B.SC. COMPUTER SCIENCE

CURRICULUM FRAMEWORK AND SYLLABUS
FOR OUTCOME BASED EDUCATION
(For the students joining in the
Academic Year 2019 – 2020 and afterwards)

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
Gandhigram - 624 302
Dindigul District
Tamil Nadu

THE GANDHIGRAM RURAL INSTITUTE
(Deemed to be University)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

B.Sc. COMPUTER SCIENCE

Vision

To provide quality-assured academic, research and extension services in the domain of Computer Science and Applications, to promote dissemination of knowledge in Information and Communication Technologies for Rural Development.

Mission

Empower the rural youth by transforming them into proficient and socially responsible computer professionals and cater them to the envisaged demand in the operational and functional domains of the industries and service sectors.

Graduate Attribute

The graduates of our institute are expected to possess the following attributes.

1. *Informed*
   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.
2. *Problem solver*
   The graduates of GRI have the ability to work on development issues. They are capable of being creative, logical and critical thinking which in turn help them to respond to challenges and opportunities effectively. They are also capable of making and implementing decisions.
3. *Active learners and critical thinkers*
   Graduates of this university are active learners and are capable of critically analyzing issues. They are capable of undertaking critical enquiry and reflection, find and evaluate information using a variety of sources and technologies. They do possess the attitude of acknowledging the works and ideas of others.
4. *Effective communication*
   The graduates have good communication skills and are capable of articulating their ideas effectively. They can negotiate and engage with people in varied settings.
5. *Rural minded*
   The graduates of GRI are well-informed and are able to retrieve, analyse and assimilate complex information. They understand the local and global issues and are able to apply their knowledge. They are able to work in tandem with the rural community.

The Gandhigram Rural Institute
(Deemed to be University)
Gandhigram – 624 302

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

OBE Elements for B.Sc. Computer Science Programme

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To prepare the graduates with expected domain knowledge to be employed in public and Information Technology (IT) enabled services.

PEO 2: To demonstrate needed skill in Computer Science and other inter-disciplinary areas.

PEO 3: To train the students to apply current tools and technologies to develop software solutions for social needs.

PEO 4: To prepare the students to continue the process of lifelong learning through professional activities that contribute to personal and social development.

PEO 5: To motivate the students to become entrepreneurs in IT enabled ventures

PROGRAMME OUTCOME (PO)

PO 1: To become knowledgeable in the subject of Computer Science and Allied Subjects that are relevant and appropriate to the domain.

PO 2: To design and develop software solutions to cater to the industrial requirements.

PO 3: To develop communication skill to present ideas effectively and efficiently.

PO4: To equip the students to the changing needs and motivate them to take-up masters programmes.

PO5: To inculcate human, professional and ethical values to become a socially responsible citizen.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO 1: Demonstrate the working principles of various hardware and software of a computer system.

PSO 2: Acquire knowledge in programming and understand the basic concepts and techniques in computer domain.

PSO 3: Analyse and identify the customer requirements to develop software solutions.

PSO 4: Develop software solutions for real life problems by applying latest technologies.

PSO 5: Empower the students with technical and other soft skills for successful career, entrepreneur and higher studies.

Mapping of PEOs with PSOs & POs:

PEO Vs. PO&PSO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
PEO1	3	3	3	2	2	3	3	3	3	3
PEO2	3	3	2	2	3	3	3	3	3	3
PEO3	3	3	2	2	2	3	3	3	3	3
PEO4	3	3	3	3	3	3	3	3	3	3
PEO5	3	3	2	2	2	3	3	3	3	3

Strongly Correlating (S) - 3 marks
Moderately Correlating (M) - 2 marks
Weakly Correlating (W) - 1 mark
No Correlation (N) - 0 mark

CO & PO ATTAINMENT RUBRICS

Direct Assessment:

i) CFA & ESE - 30 %
ii) Assignment/Reports/Case Study - 40%

Indirect Assessment:

i) Exit Survey - 30 %

THE GANDHIGRAM RURAL INSTITUTE (DEEMED TO BE UNIVERSITY)
DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

B. Sc. COMPUTER SCIENCE
(Under Choice Based Credit System)
SUBJECTS OF STUDY AND SCHEME OF EXAMINATION
(For the students joining in 2019 – 2020 and afterwards)

Course code	Title of the Course	Credits	Hours		Max. Marks		
			Theory	Practical	CFA	ESE	Total
SEMESTER I							
18TAMU0101/ 18HIDU0101/ 18MALU0101/ 18FREU0101	**Language I** Tamil / Hindi / Malayalam / French	3	3	-	40	60	100
18ENGU01X1	**Language II** English	3	3	-	40	60	100
19CSCU0101	Introduction to Programming and C	4	4	-	40	60	100
19CSCU0102	Lab – I: C Programming	1	-	3	60	40	100
19MATU01B1	Allied Maths – I for Computer Science	4	4	-	40	60	100
18NSSU0001/ 18FATU0001/ 18SPOU0001	NSS / Fine Arts / Sports	1	-	1	50	-	50
18YOGU0001	Yoga	1	-	1	50	-	50
18EVSU0101	Environmental Studies	3+1	3	2	40	60	100
Total Credits		**21**					
SEMESTER II							
18TAMU0202/ 18HIDU0202/ 18MALU0202/ 18FREU0202	**Language I** Tamil / Hindi / Malayalam / French	3	3	-	40	60	100
18ENGU02X2	**Language II** English	3	3	-	40	60	100
18CTSU0001 / 18CHIU0001/ 18MLU0001	Core Tamil / Core Hindi / Core Malayalam	2	2	-	20	30	50
19CSCU0203	Visual Programming	4	4	-	40	60	100
19CSCU0204	Lab – II: GUI	1	-	3	60	40	100
19MATU02B2	Allied Maths – II for Computer Science	4	4	-	40	60	100
18GTPU0001	Gandhi's Life, Thought and Work	2	2	-	20	30	50
18EXNU0001	Extension Education	2	2	-	20	30	50
18CSKU0201	Communication and Soft Skills	2	2	-	20	30	50
Total Credits		**23**					

