Math's/Physics/Bot/ Zoo/BM/Eco GE – 6 Math's/Physics/Bot/ Zoo/BM/Eco
	Operating Systems (4+2)				
	Computer Networks (4+2)				
IV	Visual Basis .NET (4+2)		SEC – 2	PHP Programming (2)	GE – 7 Math's/Physics/Bot/ Zoo/BM/Eco GE – 8 Math's/Physics/Bot/ Zoo/BM/Eco
	Software Engineering (4+2)				
	Database Management Systems (4+2)				
V	Internet Technologies (4+2)			DSE – 1 Microprocessor (4+2)	
	Theory of Computation (5+1)			DSE – 2 Programming in Python(4+2)	
VI	Artificial Intelligence (4+2)			DSE – 3 Data Mining, Warehousing & Big Data(4+2)	
	Computer Graphics with C (4+2)			DSE – 4 Final Year Project / Job Training(4+2)	

Semester	Course Opted	Course Name	Credits
I	Ability Enhancement Compulsory Course -I	English / MIL Hindi	2
	Core course-I	Programming Fundamentals using C/C++	4
	Core Course-I Practical/Tutorial	Programming Fundamentals using C/C++ Lab	2
	Core course-II	Computer System Architecture	4
	Core Course-II Practical/Tutorial	Computer System Architecture Lab	2
	Generic Elective-1	GE-1( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-1 Practical/Tutorial		2/1
	Generic Elective-2	GE-2( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-2 Practical/Tutorial		2/1
II	Ability Enhancement Compulsory Course-II	Environmental Science	2
	Core Course-III	Programming in JAVA	4
	Core Course-III Practical/Tutorial	Programming in JAVA Lab	2
	Core Course-IV	Discrete Structures	5
	Core Course-IV Practical/Tutorial	Discrete Structures Tutorial	1
	Generic Elective-3	GE-3( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-3 Practical/Tutorial		2/1
	Generic Elective-4	GE-4( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-4 Practical/Tutorial		2/1
III	Core Course-V	Data Structures with C	4
	Core Course-V Practical/Tutorial	Data Structures with C Lab	2
	Core Course-VI	Operating Systems	4
	Core Course-VI Practical/Tutorial	Operating Systems Lab	2
	Core Course-VII	Computer Networks	4
	Core Course-VII Practical/Tutorial	Computer Networks Lab(HTML,DHTML,CSS)	2
	Skill Enhancement Course-1	SEC-1 (Android Programming)	2
	Generic Elective-5	GE-5 ( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-5 Practical/Tutorial		2/1
Generic Elective-6	GE-6( Math's/Physics/Bot/Zoo/BM/Eco)	4/5	
	Generic Elective-6 Practical/Tutorial		2/1
IV	Core Course-VIII	VB.Net	4
	Core Course-VIII Practical/Tutorial	VB .Net Lab	2
	Core Course-IX	Software Engineering	4
	Core Course- IX Practical/Tutorial	Software Engineering Lab	2
	Core Course- X	Database Management Systems	4
	Core Course- X Practical/Tutorial	Database Management Systems Lab	2
	Skill Enhancement Course-2	SEC-2 (PHP Programming)	2
	Generic Elective- 7	GE-7( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective- 7 Practical		2/1
	Generic Elective-8	GE-8( Math's/Physics/Bot/Zoo/BM/Eco)	4/5
	Generic Elective-8 Practical/Tutorial		2/1
V	Core Course- XI	Internet Technologies	4
	Core Course- XI Practical/Tutorial	Internet Technologies Lab	2
	Core Course-XII	Theory of Computation	5
	Core Course- XII Practical/Tutorial	Theory of Computation Tutorial	1
	Discipline Specific Elective-1	DSE-1 (Microprocessor)	4
	Discipline Specific Elective-1 Practical/Tutorial	DSE-1 Lab	2
	Discipline Specific Elective-2	DSE-2 (Programming in Python)	4
	Discipline Specific Elective-1 Practical/Tutorial	DSE-2 Lab	2
VI	Core Course-XIII	Artificial Intelligence	4
	Core Course-XIII Practical/Tutorial	Artificial Intelligence Lab(Prolog)	2
	Core Course-XIV	Computer Graphics	4
	Core Course-XIV Practical/Tutorial	Computer Graphics with C/C++	2
	Discipline Specific Elective-3	DSE-3 (Data Mining, Warehousing & Big Data)	4
	Discipline Specific Elective-3 Practical/Tutorial	DSE-3 Lab	2
	Discipline Specific Elective-4	DSE-4(Project)	4
	Discipline Specific Elective-4 Practical/Tutorial	DSE-4(Job Training)	2
<b>Total Credits</b>			<b>140</b>

**Semester – I****Core Course 1: Programming Fundamental using C/C++****Classes: 60****1. Introduction to C and C++**

History of C and C++, Overview of Procedural Programming and Object-Oriented Programming, Using main () function, Compiling and Executing Simple Programs in C++.

**2. Data Types, Variables, Constants, Operators and Basic I/O**

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc).

