

M. Sc.
COMPUTER SCIENCE
SYLLABUS - 2018

SCHOOL OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF COMPUTING SCIENCES
St. JOSEPH'S COLLEGE (Autonomous)

Special Heritage Status Awarded by UGC
Accredited at 'A' Grade (3rd cycle) by NAAC
College with Potential for Excellence Conferred by UGC
DBT-STAR & DST-FIST Sponsored College
TIRUCHIRAPPALLI - 620 002, INDIA

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POSTGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014-15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCH and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice-based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The multi-discipline nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally, one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of 110 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

POSTGRADUATE COURSE PATTERN (June 2018 onwards)

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
1	I-IV	Core Courses Theory Practical	12-14 3-6	84	68	81
	II	Self-Paced Learning	1	-	2	
	III	Interdisciplinary Core	1	6	5	
	IV	Comprehensive Examination Project Work	1 1	- 6	2 4	
2	I-III	Core Electives	3	12	12	12
3	II	IDC (Soft Skills)	1	4	4	12
	III	IDC (WS) IDC (BS)	1 1	4 4	4 4	
4	I	Extra Credit Courses-1 (MOOC)	1	-	(2)	(4)
	III	Extra Credit Courses-2 (MOOC)	1	-	(2)	
5	IV	Outreach Programme (SHEPHERD)	1	-	5	5
		TOTAL		120		110 (+4 extra credits)

Note: IDC: Inter-Departmental Courses, BS: Between School, WS: Within School

However, there could be some flexibility because of practical, field visits, tutorials and nature of project work. For PG courses, a student must earn a minimum of 110 credits. The total number of courses offered by a department is given above.

Course Pattern

The Post-Graduate degree course consists of five vital components. They are core course, core electives, IDCs, Extra credit courses, and the Outreach Programme.

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practicals, Inter disciplinary core, self paced learning, comprehensive examination, Project work, field visits, library record and etc.

Inter-disciplinary Core

Inter-disciplinary Core should be shared by the various Departments of every School. This course should be opted by all the students belonging to the particular school. Each department of the respective school should allocate themselves the schedule and the units of the course.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are three core electives. They are offered in different semesters according to the choice of the school.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Inter-Departmental Courses (IDC)

IDC is an interdepartmental course offered by a department / School for the students belonging to other departments / school. The objective is to provide mobility and flexibility outside the parent department / School. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various departments.

There are three IDCs. Among three, one is the Soft-Skill course offered by the JASS in the II Semester for the students of all the Departments. The other one is offered "With-in the school" (WS) and the third one is offered "Between the school" (BS). The IDCs are of application oriented and inter disciplinary in nature.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:

Year of Revision	PG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
18	P##	x	x	xx
18	PCS	1	1	01

For Example :

IMSc - Computer Science, first semester '**Programming in JAVA**'

The code of the paper is **18PCS1101**.

Thus, the subject code is fixed for other subjects.

Specification of the Part

- I - Core Courses: (Theory, Practical, Self paced Learning, Inter-disciplinary Core, Core, Comprehensive Examination, Project work)
- II - Core Electives
- III - Inter Departmental Courses (WS, Soft Skill & BS)
- IV - Extra credit courses
- V - Outreach Programme (Shepherd)

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks	
Passing Minimum: 50 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

Mid-Semster & End-Semester Tests

Centralised – Conducted by the office of Controller of Examinations

1. Mid-Semester Test & End-Semester Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
4. The 10 marks of PART-A of Mid-Semester and End-Semester Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE / FALSE; and FILL-IN BLANKS.
5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.
6. English Composition once a fortnight will form one of the components for UG General English

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: Objective MCQs only (30 Marks)

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

Part-B & C: Descriptive (70 Marks)

Part-B: 5 x 5 = 25 marks; inbuilt choice;

Part-C: 3 x 15 = 45 marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25 marks

Part-B: 25 x 3 = 75 marks

Duration of Examination must be rational; proportional to teaching hours
90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

GRADING SYSTEM

1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in the following Table-1.

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

$$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i} \quad \text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$$

where,

'C_i' is the Credit earned for the Course-*i*,

'G_i' is the Grade Point obtained by the student for the Course '*i*',

'M' is the marks obtained for the course '*i*', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

- The classification of final results shall be based on the CGPA, as indicated in the following Table-2.
- For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99, and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.
- Absence from an examination shall not be taken as an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
Below 50	NA	RA

Table-2: Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re-appearance

Credit based weighted Mark System is to be adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

A Pass in Outreach Programme (SHEPHERD) will continue to be mandatory although the marks will not count for the calculation of the CGPA.

Declaration of Result:

Mr./Ms. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) is _____ and the class secured _____ by completing the minimum of 110 credits.

The candidate has also acquired _____ (if any) extra credits offered by the parent department courses.

M. Sc. Computer Science
Course Pattern - 2018 Set

Sem.	Code	Course	Hr.	Cr.
I	18PCS1101	Programming in Java	5	4
	18PCS1102	Data Science Using Python	5	4
	18PCS1103	Mathematical Foundations	5	4
	18PCS1104	Data Structures and Algorithms Design Methods	5	4
	18PCS1105	Software Lab-I (Java)	3	2
	18PCS1106	Software Lab-II (Python)	3	2
	18PCS1201A	Core Elective I: High Performance Computing (Or)	4	4
	18PCS1201B	Core Elective I: Advanced Microprocessors & Microcontrollers		
	18PCS1401	Extra Credit Course-I: MOOC	-	(2)
Total for Semester I			30	24+(2)
II	18PCS2107	Online Course: Programming with C# using ASP.NET	5	4
	18PCS2108	Database and NoSQL	5	4
	18PCS2109	Software Lab-III (ASP.NET)	3	2
	18PCS2110	Software Lab-IV (MongoDB)	3	2
	18PCS2202A	Core Elective II: Compiler Design (or)	4	4
	18PCS2202B	Core Elective II: Ethical Hacking		
	18PCS2111	Self-paced Learning: Computer Networks	-	2
	18PSS2301	IDC: Soft Skills	4	4
	18PCS2301	IDC (WS): Pervasive and Ad Hoc Network	4	4
	18PCS2112	Technical Aptitude	2	1
Total for Semester II			30	27
III	18PCS3113	Online Course: BIG DATA ANALYTICS	5	4
	18PCS3114	Java Script with Php and MySql	5	4
	18SCS3101B	Inter-Disciplinary Core: Mobile Application Development	6	5
	18PCS3115	Software Lab-V (Php)	3	2
	18PCS3116	Software Lab-VI (Android)	3	2
	18PCS3203A	Core Elective III: Networks Security (or)	4	4
	18PCS3203B	Core Elective III: XML and Web Services		
	18PCS3302	IDC (BS): Advances in Computer Science	4	4
	18PCS3117	Mini Project (During II Semester Vacation)	-	7
	18PCS3118	Comprehensive Examination	-	2
	18PCS3402	Extra Credit Course-II: MOOC	-	(2)
Total for Semester III			30	34+(2)
IV	18PCS4119	Project Work	30	20
	18PCW4501	Outreach Programme (SHEPHERD)	-	5
Total for Semester IV			30	25
Total for All Semesters			120	110+(4)

Programme Outcomes (POs):

1. Graduates are prepared to be creators of new knowledge leading to innovation and **entrepreneurship employable** in various sectors such as private, government, and research organizations.
2. Graduates are trained to evolve new technologies in their own discipline.
3. Graduates are groomed to engage in lifelong learning process by exploring their knowledge independently.
4. Graduates are framed to design and conduct experiments /demos/create models to analyze and interpret data.
5. Graduates ought to have the ability of effectively communicating the findings of Biological sciences= incorporating with existing knowledge.

Programme Specific Outcomes (PSOs):

1. Fundamental knowledge in problem solving, general computing, and in depth knowledge in Computer Science.
2. An ability to identify, analyse, design, optimize and implement system solutions using suitable computing techniques leading to propulsion towards employability.
3. An ability to understand and provide analytical solutions to real life problems in Data Science with thrust in lifelong learning.
4. Fundamental knowledge in computational methods and tools for solving real-time problems.
5. An ability to act as a leader, or as a part of a team to create multi-functional software products
6. An Ability to demonstrate individual practical experiences in a variety of programming languages and situations.

Semester I
18PCS1101

Hours/Week: 5
Credits : 4

PROGRAMMING IN JAVA

Course Outcomes:

1. Develop solutions for a range of problems using object-oriented programming.
2. Solve simple problems using the fundamental syntax and semantics of the Java - Programming language
3. Use the Java event-handling model to respond to events arising from the GUI - Components.
4. Acquire knowledge of threads and JDBC programming techniques in Java.
5. Learn to apply networking concepts through Java program
6. Understand Various dynamic multitier programming concepts

Unit-I

13 hr

CLASSES AND OBJECTS: General Form of A Class - Creation of Objects - Usage of Constructors - 'this' Keyword- Constructor Overloading-Copy Constructors-Static Data Members - Static Methods- Finalize Method. INHERITANCE AND POLYMORPHISM: Inheriting Variables in a Class - Inheriting Methods in a Class - Inheritance And Constructors Abstract Classes - Final Classes.

Unit-II

13 hr

INTERFACES AND PACKAGES: Interfaces-Structure of an Interface - Implementation of an Interface Interface Inheritance. Packages - Placing the Classes in a Package - Package HierarchyAccess Control Modifiers.APPLETS: The Life Cycle of an Applet -The Applet Class Development and Execution of a Simple Applet - Syntax Of Applet Tag-Methods in the Graphic Class.

Unit-III

13 hr

SWING: JApplet class - Icons - JLabel Control - JOptionPane Class - JTextField Control JButton Control - JCheckBox Control - JRadioButton Control Menus. EXCEPTION HANDLING: Default Exception Handling - Exception and Error Classes - Catch Block Searching Pattern - Custom Exceptions. I/O STREAMS: Text And Binary Formats of Data Input Stream and Output Stream Classes - Reader and Writer Classes - Data Output Stream and Data Input Stream Classes.