SEMESTER III							
18TAMU0303/ 18HIDU0303/ 18MALU0303/ 18FREU0303	**Language I** Tamil / Hindi / Malayalam / French	3	3	-	40	60	100
18ENGU03X3	**Language II** English	3	3	-	40	60	100
18CTSU0002 / 18CHIU0002/ 18MLU0002	Core Tamil / Core Hindi / Core Malayalam	2	2	-	20	30	50
19CSCU0305	Fundamentals of Database System	4	4	-	40	60	100
19CSCU0306	Lab – III: DBMS	1	-	3	60	40	100
19PHYU03B1	Allied Physics – I for Computer Science: Digital Principles	4	4	-	40	60	100
18SHSU0001	Shanthi Sena	1	2	-			
19CSAU03A1	Multimedia Technologies	3+1	3	2	40	60	100
19EXNU03V1	VPP	2	-	-	50	-	50
19CSCU03F1	Extension / Field Visit	-	-	2	-	-	-
Total Credits		**24**					
SEMESTER IV							
19CSCU0407	Introduction to System Programs and Operating System	4	4	-	40	60	100
19CSCU0408	Data Structure	4	4	-	40	60	100
19CSCU0409	Lab – IV :Data Structure	1	-	3	60	40	100
19PHYU04B2	Allied Physics – II for Computer Science: Microprocessor and Assembly Language Programming	3+1	3	2	40	60	100
19CSCU04EX	Major Elective – 1	4	4	-	40	60	100
	Non-major Elective (NME) – I	3	3	-	40	60	100
19CSCU04F2	Extension / Field Visit	-	-	2	-	-	-
Total Credits		**20**					

SEMESTER V							
19CSCU0510	Introduction to Java Programming	4	4	-	40	60	100
19CSCU0511	Computer Graphics	4	4	-	40	60	100
19CSCU0512	Software Engineering	4	4	-	40	60	100
19CSCU0513	Lab V: Java Programming	1	-	3	60	40	100
19CSCU05EX	Major Elective – II	4	4	-	40	60	100
19CSCU05SX	Skill based Elective	2	2	-	20	30	50
	Non-Major Elective (NME) - II	3	3	-	40	60	100
Total Credits		**22**					
SEMESTER VI							
19CSCU0614	Web Technologies	4	4	-	40	60	100
19CSCU0615	Introduction to Data Communication	4	4	-	40	60	100
19CSCU0616	Introduction to Artificial Intelligence	4	4	-	40	60	100
19CSCU0617	Lab VI: Web Programming	1	-	3	60	40	100
19CSCU06MX	Modular Course I	2	2	-	50	-	50
19CSCU06MX	Modular Course II	2	2	-	50	-	50
19CSCU0618	Project	4	-	8	40	40+20*	100
Total Credits		**21**					
Total Credits for B.Sc. (CS) Programme		**131**					

CFA – Continuous Formative Assessment (Internal Evaluation)
ESE – End Semester Examination (External Evaluation)

*40 for external evaluation and
20 for concurrent Viva – voce evaluation.

List of Major Electives

Major Elective –I (19CSCU04EX)

19CSCU04E1	Big Data Analytics
19CSCU04E2	Data Mining
19CSCU04E3	Management Information Systems

Major Elective –II (19CSCU05EX)

19CSCU05E1	Mobile Computing
19CSCU05E2	Cloud Computing
19CSCU05E3	Enterprise Resource Planning

List of Skill based Elective Courses

Skill based Elective Course (19CSCU05SX)

19CSCU05S1	Mobile Application Development
19CSCU05S2	Fundamentals of Statistics and SPSS
19CSCU05S3	Skill Development for Employability
19CSCU05S4	Financial Accounting Software

List of Modular Courses

Modular Course – I& II (19CSCU06MX)

19CSCU06M1	Information Technology for Rural Development (ITRD)
19CSCU06M2	Free and Open Source Software
19CSCU06M3	Cyber Security and IT Act
19CSCU06M4	System Administration and Maintenance
19CSCU06M5	Introduction to Modern Application Development (NPTEL Course)
19CSCU06M6	Project Management for Managers (SWAYAM Course)
19CSCU06M7	Software Testing (SWAYAM Course)
19CSCU06M8	Introduction to Information Security (SWAYAM Course)
19CSCU06M9	Introduction to Internet of Things (NPTEL Course)

ABSTRACT		
Course type	**Total Number of Courses**	**Total Credits**
Core Course	17	50
Major Elective Course	02	08
Non-Major Elective Course	02	06
Allied Course	04	16
Modular Course	02	04
Foundation Course	05	07
Compulsory Non Credit Course	02	-
Language	08	22
Soft Skills	01	02
Entrepreneurship Skill	01	04
Skill Based Elective	01	02
Project	01	04
Extension	01	02
Environmental Studies	01	04
Total	**48**	**131**

SEMESTER I

Course Code & Title	19CSCU0101 INTRODUCTION TO PROGRAMMING AND C		
Class	B.Sc. (Computer Science)	Semester	I
Course Objectives	**The Course aims to** • Enable the students to gain knowledge in the programming concepts • Utilize sound problem solving and program design techniques to solve simple and large problems • Implement various programming constructs and statements, following accepted principles of good style and program format. • Use Functions, Arrays and Pointers to write programs.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Programming Languages** History and Development of Computers Need for a Programming Language- History of Programming Language Problem Solving Techniques-Algorithm, Flow Chart, Pseudocode Programming Control Structures Programming Languages-Types Generations of Programming Languages Language Translators	12
II	**Structure of C Programs and Control Statements** C fundamentals: Introduction to C - Character set Keywords and identifiers - Constants -Data types -Variables Operators and Expressions – Comment Input and Output functions in C Control Statements: if ….else, switch *While, do…while, for* Break and continue statements - go to statement.	13
III	**Arrays and String** Array: Defining an array – Processing an array Single dimensional array – Two dimensional array Multidimensional array-Character array String: Declaring, Initializing, Printing and Reading strings, String and manipulation functions	13

IV	**Function and Structure**	13
	Functions: defining a function -Accessing a function Passing arguments to a function- Recursion Structure: Defining, Declaring, initialization Structures and Functions, Array of structures	
V	**Pointers and File Management**	13
	Pointers: Pointer declaration-Chain of Pointer Passing pointers to a function File: Defining, Opening and Closing, Input and output operations File: Random Access	
Total Contact Hours		**64**