**3. Expressions, Conditional Statements and Iterative Statements**

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operator Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

**4. Functions and Arrays**

Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

**5. Derived Data Types (Structures and Unions)**

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

**6. Pointers and References in C++**

Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

**7. Memory Allocation in C++**

Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

**8. File I/O, Preprocessor Directives**

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in

files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros

### **9. Using Classes in C++**

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables & Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors, Overview of Template classes and their use.

### **10. Overview of Function Overloading and Operator Overloading**

Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

### **11. Inheritance, Polymorphism and Exception Handling**

Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

### **Reference Books**

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013.
3. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
6. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
7. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
8. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
9. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014
10. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
11. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

**Semester I****Core Course 2: Computer System Architecture****Classes: 60****Modern computer system :**

- Von- Newman Architecture of the computer.
- Input Devices: Key Board, Light Pen, OMR etc.
- Output Devices: Impact/non-impact printers, display devices, LCD projector etc.
- Primary Memory: RAM, ROM and their types, Cache Memory.
- Secondary Memory: HDD, CTD, Pen drive, tape device etc.
- Concept and need for Memory Hierarchy
- Virtual memory, Pipelining.
- Concept of System Software, Application Software & Utility Software.
- Flynn's classification

**Introduction to Number Systems :**

- Decimal, Binary, Octal & Hexadecimal Base Conversion.
- Representation of binary numbers in Sign magnitude & 2's complement form.
- Internal Representation of Floating Point numbers using IEEE-754 standard.
- Representation of Characters in memory using ASCII, EBCDIC & UNICODE.
- Concept of GRAY code, Gray to binary and Binary to Gray conversion.

**Digital Logic:**

- Boolean Algebra (Axioms/Rules),
- Canonical Expression, SOP & POS.
- Logic Gates & Truth Table,
- K- Maps (2, 3, and 4-variables).

**Combinational Circuits:**

- Half adder, Full adder.
- Serial and parallel Adder
- Multiplexer, De-multiplexer
- Decoder, encoder.

**Sequential Circuits:**

- SR- Latch using NOR/NAND gate, RS-flip flop,
- D-flip flop, JK Flip flop, T- flip flop, Master Slave flip flop,
- Registers, Counters (Synchronous/ Asynchronous).

**INTEL-8086 architecture:**

- 14-general purpose registers in intel 8086 machine along with their use,
- Instruction set, type of instructions, mode of addressing etc.

**Assembly Language programming:**

- Assembler(TASM/MASM) overview, Assembly instructions for Comparing & Branching, Numeric I/O, Macros, Bit Operations,

**Text Book:**

- M. Morris Mano, C. R. Kime: Logic and Computer Design Fundamentals, Pearson Education.
- Fundamentals of Computers; Pearson Publication

**Reference Book:**

- T.C. Bartee: Digital Computer Fundamentals, McGraw Hill, 2001.
- T.L. Floyd: Digital Fundamentals, Pearson Education, 2011.

**Core Course-1 Practical****Programming Fundamentals using C/C++**

1. Execution of a simple sequential program in C.
2. Using simple C++ formatted and unformatted I/O facilities
3. Execution of a simple program based using if-else, nested if and switch-case
4. Application of goto, break, continue, return etc.
5. Application of iterative constructs
6. Programs using Arrays (1-D & 2-D)
7. Programs using Structures,
8. Using simple and nested control structures.
9. Using User Defined Functions (Interactive & Recursive) Function overloading etc.
10. Using Classes and Objects, friend function.
11. Using Constructors copy constructors and destructors.
12. Using Unary and binary operator Overloading.
13. Using single, multilevel, multiple, hierarchical, hybrid and multipath inheritance.
14. Using virtual base classes and abstract classes.
15. Using wild pointers, void pointer, pointer to class, pointer to object, this pointer.
16. Using pointer to derived and base class, pointer to members.
17. Using arrays and arrays of classes.
18. Manipulating string objects.
19. File handling and command line arguments.

**Core Course-2 Practical**

**Programming with Assembly Language**

1. Programs with strings/characters
2. Programs with numbers
3. Programs with branching
4. Programs with macros and procedures
5. Programs with bit operators

**Semester II****Core Course 3:****Programming in JAVA****classes: 60****Object Oriented Concepts:**

Recapitulate concepts of Object Oriented Programming, Object, Class, Method, Abstraction, Encapsulation, Polymorphism, Inheritance, Dynamic Binding and Message Passing.

**Introduction to Java:**

History of JAVA, features of JAVA, types of JAVA programs.

**JDK tools:**

Java compiler, Java Interpreter, applet viewer, Jot tool, Javap disassemble, Javadoc Tool, Javah tool, java Keywords, data types in java, variable naming conventions, Initializing variables, literals, operators, type conversion, looping construct, Arrays.

**Classes and objects:**

Declaring classes, creating objects, declaring objects, declaring methods, passing arguments to methods, constructors, access specifiers, modifiers, the main () method, Overloading, Relationship between classes.

**Inheritance and interfaces:**

Types of inheritance, Single inheritance, Multi-level inheritance, interface implementation,

**Packages:**

Java packages, using a package, the Lang package, the util package, the collection class, creating a package.

**Introduction to threads:**

Threads, single treaded and multithreaded applications, life cycle of a thread, the current thread, the thread class, problems in multithreading, synchronization.