Unit-IV

13 hr

THREADS: Life Cycle Of A Thread - Creating And Running Threads - Method In The Thread Class - Setting The Priority Of A Thread - Synchronization. NETWORKING: TCP Server Socket Class - TCP Socket Class.JAVA DATABASE CONNECTIVITY: Establishing AConnection - Creation Of Data Tables Entering Data Into The Tables - Table Updating.

Unit-V

13 hr

REMOTE METHOD INVOCATION: Remote Interface-Java.Rmi.Server Package TheNaming Class - Creating RMI Client And Server Classes. SERVLET: Servlet and Dynamic Webpages Life Cycle of a Servlet a Simple Servlet Javax.Servlet Package Retrieving the Values Of Parameters. COOKIES: Creating a Cookie and Sending it to the Client – Retrieving the Stored Cookies.

Text Book

1. C. Muthu, *Programming with JAVA*, Vijay Nicole Imprints Private Limited, 2 Ed, Chennai, 2011.

Book for Reference

1. Herbert Schildt, *Java 2: Complete Reference*, Tata McGraw Hill, 5th Ed., 2009.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1101	Title of the Paper PROGRAMMING IN JAVA										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	3	2	4	4	4	3	3	2	3	5	3.3	
CO2	4	4	2	3	4	3	3	5	2	4	5	3.5	
CO3	4	3	2	3	4	2	4	1	3	5	5	3.2	
CO4	5	2	2	2	4	3	3	5	2	4	5	3.3	
CO5	5	2	3	2	4	2	3	5	3	4	5	3.4	
CO6	5	3	2	3	4	3	4	5	3	4	5	3.7	
Overall Mean Score for COs												3.4	

Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

1

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester I
18PCS1102

Hours/Week: 5
Credits : 4

DATA SCIENCE USING PYTHON

Course Outcomes:

1. Understanding the basic concepts of Python
2. Preparing and pre-processing data
3. Visualizing the results of analytics effectively
4. Basic understanding of NumPy and Pandas
5. Ability to use conditional loops and list by python
6. Learn the Visualization through Matplotlib

Unit-I:

12 Hrs

Why Python for Data Analysis? - Essential Python Libraries – Installation and setup **python basics:** The python Interpreter- Ipython Basics- **Data Structure and Sequences:** Tuple - list

Unit-II

12 Hrs

NumPy Basics: Arrays and Vectorized Computation -The NumPyndarray: A Multidimensional Array Object - **Universal Functions:** Fast Element-wise Array Functions - File Input and Output with Arrays - Linear Algebra - Random Number Generation.

Unit-III

12 Hrs

Getting started with pandas: Introduction to pandas Data Structures - Essential Functionality - Summarizing and Computing Descriptive Statistics - Handling Missing Data -Hierarchical Indexing - Other pandas Topics.

Unit-IV

12 Hrs

Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format - Binary Data Formats - Interacting with HTML and Web APIs - Interacting with Databases - Data Wrangling: Clean, Transform, Merge, Reshape.

Unit-V

12 Hrs

Plotting and Visualization: A Briefmatplotlib API Primer - Plotting Functions in pandas -Python Visualization Tool Ecosystem - Time Series

Text Book:

1. Wes McKinney, "Python for Data Analysis", Published by O'Reilly Media, 2012, ISBN: 978-1-449-31979-3

- Jake Vander Plas, “Python Data Science Handbook”, O’Reilly Media Publishers, 2016.

Books for Reference

- Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
- Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python - Revised and Updated for Python 3.2”, Network Theory Ltd., 2011. <http://www.network-theory.co.uk/docs/pytut/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1102	Title of the Paper DATA SCIENCE USING PYTHON										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs	
CO1	4	3	3	4	4	4	3	3	2	3	3	3.2	
CO2	4	4	2	3	4	2	3	5	3	4	4	3.4	
CO3	4	3	2	3	4	3	4	3	3	5	4	3.4	
CO4	5	2	2	2	4	4	3	4	2	4	4	3.2	
CO5	5	5	3	3	4	2	4	3	3	5	4	3.7	
CO6	5	3	4	3	4	4	3	3	5	2	3	3.5	
Overall Mean Score for COs												3.4	

Note: Result: The Score for this Course is 3.4 (High Relationship)

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester I
18PCS1103

Hours/Week: 5
Credits: 4

MATHEMATICAL FOUNDATIONS

Course Outcomes

1. Ability to understand the basics of operation research techniques.
2. Understand the concept of graphical method
3. Ability to solve the recurrence relation.
4. Ability to apply the concepts of coding theory and how to measure the hamming distance.
5. Ability to understand the basic rules of logic.
6. Understand various Cryptography techniques

Unit-I: MATHEMATICAL LOGIC

13 hr

Propositions - Precedence Rules for Operators – Truth tables -Tautologies- Contradiction - Laws of Equivalence -Substitution Rules – Evaluation of Constant Proposition theorem - Well Defined Formula – Duality Law

Unit-II: RECURSION AND STATISTICAL ANALYSIS

13 hr

The Many Faces of Recursion- Sequences – Recurrence Relation- Some Common Recurrence Relation. Statistical analysis: F-distributions - chi-square Test- T test.

Unit-III: OPERATIONS RESEARCH

13 hr

Introduction - Basics of OR - OR & Decision Making - Linear Programming- Mathematical Formulation- Graphical Solution - Canonical & Standard Forms of LPP.

Unit-IV: SIMPLEX METHOD

13 hr

Simplex Method – Big M method – Assignment model TRANSPORTATION PROBLEM: North West Corner method – Least cost method – VAM method.

Unit-V: CODING THEORY

13 hr

Introduction– Cryptography- Caesar Cypher Coding- Matrix Encoding- Scrambled Codes- Hamming Metric- Hamming Distance- Error Detecting - Capability of an Encoding.

Text Books

1. David Gries, *The Science of Programming*, Narosa Pub. House, New Delhi, 1993. Unit: I.

2. Alan Doerr, Kenneth Levasseur, *Applied Discrete Structure for Computer Science*, Galgotia Pub., New Delhi, 1995, (Chapters: 8.1-8.4) Unit- II.
3. S.C.Gupta & V.K.Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons, New Delhi, 11th edition, 2007. Unit- II
4. Manmohan & Gupta, *Operations Research*, Sultan Chand Publishers, New Delhi, 2002. Unit: III
5. KantiSwarup, Gupta, ManMohan, *Operations Research*, 7th Ed., 1994. Unit: IV
6. James L. Fisher, *Application Oriented Algebra*, Dun Donnelly Pub., 1977. (Chapter 9.1 - 9.5 Only). Unit-V

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1103	Title of the Paper MATHEMATICAL FOUNDATIONS										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)						Mean Score of COs		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5			PSO6
CO1	4	4	4	4	4	4	4	3	3	4	4	3.8	
CO2	4	4	4	4	4	4	4	4	3	4	3	3.8	
CO3	4	4	4	3	4	4	4	4	3	4	4	3.8	
CO4	3	4	4	4	3	4	3	4	3	4	4	3.6	
CO5	4	4	4	4	4	4	4	4	3	4	3	3.8	
CO6	4	4	4	4	4	4	4	3	3	4	4	3.8	
Overall Mean Score for COs												3.7	

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester I
18PCS1104

Hours/Week: 5
Credits : 4

DATA STRUCTURES AND ALGORITHM DESIGN METHODS

Course Outcomes:

1. Learn the fundamentals of data structures with their implementation and its applications
2. Learn to design and analysis of algorithms and in various algorithm design strategies
3. Give importance to find the complexity (order) of algorithms
4. Understand sorting and searching techniques
5. Learn about the real-time problems using algorithms
6. Understand binary tree and its traversal

Unit-I: LINEAR DATA STRUCTURES

13 hr

Concepts Of Non-Primitive Data Structures - Storage Structure For Arrays - Stacks - Operations On Stacks - Queues - Priority Queues.

Unit-II: LINKED LINEAR LISTS

13 hr

Operations On Linked Linear Lists - Circularly Linked Lists - Doubly Linked Linear Lists. NON-LINEAR DATA STRUCTURE: Trees - Binary Trees – Tree Traversal - Operations On Binary Trees - AVL Trees - Storage Representation And Manipulations Of Binary Trees.

Unit-III: ALGORITHMS

13 hr

Algorithm Specification - Pseudo Code Conventions, Recursive Algorithms. DIVIDE AND CONQUER: General Method - Sequential Search - Binary Search - Finding The Maximum And Minimum - Merge Sort- Quick Sort- Insertion Sort - Selection Sort.

Unit-IV: GREEDY METHOD

13 hr

General Method - Knapsack problem - Job Sequencing With Deadlines - Optimal Merge Patterns – Spanning Tree - Minimum Cost Spanning Trees. ALGORITHM DESIGN METHODS: Sub goals - Hill Climbing and Working Backward - Heuristics - Backtrack Programming - Branch and Bound.

Unit-V: DYNAMIC PROGRAMMING

13 hr

General Method - Multistage Graphs – Single-Source Shortest Paths: General Weights - All Pair Shortest Path - Optimal Binary Search Trees - 0/1 Knapsack - Traveling Salesperson Problem.

Text Books

1. Jean-Paul Tremblay and Paul G.Sorenson, *An introduction to data structures with applications*, 2nd Ed, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995. Units I and II
2. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Computer Algorithms*, Galgotia Publications, New Delhi, 2007. Units III, IVa and V
3. S.E. Goodman and S.T. Hedetniemi, *Introduction to the Design and Analysis of Algorithms*, Tata McGraw Hill, International Edition, 1987.Unit: IVb

Books for Reference

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, *Fundamentals of Computer algorithms*, Galgotia Publications Pvt. Ltd., New Delhi, 2004.
2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, *Data Structures and Algorithms*, Addison Wesley, United States, 1987.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1104	Title of the Paper DATA STRUCTURES & ALGORITHM DESIGN METHODS										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	4	4	4	3	3	4	4	4	3.8	
CO2	4	4	4	4	3	3	4	4	3	3	4	3.6	
CO3	3	4	3	4	4	4	4	4	4	4	3	3.7	
CO4	4	4	4	3	4	4	4	4	4	3	4	3.8	
CO5	3	4	3	4	3	4	4	3	3	3	3	3.3	
CO6	3	4	3	3	3	4	3	4	3	4	3	3.3	
Overall Mean Score for COs												3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs =	Total of Values	Mean Overall Score for COs =	Total of Mean Scores
	Total No. of POs & PSOs		Total No. of COs

Software Lab-I
JAVA

Course Outcomes:

1. Demonstrate the basic concepts of OOPS
2. Implement the programming skills based on OOPS
3. Demonstrate the behavior of Exception handling and Multithreading
4. Implement the GUI techniques (Event handling, Applet and Swing).
5. Develop programming aspect with files and networking.
6. Apply JDBC methods to establish connection with database.