Text Books:

1. Ashok N Kamthane, Computer Programming and IT, ITL Education Solution Limited, New Delhi, 2011. (Unit 1: Chapter 1 & 4)
2. E.Balagurusamy, Programming in ANSI C, 7/e, Tata - McGraw Hill Publishing, New Delhi, August 2016. (Unit II : 1-6, Unit III: 7-8, Unit IV: 9 -10, Unit V : 11-12)

References:

1. Brian W. Kernighan, C Programming Language (2E), Prentice Hall, 2005
2. Programming with C, B.S .Gottfried, Schaums Outline Series, McGraw Hill Publishing Company, 1990.
3. Kalavathi.P, C – A Text for Beginners, Bonfring Publications, Tamil Nadu, 2014.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Apply fundamental programming concepts, to solve simple problems. **CO2:** Criticise the use of the C programming language to implement various algorithms. **CO3:** Analyze programming problems to choose appropriate programming constructs to produce a better program. **CO4:** Develop C programs using functions and structure **CO5:** Design, code, debug, test and document C programs

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	2	2	3	2	3
CO3	3	2	1	3	3
CO4	3	3	3	3	3
CO5	1	3	3	3	3

Course Code & Title	19CSCU0102 LAB – I: C PROGRAMMING		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
Course Objective	**The Course aims to** • Understand problems and design the flow of the program • Learn problem solving techniques • Enable the students to implement various programming concepts and write C Program for the given problem		

Sl. No.	CONTENTS	No. of Hours
	C Programming with	
1.	Control structures if, nested if, for, while and do … while	
2.	Array handling – Two and Three dimensional array	48
3.	Pointers	
4.	Functions – Various function categories and recursive function	
5.	File handlings – read and write operations	
Total Conduct Hours		**48**
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Analyse and understand the various programming constructs through simple C programs **CO2:** Write the C programs using control structures **CO3:** Trace the execution of programs and debug the programs **CO4:** Implement programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor statements **CO5:** Illustrate file concept through C programs	

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	3
CO2	2	2	3	2	3
CO3	3	2	2	3	3
CO4	3	3	3	3	3
CO5	1	3	3	3	3

Course Code & Title	19MATU01B1 ALLIED MATHS – I FOR COMPUTER SCIENCE		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
Course Objectives	**The Course aims to** • The learner will acquire knowledge of set theory, Logic and matrices • The learners will become proficient in basic ideas of graph theory and complex numbers		

UNIT	CONTENTS	Lecture Schedule
I	**Set Theory** Relations - Equivalence relations - Partial order – Function - Binary operations - Groups : definitions and examples - Elementary properties	12
II	**Logic** Introduction – Connectives - Truth tables - Tautology implication and equivalence of formulae	13
III	**Matrices** Elementary Transformation - Inverse of a matrix - Rank of a matrix - Simultaneous linear equations - Cayley Hamiltom theorem	13
IV	**Graph Theory** Introduction - Definition and examples - Degrees and sub graphs - Matrices - Connectedness: walks, trials and paths - Connectedness and components	13
V	**Introduction to Different Types of Expansion and Complex Number** **Introduction to Different Types of Expansion** Factorial Notation - Meaning of C(n,r), P(n,r) - Binomial theorem for positive index, any index - Exponential expansion – Logarithm expansion **Complex Number:** Definition of Complex Number - Operations on Complex Number (Addition, Subtract, Multiplication, Division), Conjugate complex number - Modulus and Amplitude of a Complex Number - Polar form of a complex number	13
Total Contact Hours		**64**

Text Books:

1. S.Arumugam & A. Thangapandi Issac, Modern Algebra, SCI Tech Publications, 2002 (Unit I&III)
2. Dr.M.K.Venkkatraman, Dr.N.Sridharan, Dr.N.Chandrasekaran, Discrete Mathematics, National Publishing Company, 2000 (Unit II)
3. S.Arumugam and S.Ramachandran, Invitation to Graph Theory, SCI Tech Publications, 2005, Chennai (Unit IV)
4. H. K. Dass, Polytechnic Mathematics (Unit V)

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Explain the basic concepts of set theory **CO2:** Analyze logical identities **CO3:** Solve problems in matrices **CO4:** Analyze the structure of Graph Theory **CO5:** Explain various types of expansion and complex number system

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	2
CO2	3	1	3	1	3
CO3	2	2	3	3	2
CO4	3	1	3	2	2
CO5	3	3	3	1	3

SEMESTER II

Course Code & Title	19CSCU0203 VISUAL PROGRAMMING		
Class	B.Sc. (Computer Science)	Semester	II
Course Objectives	The Course aims to • Enable the student to be familiarise with visual programming • Understood the fundamentals of GUI event programming • Understand Visual Data Manager for database programming.		

UNIT	CONTENTS	Lecture Schedule
I	**Visual Basic Overview and Development Environment** Creating a Project in Visual Basic - Using The Visual Basic Application Wizard - Overview of The Integrated Development Environment - Selecting IDE Colors, Fonts, and Font Sizes - Aligning, Sizing, and Spacing Multiple Controls - Setting A Startup Form or Procedure - Using Visual Basic Predefined Forms, Menus, And Projects - Data Tips	12
II	**The Visual Basic language** Declaring Constants, Variables - Selecting Variable Types - Converting between Data types - Declaring Arrays and Dynamic Arrays - Declaring function - Handling String - Handling operators and Operator Precedence - Using IF.. Else Statements -Using Select … case - Making Selections with Switch () and Choose () - Looping - Using Collections - Handling Dates and Times	13
III	**Managing Forms in Visual Basic** Managing Forms in Visual Basic - Visual Basic Menus - Creating sub Menus - Creating and Displaying Popup Menus - Handling MDI Form and MDI Child Menus	13
IV	**Controls** Text Boxes and Rich Textboxes - Command buttons, Checkboxes and Option buttons - List boxes and Combo boxes - Picture Boxes and Image Controls - The Timer Control - The Frame Control - The Label Control - The Shape Control	13
V	**Databases** Creating and Managing Databases with the Visual Data Manager - Creating a Table, Filed with the Visual Data Manager - Entering a Data in Database with the Visual Data Manager - Adding a Data Control - Opening a Database with the Data Control - Connecting a Data bases using controls	13
Total Contact Hours		**64**