**Exceptions Handling:**Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Finally Statements, Throwing out Own exception, Debugging.

**Applet & applications:**

Applet class, Applet & HTML, Life cycle of an Applet, Graphic class, Font class, passing parameters to applets, creating an application, converting applets to applications.

**Books Recommended:**

Herbert Schildt- Java: The Complete Reference, Seventh Edition, McGrawHill, 2006

Cay S. Horstmann and Gary Cornell – Core java, volume 1 and 2, 8th-edition, Pearson Education.

**Board Members:**



**Semester II****Core Course4: Discrete Structures****Classes: 60****1. Introduction:**

Sets - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

**2. Growth of Functions:**

Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

**3. Recurrences:**

Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

**4. Graph Theory:**

Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representaion, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

**5. Propositional Logic:**

Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

**Recommended Books:**

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill 2006
3. T.H. Cormen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John wiley Publication, 1988
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

**Semester II**

**Core Course 3 practical:**

**JAVA Programming**

- Programming using Java.
- Applet creation and execution.
- Creating programs based on multithreading.

**Semester III****Core Course 5:****Data Structures with C****Classes: 60****Introduction to Data Structures:**

- Primitive/non-primitive data structures and their importance.
- Linear/non-linear data structure and their storage structure.
- Static/Dynamic data structures.

**Algorithms:**

- Use of asymptotic notations for analysis of complexity of an algorithm.

**Arrays : C Implementation**

- Traversal, Insertion, Deletion in Arrays.
- 2-D arrays and their row major/column major storage
- Implementation of Matrices in 2-D Arrays.
- Concept of dynamic array in C language.
- Sparse matrices and their 3-Tuple representation.

**Sorting And Searching:**

- Analysis of complexity of Sequential search and Binary search
- Analysis of simple sorting algorithms: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort and Quick Sort

**Stacks:**

- Push And Pop Operations
- Application of Stacks: -prefix, postfix and infix

**Queue:**

- Insertion and Deletion Operations
- Circular Queue
- Deque:-Input restricted and Output restricted

**Linked Lists : C Implementation**

- Concept of self-referential data structure and runtime allocation/de-allocation of memory in C. Manipulation (insertion, deletion and traversal) of:
- Singly linked list.
- Doubly linked list.
- Circular linked list.
- Implementation of Stack, Queue using linked list

**Trees: Algorithm Only**

- Trees , Some Properties of Trees,
- Binary trees, Binary search trees

**Graphs: Algorithm Only**

- Graphs, Sub graphs, Walks paths and circuits.
- Connected Graphs, Representation of graph in computers Memory.
- Computation of Transitive closure of an adjacency matrix.
- Breadth First Search, Depth First Search,
- Spanning Trees, Finding all Spanning Trees of a Graph.
- Spanning Trees in a Weighted Graph,
- Kruskal's algorithm & Prim's algorithm for finding MST.
- Floyd Warshall Algorithm, Dijkstra's algorithm.

**Text Book:**

Data Structure- Lipschutz.

**References Book:**

Graph Theory-Nur Singh Dev.

C and Data Structures, Mukul Priyadarshi.

Data Structures through 'C', Y.P. Kanetkar, BPB Pub.

Introduction to algorithms, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein: PHI.

**Board Members:**

**Semester III****Core Course6:****Operating Systems****Classes: 60****Introduction to Operating System:**

- Definition and type of Operating Systems, role of Operating System as memory manager, I/o manager, process manager and file manager.

**Computer system structure:**

- Computer System Operation, I/O structure, Hardware protection.

**Operating System Structure:**

- System Components, System Services, System Calls.

**Process Concepts:**

- Process state, process control blocks (PCB), process scheduling, schedulers & threading.

**CPU Scheduling:**

- CPU and I/O burst cycle, Scheduling criteria/algorithms (FCFS, SRTN, RR etc.).

**Memory Management:**

- Memory hierarchy, properties
- Contiguous & Static/Dynamic Partitioned allocation, paging, swapping, segmentation.

**Virtual memory:**

- Demand paging, page replacement policies/algorithms (FIFO, LRU, Optimum), thrashing.

**File System Structure:**

- File allocation (Contiguous, linked, indexed) Free space management (bit vector, linked list etc.).

**I/O systems:**

- I/O Hardware, Polling, Interrupts, DMA, Spooling, buffering.

**Disk structure:**

- Disk scheduling (FCFS, SSTF, Scan), Disk management, formatting, boot block, bad block & swap space management.

**Security:**

- The problem, Authentication, program threats, encryption.

**UNIX/LINUX:**

- Process scheduling, memory management, file system, file structure, inodes,
- Linux shell Commands: ls, cat, wc, grep, chmod, directory related commands, date, man, cp, mv.

**Text Books:**

- Modern Operating Systems – A. S. Tanenbaum; Pearson Education Asia.
- Operating System Concepts – Silberschatz/Galvin/Gagne; John Wiley & Sons (Asia).

**Reference Books:**

- Operating System:NareshChouhan; Oxford University Press.
- Linux a Practical Approach -- B. Mohamed Ibrahim
- Operating Systems:Er. Rajiv Chopra; S. Chand Publications.