List of Practicals:

1. Classes & Objects
2. Packages & Interfaces
3. Inheritance
4. Exception Handling
5. Multithreading
6. Applet
7. Swing
8. Event Handling Mechanisms
9. Streams and Files
10. Networking
11. JDBC
12. Java Beans

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1105	Title of the Paper Software Lab-I: JAVA										Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
	4	3	2	4	4	4	3	3	2	3	5		
	4	4	2	3	4	1	3	5	2	4	4		
	4	3	2	3	4	2	4	1	3	5	5		
	5	2	2	2	4	1	3	5	2	4	5		
	5	5	1	3	4	2	4	1	3	4	5		
	5	3	2	3	4	4	1	3	5	2	5		
Overall Mean Score for COs												3.3	

Note: Result: The Score for this Course is 3.3 (High Relationship)

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Software Lab-I
PYTHON

Course Outcomes:

1. Design forms using various functions
2. Apply rich controls and conditional statement logic in Python
3. Demonstrate the functionality of stack and regular expressions through Python
4. Ability to Create and manipulate array functions using Numpy
5. Ability to Create indexing scripts using Pandas
6. Build applications using Pandas

List of Practicals

1. Write Python applications using variables, data types
2. Write Python application using strings and functions.
3. Write Python applications using loops, arrays, sorting
4. Write Python applications using dictionaries, lists and tuples.
5. Write Python applications using matrices.
6. Create Calculator Program
7. Array Function using Numpy
8. Aggregation function using Numpy
9. Data Operation using Scipy Basics
10. Pandas Basics
11. Twitter API Integration for tweet Analysis

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1106	Title of the Paper Software Lab-II: PYTHON											Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1	4	3	3	4	3	4	3	3	4	3	3	3.3		
CO2	4	4	3	3	4	3	3	4	3	4	4	3.5		
CO3	3	3	4	3	4	3	4	4	3	4	4	3.5		
CO4	4	4	4	4	3	4	3	3	4	4	4	3.7		
CO5	4	4	3	3	3	3	4	4	3	4	3	3.4		
CO6	4	3	3	3	4	4	3	3	4	3	4	3.4		
Overall Mean Score for COs													3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester I
18PCS1201A

Hours/Week: 4
Credits : 4

Core Elective-I
HIGH PERFORMANCE COMPUTING

Course Outcomes:

1. Understand fundamental concepts and techniques in parallel computation structuring and design.
2. To Study various architectures of high - performance computing systems.
3. To demonstrate the principles of Parallel Algorithm Design.
4. Investigate modern design structures of pipelined and multiprocessors systems.
5. Understand the algorithms using parallel programming principle.
6. To study about Parallel sparse matrix and vector multiplication

Unit-I **10 hr**

Modern Processors: Stored-program computer architecture – General-purpose cache-based microprocessor architecture – Memory hierarchies – Multi core processors - Multithread processors - Vector processors - Basic optimization techniques for serial code - Common sense optimizations - Simple measures - large impact - Role of compilers.

Unit-II **10 hr**

Parallel Computers: Data access optimization - Balance analysis and light speed estimates - Storage order - Taxonomy of parallel computing paradigms - Shared memory computers - Distributed memory computers - Hierarchical systems – Networks - Basics of parallelization- Parallelism – Parallel scalability.

Unit-III **10 hr**

Principles of Parallel Algorithm Design: Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.

Unit-IV **10 hr**

Sorting and Graph Algorithms: Dense matrix Algorithm: Matrix-vector multiplication - Matrix-matrix multiplication- Sorting: Issues in sorting on parallel computing - Sorting networks - Bubble sorts and its variants - Quick sort - Graph algorithms - Definition and representation - Prim's algorithm -

Dijkstra's algorithm - All pairs shortest path - Transitive closure – Connected components.

Unit-V **10 hr**

Shared-Memory Parallel Programming with OpenMP: Short introduction to OpenMP, Advanced OpenMP: Wavefront parallelization, Profiling OpenMP programs Performance pitfalls, Case study : OpenMP-parallel Jacobi algorithm & Parallel sparse matrix-vector multiply.

Text Books:

1. Georg Hager and Gerhard Wellein, *Introduction to High Performance Computing for Scientists and Engineers*, Chapman & Hall, 2010.
2. Ananth Grama and George Karypis, *Introduction to parallel computing*, Addison-Wesley 2009.

Books for Reference

1. John Levesque and Gene Wagenbreth, *High Performance Computing: Programming and Applications*, Chapman & Hall, 2010.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1201A	Title of the Paper Core Elective-I: HIGH PERFORMANCE COMPUTING										Hours 4	Credits 4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1	3	3	3	3	3	3	3	3	3	4	4	3.1		
CO2	3	4	3	3	3	3	3	4	4	3	4	3.3		
CO3	3	3	3	4	3	3	4	3	4	3	3	3.2		
CO4	4	3	3	3	4	3	3	3	4	4	3	3.3		
CO5	3	3	3	3	3	4	4	3	3	3	3	3.1		
CO6	3	4	3	3	3	4	3	4	3	4	3	3.3		
Overall Mean Score for COs														3.2

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester I
18PCS1201B

Hours/Week: 4
Credits : 4

Core Elective-I

ADVANCED MICROPROCESSORS & MICROCONTROLLERS

Course Outcomes:

1. Understand the architecture of 8086
2. Write simple 8086 programs
3. Compare the architectures of 286 to Pentium
4. Understand the need and use of 8051
5. Ability to understand the memory and Input addressing
6. Acquire basic knowledge of working of RTOS

Unit-I

10 hr

8086 ARCHITECTURE: PIN Diagrams - Timing Diagrams - Register Organization of 8086 - Architecture - Instruction Set of 8086. MICROPROCESSOR WITH MEMORY MANAGEMENT AND PROTECTION: Features of 80286 - Internal Architecture - Register Organization - Internal Block Diagram - Interrupts - Real and Protected Virtual Addressing - Interfacing Memory and I/O Devices with 80286 - Addressing Modes - Math Coprocessor.

Unit-II

10 hr

BEGINNING OF 32-BIT MICROPROCESSORS: Architecture of 80386 - Register Organization - Addressing Modes of 80386 - Data Types - Concepts of Addressing in Real and Protected Modes - Segmentation and Paging - Conversion of a Linear Address to a Physical Address - Features of 80486 - Architecture and Register Organization of 80486.

Unit-III

10 hr

PROCESSORS OF NEW MILLENNIUM: Salient Features of Pentium 4 - Modules of Pentium 4 Architecture: Front End Module, Out of Order Execution Engine, Execution Module, Memory Subsystem Module - Superscalar Execution - Pipelining -Hyper Threading in Pentium - RISC Processors: Basic Features and Advantages only.

Unit-IV

10 hr

MICROCONTROLLERS: Architecture of 8051 - Register set - Memory and I/ O Addressing - Interrupts - Six Addressing Modes - Ports of 8051 and their Operation - Architecture of 18-bit Microcontroller 80196.

Unit-V**10 hr****EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEMS (RTOS):**

Introduction to Multitasking - Simple Embedded Multitasking Systems - RTOS - Tasks in RTOS - Scheduling of Tasks - Resource Protection by Semaphore Concept - Examples of Applications: Temperature Monitor (Tasks, Programming, Hardware Requirements, Dealing with Numbers) - A Model Train Controller.

Text Books

1. A.K.Ray & K.M.Bhurchandi, *Advanced Microprocessors and Peripherals*, TMH, 2nd Ed., 2007. Units: I, II & III
2. Rajiv Kapadia, *8051 Microcontroller & Embedded Systems*, Jaico Publishing House, 2006. Units: IV & V

Books for Reference

1. Tim Wilmshurst, *An Introduction to the Design of Small Scale Embedded Systems*, Palgrave Publishers, 2004.
2. Muhammad Ali Mazidi *et al.*, *The 8051 Microcontroller and Embedded Systems*, Pearson Education, 2nd Ed., 2006.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18PCS1201B	Title of the Paper Core Elective-I: ADVANCED MICROPROCESSORS & MICROCONTROLLERS											Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1	4	3	4	3	4	4	3	3	4	4	4	3.63		
CO2	4	4	3	3	3	5	2	4	3	4	4	3.54		
CO3	3	4	4	4	3	3	4	3	5	4	3	3.63		
CO4	4	3	3	4	4	4	3	3	5	4	4	3.72		
CO5	4	4	5	3	3	3	2	4	4	5	4	3.72		
CO6	4	3	4	3	4	4	3	3	4	4	4	3.63		
Overall Mean Score for COs												3.64		

Result: The Score for this Course is 3.6 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs =	Total of Values	Mean Overall Score for COs =	Total of Mean Scores
	Total No. of POs & PSOs		Total No. of COs

Semester II
18PCS2107

Hours/Week: 5
Credits : 4

Online Course:
PROGRAMMING WITH C# USING ASP.NET

Course Outcomes:

1. Understand the concept and architecture of ASP.NET
2. Create rich GUI web applications using Visual Studio.NET
3. Learn and implement new features in ASP.NET
4. Discuss and extend data list and data grid controls
5. Demonstrate the database connectivity in ASP.NET
6. Learn the basics of XML and data caching

Objective :

1. Understand the concept and architecture Asp.net
2. Create rich GUI web applications using Visual Studio.NET
3. Learn and implement new features in ASP.NET

Total Hours:

60 Hours (Discussion – 40 + Outside – 20)

Intended for:

Any PG students with Computer Science Background

Prerequisite:

Students should know fundamentals of HTML Programming and perform CRUD operations in SQL Server database

Course Content :