Text Book:

Steven Holzner, 2002, Visual Basic 6 Programming, Black Book, 16th Reprint Edition, Dreamtech Press Publications, New Delhi

References:

1. Petroutsos, E., 1998, Mastering Visual Basic 6, First Edition, Edition Reprint 2001, BPB Publications, New Delhi.
2. Jerke, N., Nineteenth Reprint 2004, Visual Basic 6.0: The Complete reference, Tata-McGraw Hill Publishing Company Ltd., New Delhi.
3. Gary Cornell, Second Reprint 1999, VB 6 from Ground Up, Tata McGraw Hill Private Ltd, New Delhi.
4. Brown, S., 1998, Visual Basic 6 in Record Time, BPB Publications, New Delhi.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Understand the programming constructs like data types, variables, operators, arrays, Functions, control statements and looping structures. **CO2:** Understand the designing constructs like forms, menus and its varieties. **CO3:** Familiarize to create controls used to interact with the GUI applications. **CO4:** Gain knowledge of creating database and its connectivity with GUI applications. **CO5:** Understand the usage of objects created by other applications through linking and Embedding processes.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	3	2	-
CO2	3	3	3	2	2
CO3	3	3	3	-	2
CO4	3	3	3	2	2
CO5	3	3	3	2	2

Course Code & Title	19CSCU0204 LAB – II: GUI		
Class	**B.Sc. (Computer Science)**	**Semester**	**I**
Course Objective	**The Course aims to** • Prepare the students to design VB form for real-time applications • Implement the basic and ActiveX controls in VB • Use the database from a front-end applications		
Sl. No.	**CONTENTS**		**No. of Hours**
1. 2. 3. 4. 5. 6.	**GUI (Visual Basic) and MS-ACCESS** Simple programs using Basic Controls Programs for Launching Applications using OLE Objects Working with Menus, Dialog Boxes, Drag and Drop Events Implementing ActiveX Controls Design and use databases in MS-ACCESS Programs to Handle Databases through controls and coding		48
Total Conduct Hours			**48**

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Model the VB Application using basic controls **CO2:** Create databases in MS-ACCESS **CO3:** Implement the ActiveX Control **CO4:** Use reporting tools to generate reports using databases **CO5:** Develop a project using VB as front-end and MS-ACCESS as back-end

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	-
CO2	3	3	3	2	2
CO3	3	3	3	-	2
CO4	3	3	3	2	2
CO5	3	3	3	2	2

Course Code & Title	19MATU02B2 ALLIED MATHS - II FOR COMPUTER SCIENCE		
Class	B.Sc. (Computer Science)	Semester	II
Course Objectives	The Course aims to • Impart skills in two dimensional coordinate geometry • Understand basic statistical measures and differentiation • Acquire knowledge of vector product and probability		

UNIT	CONTENTS	Lecture Schedule
I	**Two Dimensional Coordinate Geometry** General Introduction - Distance Formula and Ratio Formula - Co-ordinate of Centroid, In-Centre - Ortho-Centre and Ex-Centre of a Triangle - Area of Triangle - Straight Line, Slope form, Intercept form, Perpendicular form - One Point Slope form - Two Point form & General form - Angle between Two Lines - Perpendicular Distance of a Line from a Point.	12
II	**Measures of Dispersion** Characteristics and classification of measures of dispersion - Range Quartile deviations - Mean deviations - Standard deviation - Coefficient of dispersion - Combined standard deviation	13
III	**Differential Calculus** Standard Formulae (Except Hyperbolic Function) - Derivative of Sum, difference - Multiplication and Division of two Functions - Differentiation of Function of a Function - Logarithmic Differentiation Differentiation of Implicit Functions - Differentiation of Parametric Functions - Differentiation by Trigonometric Transformations Differentiation of a Function w.r.t.another Function - Second Order Derivative - Maxima and Minima of Function with one Variable	13
IV	**Vector Algebra** Definition - Addition and Subtraction of Vectors - Scalar and Vector Product of two Vectors - Scalar Triple Product and Vector Triple Product - Applications of Vectors in Engineering Problems	13

V	**Probability**	13
	Probability: Introduction - Calculation of probability - Conditional probability: Baye's Theorem - Mathematical expectation	
Total Contact Hours		**64**

Text Books: 1. S.P.Gupta, "Statistical methods", Sultanchand and Sons, 2004. (Unit II) 2. Chandrika Prasad, Text book on differential calculus, (Unit III) 3. Statistics, S. Arumugam Issac, SCIT ech Publications, 2011 (Unit V) 4. Polytechnic Mathematics H. K. Dass (Unit I & IV)	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Explain the knowledge of coordinate system **CO2:** Apply statistical measures of solving real life problem **CO3:** Explain the concepts of differentiation **CO4:** Analyze the operations of vector **CO5:** Realize the concept of probability

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	2
CO2	3	1	3	1	3
CO3	2	2	3	3	2
CO4	3	1	3	2	2
CO5	3	3	3	1	3

SEMESTER III

Course Code & Title	19CSCU0305 FUNDAMENTALS OF DATABASE SYSTEMS		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • Explain the concepts of database management systems • Demonstrate the various data models and database systems • Manipulate real time data and elicit useful information using database concepts • Design database schema considering the normalization rule		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Databases** Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications - When Not to Use a DBMS Database System Concepts and Architecture: Data Models, Schemas, and Instances – Three - Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems	12
II	**Conceptual Data Modeling and Database Design** Data Modeling Using the Entity – Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design - A Sample Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types -Refining the ER Design for the Company Database - ER Diagrams, Naming Conventions, and Design Issues The Enhanced Entity – Relationship (EER) Model: Subclasses, Super classes and Inheritance - Specialization and Generalization - Constraints and Characteristics of Specialization and Generalization Hierarchies	13

III	**The Relational Data Model and SQL**	13
	The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations Basic SQL: SQL Data Definition and Data Types - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL	
IV	**More SQL**	14
	Complex Queries, Triggers, Views and Schema Modification: More Complex SQL Retrieval Queries - Specifying Constraints as Assertions and Actions as Triggers - Views (Virtual Tables) in SQL - Schema Change Statements in SQL	
V	**Database Design Theory and Normalization**	14
	Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal - Boyce-Codd Normal Form - Multivalued Dependency and Fourth Normal Form - Join Dependencies and Fifth Normal Form	
Total Contact Hours		**64**