**Board Members:**

**Semester III****Core Course 7:****Computer Networks****classes: 60****Basics of Data Communication:**

- Communication system, Analog and Digital Communication, Data communication modes, Synchronous and Asynchronous Transmission, Simplex, Half-duplex and Full duplex communication, Networking Protocols and Standards.

**OSI and TCP/IP Reference Models:**

- OSI Model, Need, Basic functions of each layer, TCP/IP, Comparisons with TCP/IP layers.

**Modulation, Encoding and Multiplexing:**

- Analog Modulation: AM, FM, PM.
- Data Encoding: Digital Data Digital Signals: NRZ-L, NRZ-I, Manchester, Differential Manchester.
- Digital Data Analog Signals: ASK FSK, PSK.
- Analog Data Digital Signals: PCM, DM.
- Introduction to FDM, TDM, SDM.

**Communication Mediums:**

- Digital data transmission, Serial and Parallel Transmission, Guided and Unguided mediums, Wireless Communication, Coaxial Cables, Twisted Pair Cables, Fiber Optic Cables, Connectors

**Network Classification:**

- Classification of Networks based on Technology, Scale, Topology and Ownership, LAN overview, LAN Topologies, LAN access methods.

**Physical and Data link Layer:**

- ARQ, CRC, Framing, Retransmission strategies, Random access (CSMA, CSMA/CD, CSMA/CA).

**Internetworking Devices & Network layer:**

- Network Interface Cards, Modems, Repeaters, Hubs, Bridges, Switches and gateways; Circuit, Message and Packet Switching; Routing, Congestion control.

**Transport layer and Application Layer:**

- Addressing, Multiplexing, Flow control, Port numbers, DNS, Remote Logging, FTP, Network Management, Client-Server Applications, WWW, E-mail.

**Network Security :**

- Introduction to computer security, Authentication and Privacy, Public and Private key Cryptography, Digital Signature.

**Text Books:**

Willam Stallings-Data and Computer communications, Pearson Education.

**Reference Books:**

Tannenbaum - Data Communication and Networking.

B.A. Forouzan: Data Communications and Networking. Tata McGraw Hill, 3<sup>rd</sup> Edition, 2004.**Board Members:**

**Semester III****Core Course 5 practical: Data Structures with C Practical**

- Using static/dynamic array sort in ascending and descending order: (Apply bubble sort, selection sort, insertion sort & quick sort algorithms).
- Searching for an element in an array using linear search and binary search.
- Input sparse matrix and store in 3- tuple scheme.
- Input 3-tuple data and convert it to standard matrix.
- Compute transitive closure of an adjacency matrix.
- Implement singly, doubly and circularly linked list using recursive functions.
- Implement STACK, QUEUE and DEQUEUE using a vector (1-D array)
- Implement STACK & QUEUE using Linked List.
- Searching for an element in a singly, doubly and circularly linked list.
- Write 'C' code to implement and manipulate a Binary Search Tree.

**Semester III**

**Core Course 6 practical:                      Unix and Shell Programming**

1. Some common Unix commands
2. Defining variables
3. Simple operations on variables
4. Shell programs with conditional and loop statements

**Semester III**

**Core Course-7 Practical**

**Programming with HTML, DHTML and CSS**

1. Use of simple HTML tags
2. Creating lists, tables, forms and frames in HTML
3. Writing CSS
4. Introduction to DHTML



**Semester III****Skill Enhancement Course 1: Android Programming****Classes:-60**

**Introduction:** History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

**Overview of object oriented programming using Java:** OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

**Development Tools:** Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, deploy it on USB-connected Android device.

**User Interface Architecture:** Application context, intents, Activity life cycle, multiple screen sizes.

**User Interface Design:** Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, Dialog.

**Database:** Understanding of SQLite database, connecting with the database.

**Book Recommended:**

1. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.

**ONLINE READING / SUPPORTING MATERIAL:**

1. <http://www.developer.android.com>
2. <http://developer.android.com/about/versions/index.html>
3. <http://developer.android.com/training/basics/firstapp/index.html>
4. <http://docs.oracle.com/javase/tutorial/index.htm> (Available in the form of free downloadable ebooks also).
5. <http://developer.android.com/guide/components/activities.html>
6. <http://developer.android.com/guide/components/fundamentals.html>
7. <http://developer.android.com/guide/components/intents-filters.html>
8. <http://developer.android.com/training/multiscreen/screensizes.html>
9. <http://developer.android.com/guide/topics/ui/controls.html>
10. <http://developer.android.com/guide/topics/ui/declaring-layout.html>
11. <http://developer.android.com/training/basics/data-storage/databases.html>

**Semester III:**

**Skill Enhancement Paper 1 Lab: Android Programming lab**

1. Create —Hello World! application. That will display —Hello World! in the middle of the screen in the emulator. Also display —Hello World! in the middle of the screen in the Android Phone.
2. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
3. Create a menu with 5 options and selected option should appear in text box.
4. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
5. Create an application with three option buttons, on selecting a button color of the screen will change.
6. Create an Login application with username and password. On successful login, pop up the message.
7. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

**Semester IV****Core Course 8:****VISUAL BASIC. NET****classes: 60****Introduction to VB.NET**

Event Driven Programming, NET as better Programming Platform, NET Framework ,NET Architecture, The Just-In-Time Compiler , NET Framework class library introduction.