<http://mail.sjctni.edu:8085/moodle/>

E-Contents will be available under Course Available M.Sc.Computer Science folder

Module Description	Discussion Hours	Outside Hours	Module Objective	Learning Outcome
Module I: .NET Basics <ul style="list-style-type: none"> • .NET Framework • Common Language Runtime (CLR) • Base Class Library • Common Type System (CTS) • Intermediate Language • Assemblies • Namespaces • Visual Studio IDE 	6	2	Understand the .NET framework and its various components.	a) Learn various components of .NET framework b) Learn how to use Visual Studio IDE
Module II: ASP.NET Web Applications <ul style="list-style-type: none"> • Components of ASP.NET Application • ASP.NET Page Processing • Server Controls, Validation Controls and User Controls • State Management • Master Pages • Caching • Configuration 	9	5	Understand ASP.NET Page processing, various server controls, validation controls and users controls used in web applications	a) Learn to apply various server controls and validation controls in web applications b) Learn to use State management Master Pages and caching techniques in web applications

Module Description	Discussion Hours	Outside Hours	Module Objective	Learning Outcome
Module III: ADO.NET <ul style="list-style-type: none"> • Introduction to ADO.NET • Data Access Components • Data Binding • Data Controls • Data Access using LINQ 	9	5	Understand database connectivity mechanism in ASP.NET and will learn how to implement CRUD operations in ASP.NET.	a) Learn to how perform CRUD operations in SQL Server database b) Learn bind and perform advanced data access operations using data controls c) Learn to perform data access using LINQ
Module IV: Security and Deployment <ul style="list-style-type: none"> • Authentication • Authorization • Code Access Security • Debugging Web Application using Visual Studio • Managing Website with IIS Manager • Deploying a Simple Website 	6	4	Understand how security concepts are implemented in ASP.NET and Deploy a simple website	a) Learn Security concepts in ASP.NET b) Learn to deploy a simple ASP.NET website
Module V: Core Development <ul style="list-style-type: none"> • MVC Framework • AJAX • Silverlight • Web Services 	10	4	Understand core development concepts like MVC, AJAX, Silverlight and Web Services	a) Learn to implement a simple project in MVC framework b) Learn to create and consume a simple web service

Module	Case Studies (Marks)	Single Page Report (Marks)	E-Content Presentation (Marks)
Module 1	5	2	5
Module 2	5	2	5
Module 3	5	2	5
Module 4	5	2	5
Module 5	5	2	5

1. All the components will be conducted by the staff member assigned for the Programme
2. Single Page Report will be submitted via Edmodo
3. E-Content will be presented during the discussion hours

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2107	Title of the Paper Online Course: PROGRAMMING WITH C# USING ASP.NET										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	4	4	4	3	4	3	4	3	4	4	3.6	
CO2	4	3	4	4	4	4	4	4	4	4	4	3.9	
CO3	4	4	4	3	4	4	4	4	3	4	4	3.8	
CO4	4	4	4	3	4	4	4	4	4	4	4	3.9	
CO5	4	4	4	4	4	3	3	4	4	4	4	3.8	
CO6	4	4	4	4	4	4	4	3	4	4	4	3.9	
Overall Mean Score for COs												3.8	

Result: The Score for this Course is 3.8 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

**Semester II
18PCS2108**

**Hours/Week: 5
Credits : 4**

DATABASE AND NoSQL

Course Outcomes:

1. Understand the concept of database and data warehouses.
2. Knowledge on MongoDB query language.
3. Ability to comprehend the principles of NoSQL.
4. Understand the difference of NoSQL key value database and Document database
5. Know the concept of Column database
6. Understand the data modelling techniques

UNIT-I

13 hr

Database Revolutions- System Architecture- Relational Database- Database Design Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval.

UNIT-II

13 hr

Introduction to MongoDB key features- Core Server tools- MongoDB through the JavaScript's Shell- Creating and Querying through Indexes- Document-Oriented, principles of schema design- Constructing queries on Databases- collections and Documents- MongoDB Query Language.

UNIT-III

13 hr

NOSQL DATABASE: RDBMS VS NOSQL - Data Management with Distributed Databases- ACID and BASE- Four types of NOSQL Databases. KEY VALUE DATABASES: Introduction to key value databases- Essential Features of Key value Databases- Key-Value Database Data Modeling Terms- Key-Value Architecture Terms- Key-Value Implementation Terms.

UNIT-IV

13 hr

DOCUMENT DATABASE: Introduction to Document Database: Document-managing Multiple Document in collection-Basic Operations on document Database- Types of Partitions- Data modeling and Query processing- Normalization, Denormalization, and the Search for proper Balance.

UNIT-V

13 hr

COLUMN DATABASE: Introduction to Column Family Database: Utilizing Dynamic Control over Column- Indexing by row, column name and Time Stamp- Controlling Location of data- Reading and Writing Atomic Rows-

Maintaining rows in Sorted Order- Column Family Database Features-
Column family Database Versus Relational Database- Basic Components of
Column Family database

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, *Database System Concepts*, Sixth Edition, McGrawHill.
2. Dan Sullivan, *NoSQL for Mere Mortals*, Addison-Wesley, 2015.

Book for References:

1. Kyle Banker, Piter Bakkum, Shaun Verch, *MongoDB in Action*, Dream tech Press.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2108	Title of the Paper DATABASE AND NoSQL										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	3	3	4	4	3	4	3	2	3	4	3.2	
CO2	3	4	3	3	4	4	3	4	3	3	2	3.2	
CO3	4	2	4	5	3	3	3	3	4	4	3	3.4	
CO4	3	3	4	2	4	4	3	4	3	4	4	3.4	
CO5	3	4	3	4	3	3	4	3	4	2	3	3.2	
CO6	4	3	2	4	4	3	4	2	3	3	4	3.2	
Overall Mean Score for COs													3.3

Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Software Lab-III
ASP.NET

Course Outcomes:

1. Design forms using various web controls
2. Apply rich controls and validation controls to the web page
3. Incorporate cookies, session and application state in a web page
4. Create and manipulate the data in the database using ADO.NET
5. Create a template using data list and data grid
6. Build an application using XML

List of Practicals :

1. Form Design using Web Controls
2. Validation Controls
3. State Management
4. Advance ASP.NET Controls
5. Data Access using ADO.NET
6. Data Binding and Data Controls
7. AJAX
8. LINQ and SilverLight
9. Simple MVC Project
10. Simple Web Service

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2109	Title of the Paper Software Lab-III: ASP.NET										Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	4	4	4	3	4	3	4	3	4	4	3.6	
CO2	4	4	4	4	4	3	4	4	4	4	4	3.9	
CO3	4	4	3	4	4	4	4	4	4	4	4	3.9	
CO4	4	4	4	4	4	4	4	4	4	3	4	3.9	
CO5	3	4	4	4	4	4	4	4	4	4	3	3.8	
CO6	4	4	4	4	4	3	4	4	4	4	3	3.8	
Overall Mean Score for COs												3.8	

Result: The Score for this Course is 3.8 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$		Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
--	--	--	--

Software Lab-IV
MongoDB

Course Outcomes:

1. Create a simple Structured query program
2. Design database using MongoDB
3. Apply distributed techniques for querying documents and modification
4. Ability to process and design forms to upload the JSON files
5. Test and debug regular expression and indexing
6. Design and Manipulate forms to provide user authentication.

List of Practicals :

1. Simple SQL Programs
2. MongoDB Create & Insert Database
3. MongoDB Query Document
4. MongoDB Query Modifications
5. JSON file program
6. Search Text
7. Regular Expression
8. Operation on Document
9. MongoDB Replication
10. MongoDB Indexing

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2110	Title of the Paper Software Lab-IV: MongoDB										Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	3	4	3	4	4	4	4	3	3.7	
CO2	4	4	4	4	4	4	3	4	4	3	4	3.8	
CO3	4	4	4	4	4	4	3	4	4	4	3	3.8	
CO4	4	4	4	4	3	4	3	4	4	4	3	3.7	
CO5	3	4	4	4	3	4	4	3	4	4	4	3.7	
CO6	4	4	3	4	4	3	4	4	3	4	3	3.7	
Overall Mean Score for COs												3.7	

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$		Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
--	--	--	--

Semester II
18PCS2202A

Hours/Week: 4
Credits : 4

Core Elective-II:
COMPILER DESIGN

Course Outcomes:

1. Apply skills and familiarity which are applicable to a broad range of computer applications.
2. Design and develop a comprehensive Compiler for a given language
3. Implement various parsing, conversion, optimization and code generation algorithms for the design of a compiler.
4. Understand the concept parsing techniques
5. Able to understand the memory allocation
6. Understand the Loop Optimization and DAG

Unit I:

10 hr

INTRODUCTION: Different Phases of Compiler - Finite State Automation and Lexical analysis - A Simple Approach to the Design of Lexical Analyzers - Regular Expressions - A Language for Specifying Lexical Analyzers.

Unit II:

10 hr

SYNTAX SPECIFICATION: Context Free Grammars - Parsers - Derivation and Parse trees- Shift Reduce Parsing - Operator Precedence Parsing - Top-Down Parsing – Predictive Parsers.

Unit III:

10 hr

CODE GENERATION: Intermediate Code Generation - Translation - Implementation of Syntax - Directed Translators - Intermediate Code – Postfix Notation - Parse Trees and Syntax Trees - Three Address Codes, Quadruples and Triples.

Unit IV:

10 hr

SYMBOL TABLES: Contents of a Symbol Table - Data Structures for Symbol Tables - Implementation of a Simple Stack Allocation Scheme - Implementation of Block Structured Languages - Storage Allocation in Block Structured Languages - Errors - Lexical Phase Error.

Unit V:

10 hr

CODE OPTIMIZATION AND CODE GENERATION: Elementary Code Optimization technique - Loop Optimization - DAG Representation of Basic Blocks - Value Numbers and Algebraic Laws - Object Programs - Problems in Code Generation - A Machine Model - A Simple Code Generator.