Text Book:

Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, New Delhi, 2016. (Chapters 1-7 and 14)

References:

1. Ramez Elmasri and Shamkant B. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson, New Delhi, 2014.
2. Avi Silberchartz, Henry F. Korth and S.Sudarshan, Database System Concepts, 6/e, McGraw – Hill Higher Education, International Edition, 2010.
3. Peter Rob, Carlos Coronol, Steven A. Morris, Keeley Crokett, Database Principles, 2/e, Cengage Learning, 2013

Course Outcomes	On completion of the course, students will be able to **CO1:** Discuss the components, functions and various database design techniques used for modeling the databases management system. **CO2:** Analyse the various data models and database architecture **CO3:** Examine the clauses and functions of SQL and write optimal queries in the above languages. **CO4:** Design entity-relationship diagrams to represent simple database application scenarios **CO5:** Apply the database schema normalization rules and techniques to criticize and improve the database design.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	19CSCU0306 LAB – III: DBMS		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • Prepare the students to create and manipulate relations using SQL • Write basic queries, views and triggers using SQL • Use oracle database from front-end applications		
Sl. No.	**CONTENTS**		**No. of Hours**
1. 2. 3. 4.	**RDBMS (Oracle)** Tables: Creations, Assigning various types of keys, Sorting, Setting relation between tables Queries using single and multiple tables Cursor and Triggers Importing Tables from Electronic Spreadsheet and Text File Report creation from usage		48
Total Conduct Hours			**48**

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Model the databases using SQL **CO2:** Write SQL queries, sub queries and aggregate functions using single and multiple tables **CO3:** Implement views and triggers using SQL **CO4:** Use reporting tools to generate reports using databases **CO5:** Develop a simple project using SQL as back-end from front – end applications.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	19PHYU03B1 ALLIED PHYSICS – I FOR COMPUTER SCIENCE: DIGITAL PRINCIPLES		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • Understand different types of number systems and conversions • Recognise the working of logic gates and circuits and map reduction • Distinguish the working of Flip Flops and Counters		

UNIT	CONTENTS	Lecture Schedule
I	**NUMBER SYSTEM AND LOGICGATES** The Basic Gates - NOT, OR, AND, Universal Logic Gates -NOR, NAND - AND-OR – Invert Gates - Positive and Negative Gates - Introduction to HDL - Boolean Laws & Theorems - Sum of Production Method - Truth Table of Karnaugh Graph - Pairs, Quads, Octets - Karnaugh Simplifications - Don't-care Conditions - Product-of-sums Method & Simplification	12
II	**BOOLEANALGEBRA** Multiplexers, Demultiplexes - 1-of-16 Decoder - BCD-to-Decimal Decoders - Seven Segment Decoders - Encoders - Exclusive-OR Gates - Parity Generators and Checkers - Read only Memory - Programmable Array Logic - Programmable Logic Arrays	13
III	**COMBINATIONAL LOGIC** Binary Number System -Binary-to-Number Conversion - Decimal-to-Binary Conversion - Octal Numbers - Hexadecimal Numbers - Binary Addition - Binary Subtraction - Unsigned Binary Numbers - Sign-Magnitude Numbers - 2's Complement Representation - 2's Complement Arithmetic - Arithmetic Building Blocks - The Adder - subtracter - Fast Adder - Arithmetic Logic Unit - Binary Manipulation & Division	13
IV	**FLIP FLOP** *RS* FLIP-FLOPs - Gated FLIP-FLOPs - Edge-Triggered *RS* FLIP-FLOPs - Edge-Triggered *D* FLIP-FLOPs - Edge-Triggered *JK* FLIP-FLOPs - FLIP-FLOP Timing Edge Triggering through Input Lock Out - *JK* Master-Slave FLIP-FLOP – Switch Contact Bounce Circuit	13

V	**COUNTERS** Asynchronous Counters - Decoding Gates - Synchronous Counters - Changing the Counter Modulus - Decade Counters	13
Total Contact Hours		**64**

Text Book:

Leach.D.P, Malvino.A.P and Goutam Saha, "Digital Principles and Applications", Seventh Edition, TMH, 2011 (Unit 1: Ch. 2.1 to 2.4 & Ch. 3.1 to 3.8 Unit 2: Ch. 4.1 to 4.8 & 4.10 to 4.12 Unit 3: Ch. 5.1 to 5.5 & Ch. 6.1 to 6.11 Unit 4: Ch. 8.1 to 8.9 Unit 5: Ch. 10.1 to 10.5)

References:

1. Vijayendran. V, X, "Digital Fundamentals", S.V.Publishers, 2012
2. Ananthi Shashasaayee, Sheshasaayee.J.G, "Digital Logic Fundamentals", First Edition, Margham Publications, 2003
3. Moris Mano.M, "Digital Logic and Computer Design", Forth Edition, PHI, 2001

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Convert numbers from one base to another **CO2:** Recognize the basics of logical circuits **CO3:** Do map simplification **CO4:** Understand different types of Flip Flops **CO5:** Define the working of Counters and Registers

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	1	2
CO2	1	1	2	1	3
CO3	2	2	1	1	3
CO4	2	2	2	1	2
CO5	3	1	2	1	3

Course Code & Title	19CSCU03A1 MULTIMEDIA TECHNOLOGIES		
Class	**B.Sc. (Computer Science)**	**Semester**	**III**
Course Objectives	**The Course aims to** • Understand the basic concepts of multimedia elements • Develop webpage using multimedia elements. • Practice shoot and edit videos		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction and Tools**	12
	Introduction: Definition of Multimedia - Basic Multimedia Software Tools - Multimedia Authoring Tools	
II	**Text and Images**	13
	Text: Fonts and Faces - Using Text in Multimedia - Font Editing and Design Tools Hypermedia and Hypertext. Images: Making Still Images, Coloring Images - Image File Formats	
III	**Sound**	13
	Digital Audio - MIDI Audio, Multimedia System Sounds - Audio File Formats, Sound recording and editing tools Adding Sound to Multimedia Project.	
IV	**Animation**	13
	Animation: Principles of Animation - Animation Techniques - Animation File Formats - Making Animations	
V	**Video**	13
	Video: How Video Works and is Displayed - Digital Video Containers - Shooting and Editing Video.	
Total Contact Hours		**64**

Text Book:

Tay Vaughan, Multimedia: Making It Work, Eighth Edition, McGrawHill, 2011.