**Elements of User Interface**

Windows Forms , Text Boxes, Buttons, Labels, Check Boxes, and Radio Buttons , List Boxes, Combo Boxes. Picture Boxes, Scrollbars, Splitters, Timer, Menus, Built-in Dialogs, Image List, Tree Views, List Views, Toolbars, Status Bar and Progress bars.

**Mastering VB Language**

Data, Operators, Conditionals and Loops, Procedures, Error Handling, Classes and Objects.

**Object Oriented Programming in VB .NET**

Class and Object, Properties, methods and events., Constructors and Destructors Method overloading, Inheritance , Access modifiers : Public, Private, Protected, Friend, Overloading and Overriding, Interfaces, Polymorphism.

**Exception Handling**

Introduction.

Handling different types of exceptions.

**Name Spaces:**

Common Namespaces.

**Databases in VB .NET**

Database : Connections , Connection to database with server explorer Multiple Table Connection with Data grid.

**Crystal Report** -Introduction

**Text Books:**

- Programming Microsoft Visual Basic.NET – Francesco Balena
- The Complete Reference -Visual Basic .NET – Jeffrey R. Shapiro
- VB.NET database programming with ADO.NET -Anne Prince and Doug Lowe.

**Reference Books:**

- The Visual Basic.NET COACH Visual Basic .NET 2003 in 21 Days. – Steven Holzner, SAMS Publications. Mastering Crystal Report - BPB Publication
- Crystal Report – The Complete Reference :- Tata McGraw Hill
- VB. Net-Halls, Macarthy,L.Hotka
- Programming in Vb.Net – V Christy, University Science Press

**Board Members:**

**Semester IV****Core Course 9:****Software Engineering****classes : 60****PRODUCT and PROCESS:**

Software Characteristics, S/w Applications and S/w Crisis, Process, Methods, and Tools and Generic View of S/w Engineering, S/w Process Models, Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary/Incremental Model, Spiral Model and Agile Model.

**PROJECT MANAGEMENT CONCEPTS :**

**People**(Player, Leader & Team), **Product** (S/w scope & Problem decomposition), **Process** (Melding Product/Process & Process Decomposition) and **Project** (W5HH Principle and Critical Practices).

**SOFTWARE PROJECT PLANNING :**

SRS, Analysis, Control flow model (Data dictionary, DFDs), Data Modeling(ERDs), Estimating, Planning, S/w Scope (Information for Scope/Feasibility), Resources (Human Resources, Reusable S/w and Environmental Resources), S/w Project Estimation and Decomposition Techniques (S/w Sizing, Problem-Based and Process-Based Estimation) COCOMO II model.

**PROJECT SCHEDULING AND TRACKING :**

Basic Concepts & Principles, Relationship Between People and Effort, Defining a Task Network (PERT, CPM), Scheduling (Timeline Charts and Tracking the Schedule).

**DESIGN CONCEPTS AND PRINCIPLES :**

S/w Design Engineering, Design Process, Design Principles, Design Concepts (Abstraction, Refinement, Modularity), Effective Modular Design (Functional Independence, Cohesion, Coupling)

**SOFTWARE TESTING TECHNIQUES and STRATEGIES :**

Objectives, Principles & Testability, Test Case Design, White-Box, Basis Path, Control Structure Testing (Condition, Data Flow & Loop Testing), Black-Box, Boundary Value Analysis, Architectures, and Applications, A Strategic Approach to S/w Testing, Verification and Validation, Organizing for S/w Testing, S/w Testing Strategy, Unit Testing, Integration Testing (Top-down, Bottom-up, Regression, Smoke) and System Testing.

**Quality and Metrics :**

Quality concepts(what is quality, ISO 9126 quality factors), Factors That Affect Quality, Metrics for Software Quality (Measuring Quality and Defect Removal Efficiency), Process metrics, Project metrics SQA (Six sigma for software engineering),

**Text Books:**

Roger S. Pressman - Software Engineering A Practitioner's Approach, McGrawHill.

**Reference Books:**

Ali Behforoz and F. J. Hudson - Software Engineering Fundamentals, Oxford University Press.

Alan Dennis and B. H. Wixom – Systems Analysis and Design An Applied Approach, John Wiley.

Carlo Ghezzi, M. Jazayeri and D. Mandrioli - Fundamentals of Software Engineering, PHI.

**Board Members :**

**Semester IV****Core Course 10:****Database Management System****classes : 60****DBMS basics :**

- Data, Data Bank, Database, DBMS, Types of DBMS, Advantages/Disadvantages in comparison with conventional file system, 3-Level Abstraction of DBMS and Database Life Cycle.

**RDBMS basics :**

- Relation, Codd's Rules, RDBMS, Super Key, Candidate Key, Primary Key, Alternate Key, Secondary Key, Foreign Key, Discriminator and Surrogate Key.

**ER Model :**

- Entity, Entity Set, Weak Entity Type, Relationship, Attributes, Domain, Degree of Relationship, Connectivity & Cardinality of Relationship, Existence of Relationship, Attributes of a relationship, Generalization, Specialization, Aggregation.