Text Book

1. Alfred V. Aho, Jeffery D. Ullman, "Principles of Compiler Design", Narosa, New Delhi 2002. Ch: 1.1-1.11, 3.1-3.7, 4.1, 4.2, 5.1-5.5, 7.1-7.6, 9.1, 9.2, 10.1, 10.2, 11.1, 11.2, 12.1-12.4, 15.1-15.4

Books for Reference

1. Dick Grune, Henri E. Bal, Criel J. H. Jacobs, Koen G. Langondeon, "Modern Compiler Design", Wiley, Singapore, 2003.
2. Loudon K., "Compiler Construction, Principles and Practice", Thomson, New Delhi, 2003.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2202A	Title of the Paper Core Elective: COMPILER DESIGN										Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	3	4	4	3	3	3	2	3	3	4	3.18	
CO2	4	2	3	4	3	4	3	4	4	1	2	3.09	
CO3	4	1	3	4	4	3	4	2	4	3	4	3.27	
CO4	5	1	4	5	4	2	4	2	3	3	4	3.36	
CO5	4	3	3	4	4	1	3	3	4	4	4	3.36	
CO6	4	1	3	4	3	3	3	3	4	3	4	3.20	
Overall Mean Score for COs												3.25	

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

**Semester II
18PCS2202B**

**Hours/Week: 4
Credits : 4**

Core Elective-II: ETHICAL HACKING

Course Outcomes:

1. Defend hacking attacks and protect data assets
2. Defend a computer against a variety of security attacks using various tools
3. Practice and use safe techniques on the World Wide Web.
4. Understand the techniques of Keyloggers and Spyware.
5. Able to know about the concept of Penetration Testing
6. Apply skills for different types of test

Unit I

12 hr

INTRODUCTION TO HACKING: Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Footprinting – Information Gathering Methodology – Footprinting Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines

Unit II

12 hr

INTRODUCTION TO SCANNING: Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools

Unit III

12 hr

CRACKING PASSWORDS: Password Cracking Websites – Password Guessing – Password - Cracking Tools – Password Cracking - Counter measures – Escalating Privileges – Executing Applications - Keyloggers and Spyware.

Unit IV

12 hr

PROGRAMMING FUNDAMENTALS: C Language – Html – Perl – Windows OS Vulnerabilities – Tools For Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools For Identifying Vulnerabilities – Countermeasures.

Unit V

12 hr

SECURITY ASSESSMENTS: Types of Penetration Testing- Phases of Penetration Testing – Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools.

Text Book

1. Ec-Council, “Ethical Hacking and Countermeasures: Attack Phases”, Delmar Cengage Learning, 2009.

Books for Reference

1. Michael T. Simpson, Kent Backman, James E. Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning, 2012.
2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy”, Syngress Media, Second Revised Edition, 2013.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2202B	Title of the Paper Core Elective-II: ETHICAL HACKING										Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	3	4	4	4	3	3	4	4	3.7	
CO2	4	4	4	3	4	4	4	4	3	4	3	3.7	
CO3	4	4	4	3	3	4	4	4	3	4	4	3.7	
CO4	3	4	4	4	3	4	4	4	4	4	4	3.8	
CO5	3	3	4	4	4	3	3	3	4	4	4	3.9	
CO6	4	1	3	4	3	3	3	3	4	3	4	3.1	
Overall Mean Score for COs												3.6	

Result: The Score for this Course is 3.6 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester II
18PCS2111

Hours/Week: -
Credits : 2

Self-paced Learning:
COMPUTER NETWORKS

Course Outcomes:

1. Define the services, functions, and inter-relationship of different layers in network models
2. Describe how modules in different layers inter-operate and analyze their enactment.
3. Learn various protocols used in communication.
4. Understand the various networks and switching concept
5. Know about the various technology using internet protocols
6. Understand the concept of Quality of Service

Unit-I

INTRODUCTION: Data Communications - Networks - The Internet – Protocols and Standards - Network Models - Layered Tasks - The OSI Model – Layers in the OSI Model - TCP/IP Protocol Suite – Addressing.

Unit-II

PHYSICAL LAYER and MEDIA: Analog and Digital - Analog to Digital Conversion - Transmission Modes - Digital to Analog Conversion - Multiplexing - Transmission Media - Guided Media - Unguided Media - Switching - Circuit Switched Networks - Datagram Networks - Virtual Circuit Networks

Unit-III

DATA LINK LAYER: Error Detection and Correction – Block Coding - Cyclic codes - Checksum - Data Link Control- Framing - Flow and error control - Protocols - Noiseless Channels - Noisy Channels -Point to Point Protocol - Channelization - IEEE 802.11 - Bluetooth - Cellular Telephony - Satellite Networks.

Unit-IV

NETWORK LAYER: IPV4 Addresses - IPV6 Addresses - Internetworking - IPV4 - IPV6 - Transition from IPV4 to IPV6 - Address mapping - ICMP – IGMP - Delivery - Forwarding - Unicast Routing Protocols - Multicast Routing Protocols.

Unit-V

TRANSPORT LAYER: Process to Process Delivery - UDP - TCP - SCTP - Data Traffic - Congestion - Congestion Control - Quality of Service. APPLICATION LAYER: Name Space - Domain Name Space – Remote Logging - Email & File Transfer.

Text Book

1. Behrouz A.Forouzan, *Data Communications and Networking*, Tata McGraw Hill Publishing Company Limited, 4th Edition , New York, 2009.

Books for Reference

1. Andrew S. Tanenbaum, *Computer Networks*, Pearson Education, Fifth Edition, New Delhi, 2011.
2. William Stallings, *Data and Computer Communication*, Dorling Kindersley Pvt. Ltd., India, Ninth Edition, 2018.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2111	Title of the Paper Self-paced Learning: COMPUTER NETWORKS										Hours -	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	3	4	3	4	4	3	3	4	4	4	3.63	
CO2	4	4	3	3	3	5	2	4	3	4	4	3.54	
CO3	3	4	4	4	3	3	4	3	5	4	3	3.63	
CO4	4	3	3	4	4	4	3	3	5	4	4	3.72	
CO5	4	4	5	3	3	3	2	4	4	5	4	3.72	
CO6	3	4	3	4	3	2	4	3	4	4	3	3.36	
Overall Mean Score for COs												3.60	

Result: The Score for this Course is 3.6 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester II
18PSS2301

Hours/Week: 4
Credits : 4

IDC: SOFT SKILLS

Course Outcomes:

- Students are taught the various nuances of grooming such as, good manners and etiquettes and they are trained to practice them in the class rooms.
- Students are empowered with public speaking skills via extempore speeches and prepared speeches, presented before the class and assessed by the trainer as well as the companions which eventually helps build self confidence of the students.
- Students learn the different types of resumes and different types of interview skills and write and print their own resumes and present before the interview panel for their mock interview.
- Students actively learn the ten parameters of group discussion, perform on the stage with their colleagues, which is videotaped, reviewed and evaluated.
- As students go through their teenage, self discovery becomes a tool to develop their personality facilitated with scientific psychological personality tests.
- Students are guided to knowing their SWOT (Strengths, Weaknesses, Opportunities and Threats) and setting their short term and long term goals for their lives.

Module 1: Basics of Communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication, **Effective Communication:** The Art of Listening, Exercises in Kinesthetics, Production of Speech, Organization of Speech, Modes of delivery, Conversation Techniques, Dialogue, Good manners and Etiquettes, Politeness markers & Listening links.

Module II: Resume Writing: What is Resume? Types of Resume? Chronological, Functional and Mixed Resume, Steps in preparation of Resume, structure and framework for writing resume, Intensive training / personalized training on resume writing. **Interview Skills:** Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Module III: Group Discussion: Group Discussion Basics, GD Topics for Practice, Points for GD Topics, Case-Based and Article based Group Discussions, Points for Case Studies, and Notes on Current Issues for GDS & Practicum with video coverage. **Team Building:** Team Vs Group – Synergy,

Stages of Team Formation, Broken Square-Exercise, Win as much as you win- Exercise, Leadership – Styles, Work ethics.

Module IV: Personal Effectiveness: Self Discovery, Self Esteem, Goal setting, Problem-solving, Conflict and Stress Management

Module V: Numerical Ability: Average, Percentage, Profit and Loss, Problems on ages, Simple Interest, Compound Interest, Area, Volume and Surface Area, Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Boats and Streams, Calendar, Clocks, Permutations and Combinations, Probability.

Module VI: Test of Reasoning: Series Completion, Analogy, Data Sufficiency, Blood Relations, Assertion and Reasoning, Logical Deduction, Direction.

Non-Verbal Reasoning: Series, Classification

Text Book

1. Melchias, G., Balaiah John., John Love Joy (Eds) 2015. *Winners in the making*. St. Joseph's College, Trichy-2

References

1. Aggarwal, R. S. *Quantitative Aptitude*, S.Chand & Sons
2. Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*. S. Chand & Co, Revised Edition.
3. Covey, Stephen. (2004). *7 Habits of Highly effective people*, Free Press.
4. Egan Gerard (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/ Cole.
5. Khera, Shiv (2003). *You Can Win*. Macmillan Books, Revised Edition.
6. Murphy, Raymond. (1998). *Essential English Grammar*. 2nd ed., Cambridge University Press.
7. Prasad, L. M. (2000). *Organizational Behaviour*, S.Chand & Sons.
8. Schuller, Robert. (2010). *Positive Attitudes*. Jaico Books.
9. Trishna's (2006). *How to do well in GDs & Interviews*, Trishna Knowledge Systems.
10. Yate, Martin. (2005). *Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting*.

Modules	Topics	Examination Pattern	
		CIA	Online
I	Basics of Communication	15	5
II	Resume Writing & Interview Skills	15	5
III	Group Discussion & Team Building	10	5
IV	Personal Effectiveness	10	5
V	Numerical Ability (Common Session)	5	10
VI	Test of Reasoning (Common Session)	5	10
Total		60	40

Semester II 18PCS2301

Hours/Week: 4
Credits : 4

IDC (WS): PERVASIVE AND AD HOC NETWORKS

Course Outcomes:

1. Understand the basics of Mobile Adaptability
2. Comprehension of Ad Hoc Networks and their security
3. Understanding of Wireless Network Security mechanisms
4. Able to know about Integrity Codes
5. Understand the concept of Authentication
6. Learn the concept of Equivalent Privacy

Unit I

10 hr

MOBILE COMPUTING: Adaptability - The Key to Mobile Computing - Mechanisms for Adaptation - Development or Incorporation of Adaptations in Applications. MOBILITY MANAGEMENT: Concept of Mobility Management - Location Management - Principles and Techniques.