Reference:

A.C. Luther, Authoring Interactive Multimedia, A.P. Professional, 1994.

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Explore the basic understanding of various Multimedia Concepts. **CO2:** Utilize the Multimedia tools **CO3:** Familiarize the concepts of text and image editing. **CO4:** Practice sound and video editors. **CO5:** Develop multimedia projects.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

SEMESTER IV

Course Code & Title	19CSCU0511 INRODUCTION TO SYSTEM SOFTWARE AND OPERATING SYSTEM		
Class	B.Sc. (Computer Science)	Semester	IV
Course Objectives	**The Course aims to** • Study the fundamental concepts of operating system • Provide knowledge on process and CPU scheduling • Know about memory and file system management		

UNIT	CONTENTS	Lecture Schedule
I	**Background, Machine Structure and Languages** Background - Evolution of the components of programming system - Evolution of Operating System - Operating System User View point: Functions, Batch, Control language and Facilities - General machine structure - Machine language	12
II	**Introduction and Process Management** Operating System Structure - Process Scheduling - Process State - Scheduling Criteria -Scheduling Algorithms - Scheduling Algorithm Performance - Process Attributes - Process Supervisor Call	12
III	**Inter-process Communication and Synchronization** Inter-process Communication - Process synchronization - Dead lock - deadlock detection and recovery - deadlocks avoidance - deadlock prevention.	13
IV	**Memory Management** Single absolute partition - Single relocatable partition - Multi programming - Multiple partition - Simple paging - Simple segmentation - Segmentation with paging - Page and segment tables – Swapping	13
V	**Virtual Memory & File System Management** Demand paging – Segmentation - Directories and names - Types of file system objects - File system functions - Information types - File system architecture	14
Total Contact Hours		**64**

Text Books: 1. John J. Donovan, System Programming, Tata Mc-Graw Hill Publishing, 46th reprint, 2009 (Unit I – Chapter 1&2) 2. J.Archer Harris, John Cordani, Operating System, Mc-Graw Hills Publication, 2002 (Unit 2: Chapter 1 & 2, Unit 3: Chapter 3, Unit 4: Chapter 4, Unit 5: Chapter 5 & 6) **References:** 1. Silberschatz P.B.Galvin, Gange, "Operating System Concepts", 6th Ed, John Wiley & Sons., 2002 2. H.M. Deitel, An Introduction to Operating System, Second Edition, Addison Wesley, 1990.	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Analyze the structure and basic components of operating system **CO2:** Describe the process, interprocess communication and synchronization **CO3:** Understand the memory types and segmentation process **CO4:** Learn the concept of memory allocation and relocation during process execution **CO5:** Understand the file management of an operating system

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	3	2
CO2	3	3	3	3	3
CO3	3	2	3	2	3
CO4	3	1	2	3	2
CO5	3	3	3	2	3

Course Code & Title	19CSCU0408 DATA STRUCTURES		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Explain the design and implementation of various basic and advanced data structures. • Describe various techniques for representation of the data in the real world. • Prepare the students to choose the appropriate representation of data structures and their applications		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction and Overview** Introduction - Basic Technology; Elementary Data Organization – Data Structures - Data Structure Operations String Processing: Introduction – Basic Terminology – Storing String – Character Data Type – String Operations – Word Processing – Pattern Matching algorithms	12
II	**Array, Records and Pointers** Introduction – Linear Arrays – Representation of Linear Arrays in Memory – Traversing Linear Arrays – Inserting and Deleting – Sorting; Bubble Sort – Searching; Linear Search – Binary Search – Multidimensional Arrays – Pointers; Pointer Arrays – Records; Record Structures – Representation of Records in Memory; Parallel Arrays – Matrices – Sparse Matrices	13
III	**Linked List** Introduction – Linked List – Representation of linked List in Memory – Traversing a Linked List – Searching a Linked List – Memory Allocation; Garbage Collection – Insertion into a Linked List – Deletion from a Linked List – Header Linked List – Two-way Lists	13
IV	**Stacks, Queue and Recursion** Introduction – Stacks - Array Representation of Stacks – Linked Representation of Stacks – Arithmetic Expressions; Polish Notation – Quicksort, an Application of Stacks – Recursion – Tower of Hanoi – Implementation of Recursive Procedures by Stacks – Queues – Linked Representation of Queues – Deques – Priority Queues	13

V	**Trees** Introduction – Binary Trees – Representing Binary Trees in Memory – Traversing Binary Trees – Traversal Algorithm using Stacks – Header Nodes; Threads – Binary Search Trees – Searching and Inserting in Binary Search Trees – Deleting in a Binary Search Tree – AVL Search Trees – Insertion in an AVL Search Tree – Deletion in an AVL Search Tree	13
Total Conduct Hours		**64**

Text Book:

Seymour Lipschutz, Data Structures, Revised First Edition, Schaum's Outlines, Mc-Graw Hill Education, 2017. Chapters 3, 4, 5, 6, 7.1 to 7.12

References:

1. Debasis Samanta, Classic Data Structures , PHI Learning Pvt. Ltd., Second Edition, 2009.
2. Horowitz, Shani, Dinesh Mehta, Fundamentals of Data Structures in C++, Galgotia Publications, 2008.
3. Yedidhayah Langsam, Moshe J.Augenstien, Aaron M.Tanebaurm, Data Structures using C and C++, 2/e, PHI, 1999

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Describe the representation of single dimensional and multi-dimensional arrays and their applications **CO2:** Analyse the string processing and various string operations **CO3:** Formulate the data representation using linked list and its variants **CO4:** Demonstrate primitive operations of Stacks and Queues **CO5:** Relate the various types of binary trees and illustrate binary tree traversals with algorithms and examples

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	3	3
CO2	3	3	1	2	3
CO3	3	3	1	1	3
CO4	3	3	1	1	3
CO5	3	3	1	2	3