**Normalization :**

- Normalization, desirable properties, insert, update, Delete anomalies & reduction in redundancy, FD, 1NF, 2NF, 3NF, BC/NF, MVD 4NF, JD, 5NF or PJ/NF, DK/NF and De-normalization.

**Transaction Concept:**

- Transaction, ACID properties, Transaction States, Concurrent Executions, Serializability, conflict & view serializability
- Deadlock: When occur, Detection, Prevention and Avoidance.

**Relationship algebra & Calculus:**

- Project, Select, Compose, Rename, Cartesian Product, Join (equi, natura,  $\theta$  & Outer join), Union, Intersection, Difference, Division operations, Tuple Relational Calculus, Domain Relational Calculus.

**Oracle SQL :**

SQL \*Plus: Buffer Commands, Environment variables and Data Types.

Basic parts of speech in SQL: select, from, where, order by, having, group by.

Arithmetic Operators: Unary (+, -), Binary (\*, /, +, -); Comparison Operator: =, !=, <, >, <=, >=, IN, NOT IN, IS NULL, IS NOT NULL, LIKE, % or \_, ALL, ANY, SOME, EXISTS, BETWEEN;

Logical Operators: AND, OR, NOT, Set Operators: UNION, UNION ALL, INTERSECT, MINUS.

DQL: Data Query Language – SELECT.

DML: Data Manipulation Language (INSERT, UPDATE, DELETE).

DDL: Data Definition Language (CREATE, ALTER, DROP, RENAME).

TCL: Transaction Control Language (COMMIT, ROLLBACK, SAVEPOINT).

DCL: Data Control Language (GRANT, REVOKE).

Handling Database Objects like Table, View,

Concept of simple query, nested sub-query, self-join, equi-join,

PL/SQL: Introduction, Simple Procedure, Function.

**Text Books:**

- Silberschatz, Korth, Sudarshan – Database System Concepts, McGraw Hill.
- Ivan Byross - PL/SQL Programming.

**Reference Books:**

- Toby Teory et al., Database Modelling and Design, Morgan Kaufman Publishers.
- C. J. Date - Database management System.
- Alexis Leon, Mathews Leon – SQL A Complete Reference, TMH.
- V.P. Desai - Database management System.
- Sharad Maheswari and Ruchinjain–SQL and PL/SQL Programming's.

**Board Members :**

**Semester IV****Skill Enhancement Paper 2: PHP programming****classes : 60**

**Introduction to PHP:** PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other technologies, scope of PHP , Basic Syntax, PHP variables and constants Types of data in PHP , Expressions, scopes of a variable (local, global) ,PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator, PHP operator Precedence and associativity

**Handling HTML form with PHP:** Capturing Form Data , GET and POST form methods, Dealing with multi value fields, Redirecting a form after submission

**PHP conditional events and Loops** PHP IF Else conditional statements ( Nested IF and Else), Switch case, while ,For and Do While Loop, Goto , Break ,Continue and exit

**PHP Functions:** Function, Need of Function , declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference , Scope of Function Global and Local

**String Manipulation and Regular Expression:** Creating and accessing String , Searching & Replacing String, Formatting, joining and splitting String , String Related Library functions, Use and advantage of regular expression over inbuilt function , Use of preg\_match(), preg\_replace(), preg\_split() functions in regular expression

**Array:** Anatomy of an Array ,Creating index based and Associative array ,Accessing array, Looping with Index based array, with associative array using each() and foreach(), Some useful Library function

**Reference Books:**

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly, 2014.
4. Luke Welling, Laura Thompson, "PHP and MySQL Web Development", 4th Edition, Addition Paperback, Addison-Wesley Professional, 2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.

**Software Lab Based on PHP:**

**Semester IV**

**Core Course 8 Practical : VISUAL BASIC.NET**

- Console Based Programming
- Window Based Programming
- Application Development using Database connectivity

**Core Course-9 Practical**

**Software Engineering Practical**

1. Creation of SRS according to IEEE standards for given Software Project
2. Case Study of
  - a. Online shopping system
  - b. Online Hotel management
  - c. Online Tourism
  - d. Hospital Management
  - e. Online Assessment system
  - f. Parking App
  - g. Food delivery app

Or given software.



**Semester IV**

**Core Course 10 Practical: Database Management System**

**SQL \* plus and SQL Commands:**

- Use of SQL \*Plus Buffer Commands, Environment variables and Data Types.
- Use of select, from, where, order by, having, group by.
- Use of IN, NOT IN, IS NULL, IS NOT NULL, LIKE, % or \_, ALL, ANY, SOME, EXISTS, BETWEEN.
- Use of AND, OR, NOT, UNION, UNION ALL, INTERSECT, MINUS in SQL.
- Using DDL and DML with database objects like Table, View, Sequence, Synonym and Index.
- Use of COMMIT, ROLLBACK, SAVEPOINT.
- GRANT & REVOKE privileges on database objects.
- Use of sub-query, correlated sub-query, self-join, equi-join,
- Displaying data from multiple tables.
- Producing Readable output using SQL \* plus.

**Semester V**

**Core Course 11:**

**Internet Technologies**

**classes : 60**

**HTML**

Introduction to HTML, Basic-Tags Head, Body, Font, Colors, Attribute, List, Ordered and Unordered, Links, Images, Tables, Form, CSS.