Unit II

10 hr

DATA DISSEMINATION: Mobile Data Caching - Mobile Cache Maintenance Schemes - Mobile Web Caching. CONTEXT-AWARE COMPUTING: Ubiquitous of Pervasive Computing - Various Definitions and Types of Contexts - Context Aware Computing & Applications - Middleware Support. INTRODUCTION TO MOBILE MIDDLEWARE: Definition of Mobile Middleware - Application - Agents - Service Discovery.

Unit III

10 hr

INTRODUCTION TO AD HOC AND SENSOR NETWORKS: Overview - Properties of an Ad hoc Network -Unique Features of Sensor Networks - Proposed Applications -Challenges - Constrained Resources - Security - Mobility.

Unit IV

10 hr

WIRELESS SECURITY: Traditional Security Issues – Mobile and Wireless Security Issues. - Problems in Ad-hoc Networks. APPROACHES TO SECURITY: Limit the Signal -Encryption - Integrity Codes - IPSec – Other Security Related Mechanisms.

Unit V

10 hr

SECURITY IN WPAN: Security in Wireless Personal Area Networks - Basic Idea - Bluetooth Security Modes - Basic Security Mechanisms.

ENCRYPTION: Authentication - Limitation and Problems. SECURITY IN WLAN: Security in Wireless Local Area Networks - Basic Ideas - Wired-Equivalent Privacy (WEP) - WEP Fixes and Best Practices.

Text Books

1. Frank Adelstein, Sandeep K.S., Gupta Golden G. Richard III Loren Schwibert "Fundamentals of Mobile and Pervasive Computing", TMG Ed. Pvt. Ltd., 2005.

Books for Reference

1. Roopa R Yavagal, Hasan Ahmed, Asoke K Talukder, "Mobile Computing: Technology, Applications and Service Creation", 2nd Ed., Tata McGraw Hill Pvt. Ltd., 2010.
2. UweHansmann, Martin S. Nicklous, LotharMerk, Thomas Stober, "Principles of Mobile Computing", 2nd Ed., Springer, 2006.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester II	Code 18PCS2301	Title of the Paper IDC (BS): PERVASIVE AND AD HOC NETWORK										Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
	5	5	3	2	4	4	5	2	4	4	4		
	4	4	2	1	4	4	4	2	4	4	4		
	5	4	3	2	4	4	4	2	4	3	4		
	4	4	2	4	1	4	4	2	2	3	3		
	5	5	2	2	1	4	4	2	2	4	4		
	3	4	3	4	3	2	4	3	4	4	3		
	Overall Mean Score for COs												3.4

Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester III
18PCS3113

Hours/Week: 5
Credits : 4

**Online Course:
BIG DATA ANALYTICS**

Course Outcomes:

1. Understand the concept and challenge of big data and why existing technology is inadequate to analyze the Big Data;
2. Collect, manage, store, query, and analyze various form of Big Data;
3. Gain hands-on experience on large-scale analytics tools to solve some open big data problems;
4. Understand the impact of big data for business decisions and strategy.
5. Address the limitations and challenges of working in a Big Data environment and thus utilize the opportunities for commercial and/or social benefit.
6. Understand the workings of various tools using Big Data

Objective :

1. Introduce the students the concepts of big data and various techniques used with big data
2. Teach the students in applying skills and tools to analyse big data

Total Hours:

60 Hours (Contact – 36 + Outside – 24)

Intended for :

Any PG students with Computer Science Background

Prerequisite :

Students should know fundamentals of RDBMS, SQL Queries and some basic programming

Course Content :

<http://mail.sjctni.edu:8085/moodle/> E-Contents will be available under Course Available ? M.Sc. Computer Science Folder

Module Description	Discussion Hours	Outside Hours	Module Objective	Learning Outcome
Module I: Introduction to Big Data <ul style="list-style-type: none"> • Business Importance of Big Data • Characteristics of Big Data • Big Data Processing • Tools and Techniques for Analysing Big Data • Demonstration - Movie Review Analysis 	4	2	To understand big data concepts and its importance in business field	a) Understand basics of big data b) Have a clear idea on the various tools and techniques used with big data c) Perform some analysis based on sample dataset
Module II: Hadoop Fundamentals <ul style="list-style-type: none"> • Hadoop Architecture • Hadoop Installation Prerequisite • Single Node vs Multi Node Installation • Overview of Hadoop Ecosystem • Demonstration - Single node Installation 	4	4	To understand Hadoop Framework and try hands on in Hadoop single node installation	a) Understand Hadoop Architecture b) Installing Hadoop in Single node c) Understand Hadoop Ecosystem components
Module III: Map Reduce Programming <ul style="list-style-type: none"> • Map Reduce Architecture • Map Reduce Internals • Map Reduce Phases • Text processing using Python Language • Demonstration - Word Count 	8	6	To understand various phases of Map Reduce Programming and how to perform Text processing using Python	a) Understand fundamentals of Map reduce programming b) Understand how to process text information c) Execute simple Map Reduce programmes

Module Description	Discussion Hours	Outside Hours	Module Objective	Learning Outcome
Module IV: NoSQL <ul style="list-style-type: none"> • Move to NoSQL from RDBMS • NoSQL Features • Overview of MongoDB • MongoDBvs Other NoSQL databases • Demonstration: Working MongoDB with CatLog 	10	6	To understand the fundamentals of NoSQL and in particular about MongoDB	a) Understand the nuances of NoSQL databases b) Working with MongoDB
Module V: Data Analytics using Pig <ul style="list-style-type: none"> • Introduction to Pig • Pig Data Types • Representing Data in Pig • Pig Queries • Demonstration: Pig • Installation and executing sample queries 	10	6	To understand data analysis using Hadoop Ecosystem tool Pig	a) Understand how to analyse data using Pig b) Execute Sample Pig Queries

Case Studies

Module I - Social Media Analytics to analyse sentiments

Module II - Hadoop Single Node Installation

Module III - Log File Analysis

Module IV - Retrieve restaurant data using MongoDB

Module V - Executing Sample Pig queries

Module	Case Studies (Marks)	Single Page Report (Marks)	E-Content Presentation (Marks)
Module1	5	2	5
Module 2	5	2	5
Module 3	5	2	5
Module 4	5	2	5
Module 5	5	2	5

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3113	Title of the Paper Online Course: BIG DATA ANALYTICS										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	4	4	4	4	3	3	4	4	4	4	3.7	
CO2	4	3	4	4	3	4	4	4	3	3	4	3.6	
CO3	4	3	4	3	4	4	3	4	4	3	3	3.5	
CO4	3	3	4	3	4	3	4	4	4	4	4	3.6	
CO5	4	4	4	4	4	4	4	4	4	4	4	4.0	
CO6	4	4	4	4	3	4	3	4	4	4	4	3.8	
Overall Mean Score for COs												3.7	

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs =	Total of Values	Total of Mean Scores
	Total No. of POs & PSOs	Total No. of COs

**Semester III
18PCS3114**

**Hours/Week: 5
Credits : 4**

JAVA SCRIPT WITH PHP AND MYSQL

Course Outcomes:

1. Understand the concept of Internet programming using JavaScript
2. Describe the basic JavaScript syntax and structures
3. Use regular expressions for form validation.
4. Understand the use of event-handlers and the Document Object Model
5. Understand the basic functionality of PHP scripting
6. The ability to understand PHP, MYSQL and AJAX concepts

Unit-I

12 hr

JAVASCRIPT OVERVIEW: JavaScript and the Web – Uses of JavaScript – Development Tools – Web Browsers – Linking JavaScript. DATA TYPES AND VARIABLES: Types of Data in JavaScript – Variables – Storing Data in Memory – Basic String Manipulation – Arrays. DECISION AND LOOPS: Decision Making – Looping.

Unit-II

13 hr

FUNCTIONS: Scope and Lifetime – Functions as Values. OBJECT ORIENTED JAVASCRIPT – Using JavaScript Objects – JavaScript Native Object Types. STRING MANIPULATION: String Methods – Regular Expressions – String Object – Date, Time and Timers.

UNIT-III

14 hr

ADVANCED JAVASCRIPT: Programming the Browser – DOM Scripting. EVENTS: The Standard Event Model – Cross Browser Code – Drag and Drop. HTML FORMS: HTML Elements in Forms – Button, Text Elements – Common Properties – Object Properties and Methods. DATA STORAGE: Cookie String – Creating Cookies – Web Storage.

UNIT-IV

13 hr

INTRODUCTION: Brief Introduction to PHP, Apache, MySQL, and Open Source - Pieces of AMP Module - PHP Structure and Syntax. STRINGS AND ARRAYS: String Functions- Converting to and from Strings - Formatting Text String -Modifying Data in an Array- Deleting Array Elements- Arrays with Loops - PHP Array Functions - Sorting Arrays - Splitting and Merging Arrays. CREATING FUNCTIONS: Passing Functions - Passing Arrays to Functions- Passing by Reference.

UNIT-V**13 hr**

USING PHP WITH MYSQL: MySQL Structure and Syntax - Connecting to MySQL Server - Querying the Database. USING TABLES TO DISPLAY DATA: Creating a Table - Populating Table - Creating Master/Child Relationship - Form Elements – Session – Cookie. DATABASE OPERATIONS: Inserting – Deleting – Editing. MANIPULATING AND CREATING IMAGES: Working with GD Library - Upload Images - Converting Image Files Types- Validating User Input. AJAX: Using XMLHttpRequest Object – Creating a Simple Ajax Module – Validating Form Fields with Ajax.