Course Code & Title	19CSCU0409 Lab IV: DATA STRUCTURES		
Class	**B.Sc. (Computer Science)**	**Semester**	**IV**
Course Objectives	**The Course aims to** • Explain the design and implementation of various basic and advanced data structures. • Describe various techniques for representation of the data in the real world. • Prepare the students to choose the appropriate representation of data structures and their applications		

Sl.No.	CONTENTS	Hours of Work
1. 2. 3. 4. 5.	Stack – Creation, Push and Pop, Conversion and evaluation of Prefix and Postfix expression Queues – Creation, Insertion, Deletion Linked list – Creation, Insertion and Deletion using Singly Linked List, Circular List and Doubly - Linked list. Binary Trees – Creation, Tree traversals Binary Search Tree – Creation, Searching and Deleting an element	48
Total Conduct Hours		**48**
Course Outcomes	**On completion of the course, students will be able to** **CO1:** Model the databases using SQL **CO2:** Write SQL queries, sub queries and aggregate functions using multiple tables **CO3:** Implement views and triggers using SQL **CO4:** Use reporting tools to generate reports using databases **CO5:** Develop a simple project using VB as front-end and SQL as back-end	

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	2	2
CO3	3	3	3	2	2
CO4	3	3	3	1	2
CO5	3	3	3	3	2

Course Code & Title	19PHYU04B2 ALLIED PHYSICS – II FOR COMPUTER SCIENCE: MICRROPROCESSOR AND ASSEMBLY LANGUAGE PROGRAMMING		
Class	B.Sc. (Computer Science)	Semester	IV
Course Objectives	The Course aims to • Understand different types of Microprocessors • Write Assembly language programmes (ALP)		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Types of Computers - Overview of Microcomputer structure and Operation - Execution of a Three-instruction Program - Microprocessor Evolution and Types - The 8086 Microprocessor Family – Overview - 8086 Internal Architecture - Introduction to programming the 8086	13
II	**Family Assembly Language Programming -Introduction** Introduction - Program Development steps - Constructing the Machine Codes for 8086 instructions - Writing Programs for use with an assembler - Assembly language program development tools.	13
III	**8086 Assembly Language Programming Techniques** simple sequence programs - Flags, Jumps and Condition Jumps IF-THEN, IF-THEN-ELSE and multiple IF THEN-ELSE programs - WHILE- DO Programs - REPEAT-UNTIL Programs Instruction Timing and delay Loops	13
IV	**Strings, procedures and Macros** The 8086 String Instructions - Writing and using procedures - Writing and using assembler macros	13
V	**8086 Instruction Descriptions and Assembler Directives** 8086 Instruction Descriptions - 8086 Assembler Directives	12
Total Contact Hours		**64**

Text Book:

D.V. Hall., "Microprocessors and Interfacing", Revised Second Edition, D.V. Hall, Seventh Reprint, Tata McGraw Hill Edition, New Delhi, 2006.
(Unit 1: Ch. 2 Unit 2: Ch. 3 Unit 3: Ch. 4 Unit 4: Ch. 5 Unit 5: Ch. 6)

References:

1. A.P. Mathur, Introduction to Microprocessors, 3/e, Tata McGrawHill Company Limited, New Delhi 1994.
2. Mohamed Rafiquzzman, Microprocessor and Micro Computer based System Design, 2/e, CRC Press, 1995.
3. B. Kauler, PC Architecture & Assembly Language, Galgotia Publication, New Delhi, 1995.

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Explain the architecture of Microprocessors **CO2:** Recognize the basics of Assembly Language Programming (ALP) **CO3:** Write simple programmes in ALP **CO4:** Work with assembler macros **CO5:** Write Procedural Programmes

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	1	3
CO2	3	1	2	2	3
CO3	2	2	1	1	3
CO4	2	2	2	-	3
CO5	2	1	2	-	3

SEMESTER V

Course Code & Title	19CSCU0510 INTRODUCTION TO JAVA PROGRAMMING		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	**The Course aims to** • Provide the foundation to the object oriented programming concepts • Discuss the implementation of OOP's concepts in Java language • Make learners as a good Java programmers • Import skills and knowledge to create and run Java programs for solving real time problems		

UNIT	CONTENTS	Lecture Schedule
I	**Basics** Introduction: Object Oriented Programming Concepts - Encapsulation, Inheritance, Polymorphism, Features of Java Language, Types of Java Programs, Java Architecture. Literals, Data Types and Variables: Literals - Integer, Floating Point, Character, String and Boolean Literals, Data Types - Integer, Floating Point, Character and Boolean. Variables The Structure of A Java Program – Comments, Expressions and Statements, Type Conversion, Block Statements and Scope Operators –Arithmetic, Bitwise, Relational, Boolean Logical and Ternary. Operator Precedence Control Statements – If...Else, Switch, While, Do...While, For..., Break, Continue and Comma Statement, Arrays - One-Dimensional and Multi-Dimensional Arrays.	13
II	**Classes and Packages** Classes: Defining A Class, The New Operator and Objects, The Dot Operator, Method Declaration and Calling, Constructors, Instance Variable Hiding, This in A Constructor, Method Overloading, Passing Objects as Parameters to Methods Inheritance: Creating Subclasses, Method Overriding, Final Class, Final Method, Final Variables, Object Destruction and Garbage Collection, Recursion, Static Method, Static Variables and Static Block, Abstract Classes, Mathematical Methods Packages and Interfaces: Package, The Import Statement, Access Modifier, Interfaces - Defining Interfaces, Implementing an Interface Wrapper Classes – The Number Class, The Character Class, The Boolean Class	13

III	**Exceptions, Input and Output Classes**	12
	Exceptions: Types of Exceptions, Catching Exceptions - Nested Try Blocks, Hierarchy of Multiple Catch Blocks, Throw Statement, Creating your Own Exceptions, Throws Statement, The Finally Block, Checked and Unchecked Exceptions Input and Output Classes - I/O Streams, The File Class, Byte Stream – Input Stream, Output Stream, Disk File Handling - File Input Stream, File Output Stream, Filtered Byte Stream – Data Output Stream, Data Input Stream	
IV	**Strings and Threads**	13
	Strings: String Class - Equality Operator(==) and Equals Method, String Concatenation with +, String buffer Class, Threads - Multitasking, Creating a Thread, States of a Thread, Multithreaded Programming, Thread Priorities, Join Method, Controlling the Threads	
V	**Applets and Graphics**	13
	Applets: Applet Basics, Methods of Building an Applet, Some General Methods of Applet, Displaying Text in Status Bar, Embedding Applet Information, The HTML Applet Tag, Reading Parameters into Applets Graphics - Drawing Lines, Rectangles, Ovals and Circles, Arcs, Polygons and Poly line.	
Total Contact Hours		**64**