**JavaScript**

Data types, operators, functions, control structures, events and event handling. , Working with Result Set Objects.

**JSP**

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

**JDBC**

JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing

**Recommended Books:**

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. Jim Keogh , The Complete Reference J2EE, TMH, , 2002.
5. O'Reilly , Java Server Pages, Hans Bergsten, Third Edition, 2003.

**Semester V****Core Course 12:****Theory of Computation****classes: 60**

**Mathematical Preliminaries:** - Sets Relations, Functions, Graph and Trees, Strings and their properties, Principles of Induction.

**Propositions and Predicates:** - Proposition (or statements), Propositional connectives, Well formed formulae, tautology, Predicates, Universal and Existential qualifiers.

**Theory of Automata:** - Definition, Description of finite Automata, Transition System, Properties of transition system. Acceptability of a string by finite automata, Non-deterministic finite state machine.

**Formal Languages:-**Basic Definition and examples, Chomsky classification of languages, languages and their relations, operations on languages, languages and automata.

**Regular Set and Regular Grammar :-** Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma for regular Sets, closure properties of regular set, Regular set and Regular Grammar.

**Context – free languages:** - Basic definition, Context-free languages and derivation trees, Normal forms of context free grammar.

**Pushdown Automata:-** Basic definition, Acceptance by pda, pushdown Automata and context-free languages, parsing and pushdown Automata.

**Turing Machine and Linear bounded Automata:-** Turing Machine Model, Representation of Turing machines, language acceptability by Turing machines, design of Turing Machines.

**Text Books:**

M. Sipser - Introduction to the theory of computation, Thomson Learning, 2001.

**Reference Books:**

- J. Martin - Introduction to languages and the Theory of computation, 3<sup>rd</sup> edition, McGraw Hill, 2002.
- K.L.P.Mishra- Theory of Computer Science , PHI Publication.
- J. E. Hopcroft, R. Motwani and J.D. Ullman - Introduction to Automata Theory, Languages and Computation, 2<sup>nd</sup> Edition, Pearson Education, 2001.

**Board Members:**

**Semester V**

**Discipline Specific Elective Paper 1: Microprocessor**

**classes : 60**

**Microprocessor architecture:** Internal architecture, system bus architecture, memory and I/O interfaces.

**Microprocessor programming:** Register Organization, instruction formats, assembly language programming.

**Interfacing:** Memory address decoding, cache memory and cache controllers, I/O interface, keyboard, display, timer, interrupt controller, DMA controller, video controllers, communication interfaces.

**Recommended Books:**

1. Barry B. Brey : The Intel Microprocessors : Architecture, Programming and Interfacing. Pearson Education, Sixth Edition,2009.
2. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, Fourth Edition 2005.

**Microprocessor Lab**

**ASSEMBLY LANGUAGE PROGRAMMING**

1. Programs with strings/characters
2. Programs with numbers
3. Programs with branching
4. Programs with macros and procedures
5. Programs with bit operators
6. Taking input from users

**Semester V**

**Discipline Specific Elective Paper 2: Programming in Python**

**classes : 60**

**Introduction to Python:** Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals

**Introduction to programming in Python:** variables and built-in types (strings, lists, tuples, dictionaries, sets), Operators in python, Input and Output Statements, multi-dimensional lists

**Control statements:** Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass

**Functions:** Defining Functions, default arguments

**Classes and Objects:** defining classes, constructor, destructor, inheritance, super() function and MRO overriding methods, Special/magic methods and operator overloading

**File Handling:** file object, opening and closing files, reading and writing to text files, csv values and binary files

**Reference Books**

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation [www.python.org](http://www.python.org) 2015
3. Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist : learning with Python , Freely available online.2012
4. <http://docs.python.org/3/tutorial/index.html>
5. <http://interactivepython.org/courselib/static/pythonds>
6. <http://www.ibiblio.org/g2swap/byteofpython/read/>

**Semester V**

**Discipline Specific Elective Paper 2 Lab: Programming in Python Lab**

1. Programs with lists, tuples and dictionaries
2. Program performing various set operations
3. Programs with different matrix operations
4. Programs with control statements
5. Programs with functions and default parameters
6. Programs with classes, inheritance and operator overloading
7. Programs with text and binary files

**Semester V**

**Core Course 11 Practical: Internet Technologies**

- Web page creation with HTML tags, CSS .
- Adding lists, tables, pictures etc to web pages
- Event driven programming using JS

**Semester VI**

**Core Course 13:**

**Artificial Intelligence**

**Classes : 60**

**Introduction to AI:**

AI technique, importance, Task domains of Artificial intelligence, Intelligent System.

**State Space Search:**

Defining the problem as a State Space search, Strategies for State Space Search, Implementation for Graph Search, Production System-Characteristics, Components, Advantages, Applicability, Learning - Definition and classification.

**Knowledge Representation :**

Representation and mappings, approaches to knowledge representation, Knowledge representation using Predicate logic, Representing simple facts in logic, Representing instance and ISA relationships, Knowledge Representation using Rules- Procedural Versus Declarative Knowledge and knowledge Acquisition

**Heuristic Search :**

Generate and Test, Heuristic Search Techniques (Hill-climbing Heuristic, Best-first Search), Admissibility, Monotonicity, and Informedness and Heuristic Classification.