Text Books

1. Jeremy McPeak, Paul Wilton” Beginning JavaScript “,5th Edition, John Wiley & Sons, Inc, USA, 2015. Units: I, II, III & V (AJAX)
2. Elizabeth Naramore, Jason Gerner, “Beginning PHP5, Apache, MySQL, with Web Development”, Wiley Publishing, Inc., Indianapolis, Indiana, 2005. Units: IV (Introduction) & V
3. Steven Holzner,”The Complete Reference PHP”, Tata McGraw Hill Pvt.Ltd., 2008.Units: IV (Strings and Arrays - Creating Functions) & V

Books for Reference

1. Jason Gerner Elizabeth Naramore, Morgan L. Owens, Matt Warden, “Professional Lamp, Linux, MySQL and PHP5 and Web Development”, Wiley Publishing, 2006.
2. James Lee, Brent Ware, “Open Source Web Development with LAMP using Linux, Apache, MySQL, PERL and PHP”, Pearson, 2003.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3114	Title of the Paper JAVA SCRIPT WITH PHP AND MYSQL										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	4	4	4	4	3	3	4	4	3.8	
CO2	4	4	4	4	4	4	4	4	3	4	3	3.8	
CO3	4	4	4	3	4	4	4	4	3	4	4	3.8	
CO4	3	4	3	4	3	4	3	3	3	4	4	3.4	
CO5	4	4	4	4	4	4	4	4	3	4	3	3.8	
CO6	4	4	3	4	3	3	3	3	4	4	4	3.5	
Overall Mean Score for COs												3.6	

Note: Result: The Score for this Course is 3.6 (High Relationship)

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$		Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
--	--	--	--

Semester III
18SCS3101B

Hours/Week: 6
Credits : 5

Interdisciplinary Core:
MOBILE APPLICATION DEVELOPMENT

Course Outcomes:

1. Understand the basic concept of mobile devices and types of mobile operating system
2. Ability to know the concept of cross platform system architecture
3. Use the development tools in the Android development environment
4. To develop their own apps using the major components of Android API
5. Use the Java programming language to build Android apps
6. Analyze the concept of android SQLite and managing database.

Unit-I **9 hr**

MOBILE APPLICATION DEVELOPMENT: Mobile Device Evolution – Smart Phone's- Tablet PC's – Classic MAD Challenges – Mobile Platform – Types of Mobile Platforms(Mobile OS) – Mobile Applications - Cross Platform Mobile Apps Development- Benefits of Cross Platform MAD – Cross Platform System Architecture.

Unit-II **13 hr**

ANDROID: Introduction to Android – History of Android – Android Architecture – App Architecture – Activities in Depth – Services in Depth – Installing the Android SDK – Installing an Android Platform – Creating an Android Virtual Device – Starting the AVD.

CREATING ANDROID PROJECT: Starting a New Project in Eclipse - Deconstructing Your Project – Setting up an Emulator – Creating Launch Configuration – Running the Hello Android App – Understanding the Project Structure.

Unit-III **13 hr**

USER INTERFACE RECIPIES: Customizing the Window – Creating and Displaying Views – Creating Popup Menu Actions – Scrolling Text View Ticker – Animating a View – Creating Draw Tables as Backgrounds – Applying Masks to Images.

Unit-IV **18 hr**

UNDERSTANDING ANDROID RESOURCES : Understanding Resources - Dimensions - Styles - Themes - Values - Menus – Colors - Working with Resources - Moving Strings into Resources - Making Your Apps Global with

Resources. TURNING YOUR APPLICATION INTO A HOME-SCREEN WIDGET: Working with App Widgets in Android - Working With Remote Views - Using App Widget Providers - Working With Pending Intents - Understanding the Android Intent System - Understanding Intent Data - Evaluating Intents - Using Pending Intents - Creating the Home-Screen Widget - Implementing the App Widget Provider Communicating with the App widget - Building the App Widget's Layout - Doing Work Inside an App Widget Provider.

Unit-V **12 hr**

PERSISTING DATA: Persisting Data – Reading and Writing Files – Using Files As Resources - Managing Database – Querying the Database – Backing Up Data – Sharing Your Database – Sharing Your Other Data.

Text Books

1. Yonathan Akilu Redda, “Cross Platform Mobile Applications Development” NTNU, 2012 Unit-I.
2. Dave smith, Jeff Friesen, “Android Recipes Problem Solution Approaches”, Apress, 2011. Units IIa, III, V.
3. Donn Felker, “Android Application Development for dummies”, Wiley Publishing Inc, 2011. Unit-IIb, IV.

Books for Reference

1. Jerome J.F DiMarzio, “Android a programmers guide” McGraw-Hill, 2008.
2. Wei-Meng Lee, “Beginning Android Application Development” Wrox publications, 2011.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18SCS3101B	Title of the Paper Inter-disciplinary Core: MOBILE APPLICATION DEVELOPMENT USING ANDROID										Hours 6	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	3	4	4	4	4	3	3	4	4	4	4	3.7
CO2	4	4	4	3	3	3	4	4	3	3	4	4	3.5
CO3	3	4	4	4	4	4	4	3	4	4	3	4	3.7
CO4	4	3	4	3	4	4	4	4	4	3	4	4	3.7
CO5	4	4	4	4	4	4	4	4	4	4	4	4	4.0
CO6	4	4	3	4	3	4	3	4	4	4	3	4	3.6
Overall Mean Score for COs												3.7	

68

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

**Semester III
18PCS3115**

**Hours/Week: 3
Credits : 2**

Software Lab-V: PHP

Course Outcomes:

1. Ability to create dynamic interactive websites using Javascript
2. Ability to create content to interacts with the databases
3. Understand the functionality of Javascript
4. The Ability to understand Php, Mysql and Ajax Concepts
5. Understand the concept of cookies and function
6. Understand the functionality of get and post method

Experiments

JavaScript

1. Basic Methods
2. Functions
3. Strings
4. Events
5. Validation
6. Array and Date and time

PHP MySQL

7. Variables and Constants
8. Functions
9. Cookies
10. Forms - Get & Post
11. Database CRUD Operations
12. Student Mark list using MySQL

69

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3115	Title of the Paper Software Lab-V: PHP										Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	4	4	4	3	4	4	3	4	3.8	
CO2	4	4	4	3	4	3	4	4	4	4	3	3.7	
CO3	3	4	4	4	3	4	4	3	4	4	4	3.7	
CO4	4	4	4	4	3	4	3	4	4	4	3	3.7	
CO5	4	4	4	4	4	4	3	4	4	4	3	3.8	
CO6	4	4	4	4	4	3	4	4	3	4	4	3.8	
Overall Mean Score for COs												3.7	

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
---	---

**Semester III
18PCS3116**

**Hours/Week: 3
Credits : 2**

Software Lab-VI: ANDROID

Course Outcomes:

1. Describe and compare different mobile application models/architectures and patterns.
2. Describe the components and structure of a mobile development framework
3. Install and configure Android application development tools.
4. Design and develop user Interfaces for the Android platform.
5. Save state information across important operating system events.
6. Apply Java programming concepts to Android application development.

List of Practicals :

1. Layouts
2. Simple Controls
3. Working With Colors
4. Working With Text Using Styles
5. Image Manipulation
6. Menu Creation
7. Implicit Intents
8. Explicit Intents
9. Adding Audio & Video
10. Create An Application Using Links
11. Widgets
12. Data Storing & Retrieving.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3116	Title of the Paper Software Lab-VI: ANDROID										Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	3	4	4	4	3	3	4	4	4	3.7	
CO2	4	4	4	3	3	3	4	4	3	4	4	3.6	
CO3	4	3	4	4	3	4	4	3	4	3	3	3.5	
CO4	3	4	4	3	4	4	3	4	4	3	4	3.6	
CO5	4	3	4	4	4	4	4	4	4	4	4	3.9	
CO6	3	4	3	4	4	3	4	4	3	4	3	3.5	
Overall Mean Score for COs												3.6	

Result: The Score for this Course is 3.6 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

**Semester III
18PCS3203A**

**Hours/Week: 4
Credits : 4**

Core Elective-III: NETWORKING SECURITY

Course Outcomes:

1. Identify some of the factors driving the need for network security
2. Define the terms vulnerability, threat and attack
3. Identify physical points of vulnerability in simple networks
4. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.
5. Understand the functionality of virus and thread
6. Understand the concept of Firewall and configuration

Unit-I

10 hr

INTRODUCTION: OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security. CLASSICAL ENCRYPTION TECHNIQUES: Symmetric Cipher Model - Substitution Techniques - Transposition Techniques - Steganography.

Unit-II

10 hr

BLOCK CIPHERS AND DATA ENCRYPTION STANDARD: Block Cipher Principles - The Data Encryption Standard - The Strength of DES. ADVANCED ENCRYPTION STANDARD: AES Structure – AES Transformation Functions - AES Key Expansion - AES Implementation. PUBLIC- KEY CRYPTOGRAPHY AND RSA: Principles of Public Key Cryptosystems - The RSA Algorithm.

Unit-III

10 hr

CRYPTOGRAPHIC HASH FUNCTIONS: Applications of Cryptographic Hash Functions - Simple Hash Functions - Secure Hash Algorithm (SHA). MESSAGE AUTHENTICATION CODES: Requirements - Functions - Security - HMAC - Data Authentication Algorithm (DAA) - Cipher-Based Message Authentication Code (CMAC). DIGITAL SIGNATURES: Digital Signatures - Digital Signature Standard.

Unit-IV

10 hr

KEY MANAGEMENT AND DISTRIBUTION: Symmetric key Distribution Using Symmetric, Asymmetric Encryption - X.509 Certificates. USER AUTHENTICATION: Remote User - Authentication Principles - Remote User

Authentication using Symmetric, Asymmetric Encryption - Kerberos.
TRANSPORT-LEVEL SECURITY: Secure Socket Layer - Transport Layer Security - Secure Shell (SSH).

Unit-V

10 hr

SYSTEM SECURITY: Intruders - Intrusion Detection - Password Management. MALICIOUS SOFTWARE: Viruses – Virus Countermeasures - Distributed Denial of Service Attacks. FIREWALLS: Types of Firewalls - Firewall Location and Configurations.

Text Books

1. William Stallings, “Cryptography and Network Security - Principles and Practices”, Prentice Hall (Pearson Education), Dorling Kindersley India Pvt. Ltd., 5th Ed., 2011.

Books for Reference

1. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill Publications, New Delhi, 2008.
2. Jie Wang, “Computer Network Security: Theory and Practice”, Springer Publisher, Higher Education Press, 2009.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3203A	Title of the Paper Core Elective-III: NETWORK SECURITY										Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	4	4	4	4	3	3	2	4	3.6	
CO2	4	4	4	4	4	4	4	3	3	2	3	3.5	
CO3	4	4	4	3	4	4	4	3	3	2	4	3.5	
CO4	4	4	4	4	4	4	4	3	4	2	4	3.7	
CO5	4	4	4	4	4	4	4	3	3	2	3	3.5	
CO6	4	4	4	4	4	4	4	3	4	2	4	3.7	
Overall Mean Score for COs												3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester II
18PCS3203B

Hours/Week: 4
Credits : 4

Core Elective-II:
XML AND WEB SERVICES

Course Outcomes:

1. Analyze structured web document in XML based syntax
2. Ability to know the Java API of the semantic web platform
3. Identify and select the appropriate framework components in the creation of web service solutions.
4. Understand the techniques about Soap
5. Able to know about web services and enterprises
6. To know about the techniques WSDL using SOAP and UDDI

Unit-I **10 hr**
INTRODUCTION TO XML: An Eagle Eye View of XML - XML Definition - Life of an XML Document - Related Technologies. STRUCTURING THE DATA: Examining the Data - XMLizing the Data - Advantages of the XML format - Preparing a Style Sheet for Document Display. ATTRIBUTES, EMPTY TAGS AND XSL: Attributes - Attributes Vs Elements - Empty Tags. XSL WELL FORMEDNESS: Well Formed Rules - XML Documents - Text in XML - Processing Instructions.

Unit-II **10 hr**
DOCUMENT TYPE DEFINITION: Document Type Definition and Validity - Document Type Declaration - Validation against DTD - Listing Elements - Element Declaration - Comments in DTD - Entities and External DTD Subset - Attribute Declaration in DTD's - Attribute type - Predefine Attribute.

Unit-III **10 hr**
WEB SERVICES: Concepts of Web Services - SOAP, WSDL, UDDI - Importance of Web Services - Evolution of Web Applications – Distributed Computing Platform - Web Services and Enterprises.

Unit-IV **10 hr**
BASIC WEB SERVICES STANDARDS, TECHNOLOGIES AND CONCEPTS: SOAP Model - SOAP - SOAP Messages - SOAP Encoding - SOAP RPC - Using Alternative SOAP Encodings - Document, RPC, Literal, Encoded SOAP.

Unit-V **10 hr**
UDDI: UDDI at a Glance - UDDI Business Registry - Accessing UDDI. WSDL: WSDL using SOAP and UDDI.

Text Books

1. Elliotte Rusty Harold, “XML Bible”, IDG Books India, New Delhi, 2004. Unit: I & II
2. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services - An Architect's Guide”, PHI, New Delhi, 2003. Units: III, IV and V

Books for Reference

1. Gold forb, “XML hand book”, Pearson Education, New Delhi, 2003.
2. B V Kumar, S V Subramanya, “Web Services: An Introduction”, Tata McGraw Hill Publishing Co., New Delhi, 2006.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3203B	Title of the Paper Core Elective-III: XML & WEB SERVICES										Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
	CO1	3	3	4	4	3	3	3	2	3	3	4	3.18
CO2	4	2	3	4	3	4	3	4	4	1	2	3.09	
CO3	4	1	3	4	4	3	4	2	4	3	4	3.27	
CO4	5	1	4	5	4	2	4	2	3	3	4	3.36	
CO5	4	3	3	4	4	4	1	3	3	4	4	3.36	
CO6	3	4	4	3	4	4	4	3	4	3	4	3.60	
Overall Mean Score for COs												3.31	

Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

**Semester III
18PCS3302**

**Hours/Week: 4
Credits : 4**

IDC (BS): ADVANCES IN COMPUTER SCIENCE

Course Outcomes:

1. To understand the basic concepts of Cloud Computing
2. Differentiates the types of Cloud, its architecture and its applications
3. To understand the basic concepts of IoT and its applications
4. Understand the concept of consumer application
5. Able to understand the concept of security
6. Understand Food and Water Tracking Security

Unit-I 10 hr

INTRODUCTION: Cloud Computing at a Glance - Historical Developments – Building Cloud Computing Environments – Computing Platforms and Technologies.

CLOUD COMPUTING ARCHITECTURE: Cloud Reference Model – Types of Clouds – Economics of the Cloud.

Unit-II 10 hr

CLOUD PLATFORMS IN INDUSTRY : Amazon Web Services : Compute Services – Storage Services – Communication Services – Additional Services.

Google AppEngine : Architecture and Core Concepts – Application Life Cycle – Cost Model. Microsoft Azure: Azure core Concepts – SQL Azure.

Unit-III 10 hr

CLOUD APPLICATIONS : Scientific Applications – Healthcare – Biology – Geoscience – Business and Consumer Applications: CRM and ERP – Productivity – Social Networking – Media Applications.

ADVANCED TOPICS IN CLOUD COMPUTING : Energy Efficiency in Clouds. FEDERATED CLOUDS / INTER CLOUD: Characterisation and Definition – Cloud Federation Stack – Aspects of Interest – Technologies for Cloud Federations.

Unit-IV 10 hr

INTERNET OF THINGS: Introduction- Putting the Internet of Things to the Next Level- Strategic

RESEARCH AND INNOVATION AGENDA: Internet of Things Vision- IoT Strategic Research and Innovation Directions.

Unit-V

10 hr

IoT SMART- X APPLICATION: Smart Cities- Smart Energy and Smart Grid - Smart Mobility and Transport - Smart Home, Smart Buildings and Infrastructure- Smart Factory and Smart Manufacturing- Smart Health - Food and Water Tracking Security- Participatory Sensing - Smart Logistics and Retail.

IoT RELATED STANDARDIZATION: The Role of Standardization Activities- Current situation- Areas for additional Consideration- Interoperability in the Internet of Things. .

Textbook

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education (India) Private Limited Publications, First Reprint, 2013.
2. Ovidie Vermesan, Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment” River Publisher, 2018.

Books for Reference

1. Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing Principles and Paradigms”, Wiley Publications, 2011
2. Michael Miller, “Cloud Computing Web Based Applications that change the way you work and collaborate online”, Pearson Education, 2009.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3302	Title of the Paper IDC (BS): ADVANCES IN COMPUTER SCIENCE												Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)						Mean Score of COs		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1	5	3	3	4	2	2	5	3	4	2	3	2	3.3		
CO2	4	3	4	4	2	2	4	3	4	4	2	3	3.4		
CO3	3	4	4	3	4	4	3	4	4	3	4	3	3.5		
CO4	4	3	4	2	1	1	4	3	4	2	1	4	2.9		
CO5	4	4	3	3	2	2	4	4	3	3	2	2	3.1		
CO6	5	3	3	4	2	2	5	3	4	2	3	2	3.3		
Overall Mean Score for COs														3.2	

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

MINI PROJECT

Course Outcomes:

1. Learn to plan, Design and Analyze small scale projects
2. Understand the Software development life cycle phases through various models
3. Ability to perform Critical Thinking, Reasoning, and Creative Thinking
4. Develop Interpersonal Communication
5. Ability to visualize the simple problems and provide simple solutions
6. Ability to choose an appropriate tool for the task

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3117	Title of the Paper MINI PROJECT										Hours -	Credits 8
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
	4	4	4	3	3	3	4	4	4	3	4		
	3	4	4	3	3	4	4	4	5	4	5		
	4	3	3	4	3	4	5	5	3	4	4		
	3	3	4	3	5	3	3	3	4	5	4		
	3	4	4	4	3	5	5	5	3	3	5		
	3	4	4	4	3	3	4	4	4	3	4		
Overall Mean Score for COs												3.8	

Result: The Score for this Course is 3.8 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester III
18PCS3118

Hours/Week: -
Credits : 2

COMPREHENSIVE EXAMINATION

Course Outcomes:

1. Develop solutions for a range of problems using object-oriented programming.
2. Learn programming paradigms in Python.
3. Create rich GUI web applications using Visual Studio.NET
4. Learn MongoDB query language.
5. Use the development tools in the Android development environment
6. Understand the basic functionality of PHP scripting

Unit-I

JAVA, Python

Unit-II

ASP.NET, Database and NoSQL

Unit-III

PHP, ANDROID

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester III	Code 18PCS3118	Title of the Paper COMPREHENSIVE EXAMINATION										Hours -	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	3	4	3	3	3	4	3	4	3	4	4	3.4	
CO2	3	4	3	3	3	4	3	4	4	3	4	3.4	
CO3	3	4	3	4	3	4	4	3	4	4	3	3.5	
CO4	4	3	3	4	4	3	3	4	4	4	3	3.5	
CO5	3	4	3	4	3	4	4	3	3	3	3	3.3	
CO6	3	4	3	3	3	4	3	4	3	4	3	3.3	
Overall Mean Score for COs													3.4

Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Semester IV
18PCS4119

Hours/Week: 30
Credits : 20

**MAJOR PROJECT
DISSERTATION AND VIVA-VOCE**

Course Outcomes:

1. Learn to plan, design and analyze the modules
2. Understand various needs of the Industry
3. Ability to perform Critical Thinking, Reasoning, and Creative Thinking in a Workplace
4. Develop Communication Skills, both for Interpersonal and Presentation Needs
5. Ability to visualize the problems and provide Solution by Decision Making
6. Work as an individual, or as a part of a team in a real-time industry environment

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	Code 18PCS4119	Title of the Paper PROJECT DISSERTATION & VIVA VOCE										Hours 30	Credits 20
Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs	
CO1	4	4	4	3	3	3	4	4	4	3	4	3.6	
CO2	3	4	4	3	3	4	4	4	5	4	5	3.9	
CO3	4	3	3	4	3	4	5	5	3	4	4	3.8	
CO4	3	3	4	3	5	3	3	3	4	5	4	3.6	
CO5	3	4	4	4	3	5	5	5	3	3	5	4.0	
CO6	3	4	4	4	3	3	4	4	4	3	4	3.6	
Overall Mean Score for COs												3.8	

Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
--	--

Notes

This image shows a full page of a handwriting practice worksheet. It consists of approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for letter height. The entire page is otherwise blank, with no text or other markings.