**Expert Systems :**

Introduction, Features, characteristics, Architecture, goals, advantages, Difference between Expert system and conventional method, Stages in the Development of an Expert System.

**Fuzzy Systems :**

Introduction, Crisp Sets, Fuzzy sets, Basic terms and operation, Fuzzy Relations, Arithmetic Operations of Fuzzy Numbers, Linguistic Descriptions, Fuzzification.

**Artificial Neural Networks :**

Introduction Artificial Neural Networks Architecture, Features of Artificial Neural Networks, Back propagation Training Algorithms.

**Text Book:**

N. P. Padhy – Artificial Intelligence and Intelligent Systems, Oxford University Press.

**Reference Book:**

Patterson, Dan W. – Introduction to Artificial Intelligence and Expert Systems, PHI.

**Board Members :**



**Semester VI****Core Course 14: Computer Graphics with Flash****classes : 60****Introduction to Computer Graphics and its Applications****Overview of Graphics Systems**

- CRT:- Refresh CRT, Raster Scan Display, Color CRT
- Flat Panel Displays:- Plasma Panel, LED, LCD,
- Input devices:- Mouse, Track ball & space ball, joysticks, Data gloves, digitizers, image Scanners, touch panels, light pens, voice systems.
- Hard copy Devices

**Graphics Software**

- Classification of Graphics Software
- Coordinate representations And Homogeneous Coordinates
- Software standards.

**Output Primitives**

- Points and Lines.
- Line drawing algorithms: DDA Algorithms, Bresenham's Algorithm
- Circle generation algorithm
- Curves: Conic Section, Polynomial and spline curves

**Filled Area Primitives**

- Scan-line polygon fill algorithm,
- Flood fill algorithm.

**Two-Dimensional Geometric Transformations**

- Translation, Rotation, Scaling, Composite Transformation, Reflection & Shear.

**Two-Dimensional Viewing**

- Viewing Coordinates & window coordinates
- Line Clipping: Cohen-Sutherland line clipping algorithm.

**Three-Dimensional Geometric Transformations**

- Translation, Rotation, Scaling, Composite Transformation,

**Visible Surface Detection methods**

- Classification of methods.
- Backface Detection: - Depth Buffer methods, Scan-line method.
- Visible face detection
- Curve Surfaces: Surface Contour Plots.

**Introduction to Computer Animation**

- Tweeing, Interpolation
- Morphing, Warping, Color Dissolving.
- Multimedia : Introduction.

**Text Book:**

Donald Hearn, M. Pauline Baker – Computer Graphics, PHI

**Reference Book:**

D.P. Mukherjee – Fundamentals of Computer Graphics and Multimedia, PHI.

**Semester VI****Discipline Specific Elective Paper 3: Data Mining, Warehousing & Big Data classes:60**

**Data Mining** :Introduction, KDD, Mining Concept and Need, Stages, Methodology, Data objects and attributes: Nominal, Binary, and Ordinal, Numeric, measuring similarities among data sets, Measuring distances.

**Data mining techniques** : Classification, classification techniques-Bayes' Theorem, Decision Tree Induction, Rule based classification, Clustering techniques- Introduction, Requirements, Overview of basic Clustering methods, partitioning method- K-means, Hierarchical methods, Agglomerative vs. Divisive Hierarchical Clustering.

**Data pre-processing**: Data Quality, Data Cleaning, Data integration, data reduction, Data transformation and Data discretization, Histograms, Sampling.

**Data Warehousing** :Data Warehouse basic concept, Data Warehouse Modeling, Data Analysis, MOLAP, Data Cube and OLAP, Data warehouse design and usages, Data Warehouse environment, Architecture of a data warehouse.

**Big Data Analytics**: Introduction, Data life cycle (traditional data mining big data life cycle) Methodology, four deliverables, stakeholders, data analyst, data scientist

**Big data project** : problem identification and definition, data collection, data cleaning, data summarization, data exploration and visualization.

**Text Books:**

JiaweiHan, Kamber – Data Mining Concepts and Techniques, Morgan Kaufmann Publishers.

**Reference Books:**

Pudi&Krisna-Data Mining , Oxford University Press

ReemaThareja - Data Warehousing, Oxford University Press..

Anahorys, S., Murray, D; 2008; Data Warehousing in Real World, Pearson Publication.

**Discipline Specific Elective Paper 4: Final Year Project and Job Training**

**Software Project (80 marks)**

- Web based
- Android Application
- Desktop based projects
- Animations and games

Or

Any type according to current technologies and trends

**Job Training (20 marks)**

**Core Course 13 practical: Artificial Intelligence Practical**

**Practical with Scilab/MATLAB**

1. Introduction of prolog/ Scilab/ Matlab
2. Implementation of search technics
3. Plotting fuzzy membership functions
4. Creating neural networks

**Core Course 14 practical: Computer Graphics with C Practical**

1. Graphical functions in C
2. DDA line drawing algorithm
3. Bresenham's Line drawing algorithm
4. Line clipping algorithm
5. Drawing curves
6. Drawing Circles