Text Book:

K. Somasundaram, Introduction to JAVA Programming, Jaico Publishing House, New Delhi, 2013.

References:

1. K.Somasundaram, Programming in Java2, Jaico Publishing House, New Delhi, 2009.
2. H.Schildt, Java2: The Complete Reference, 4/e, TMH Publishing Company, New Delhi, 2001.
3. K.Somasundaram, Do 'n' Learn JAVA – A Practical Approach, Anuradha Publications, Chennai, 2013.

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Outline the concepts of OOP and basics of Java language features, types, control statements and array. **CO2:** Grasped the idea of inheritance, package and identify classes, objects, member of a class and the relationship among them. **CO3:** Discuss the implementation of exception handling and Input Output stream classes. **CO4:** Describe the methods in String. Identify the use of threads to perform subtask and inter-thread communication. **CO5:** Develop client side programming with AWT.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

Course Code & Title	19CSCU0511 COMPUTER GRAPHICS		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	The Course aims to • Explain about the creation and manipulation of images. • Describe the techniques of transformations and three dimensional graphics with display methods. • Demonstrate the use of graphics functions in developing solutions to graphics applications		

UNIT	CONTENTS	Lecture Schedule
I	**Overview of Graphics Systems** Overview Of Graphics Systems - Video Display Devices - Raster Scan And Random Scan Systems - Input Devices - GUI and Interactive Input Methods: Logical Classification of Input Devices Input Functions - Interactive Picture Constructive Techniques.	13
II	**Output Primitives** Output Primitives: Points and Lines – Line Drawing Algorithms – DDA and Bresenham - Loading the Frame Buffer – Line Function – Circle Generating Algorithms - Filled Area Primitives – Fill Area Functions – Cell Array - Character Generation.	13
III	**Attributes of Output Primitives** Attributes Of Output Primitives : Line Attributes - Curve Attributes- Colour and Gray Scale - Area Fill Attributes – Character Attributes - Bundled Attributes – Inquiry Functions Antialiasing	12
IV	**Two Dimensional Geometric Transformations** Two Dimensional Geometric Transformations: Basic Transformations – Matrix Representation - Composite Transformations – General Fixed Point – Scaling – Other Transformations - Two Dimensional Viewing : The Viewing Pipeline – Window– To– Viewport Coordinate Transformation - Clipping Operations – Point Clipping – Line Clipping – Cohen – Sutherland Line Clipping - Sutherland – Hodgeman Polygon Clipping – Curve Clipping – Text Clipping	13
V	**Three Dimensional Concepts** Three Dimensional Concepts: Three Dimensional Methods – Three Dimensional Geometric and Modeling Transformations - Translation – Rotation – Scaling – Other Transformations - Visible – Surface Detection Methods – Classification – Depth Buffer Method - Scan Line Method – Depth Sorting Method - BSP Tree Method – Area Subdivision Method.	13
Total Contact Hours		**64**

Text Book:

Donald Hearn & M. Pauline Baker, *Computer Graphics C Version,* 2nd Edition, Pearson India Education Services Private Limited, 2016.
(Chapters: 2, 3.1-3.5,3.11-3.14,4.1-4.8,5.1-5.4,6.1-6.7,6.8-6.10,9.1,11,13.1-13.8)

References:

1. Edward Angel and Dave Shreiner, *Interactive Computer Graphics: A top-down approach with OpenGL*, 6th Edition, Addison Wesley, 2012.
2. Foley, Van Dam, Feiner, Hughes, *Computer Graphics Principles and Practice*, 3rd Edition, C. Addison Wesley, 2014.
3. W.M.Newman and R.F.Sproull, Principles of Interactive Computer Graphics, 2/e, Tata McGraw– Hill Publishing Co. Ltd, 1997.
4. D.F.Rogers, Procedural Elements for Computer Graphics, 2/e, Tata McGraw– Hill Publishing Co. Ltd., 2001.
5. V. Xiang and R.A. Plastock, Computer Graphics, Schaum's Outline Series, Tata McGraw– Hill Publishing Co., 2002.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Identify the types of graphics monitors, workstations, input devices and input techniques available to work with graphics. **CO2:** Understand the mathematical and heuristic algorithms behind the graphics object generation **CO3**: Familiarize the attributes to control the object shape and antializing techniques for accurate display. **CO4**: Understand the forms of 2D transformations, mapping process from world view to display view and clipping process to select the visible portion. **CO5:** Construct the algorithms for 3D object modelling and processing

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	3	3
CO2	2	2	3	3	2
CO3	2	3	2	3	2
CO4	3	2	2	3	2
CO5	3	3	3	3	3

Course Code & Title	19CSCU0512 SOFTWARE ENGINEERING		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Understand the various processes and models in software development • Discuses the metrics and estimates of software • Analyze risk management and requirement specifications • Demonstrate various testing techniques and strategies.		

UNIT	CONTENTS	Lecture Schedule
I	**THE SOFTWARE PROCESS** A Generic Process Model – Prescriptive Process Models – Specialized Process Models – Process Technology – Product and Process.	12
II	**REQUIREMENT ENGINEERING** Requirement Engineering – Elicitation – Requirement Model – Negotiation and validation -	13
III	**DESIGN CONCEPTS & SOFTWARE QUALITY ASSURANCE** The Design Process – Design Concepts – The Design Model - Elements of Software Quality Assurance – SQA Tasks, Goals and Metrics – Formal Approaches to SQA – Statistical Software Quality Assurance – Software Reliability	13
IV	**SOFTWARE TESTING STRATEGIES** A Strategic approach to software testing – test strategies for conventional software – Validation Testing – System Testing – The art of Debugging	13
V	**METRICS & RISK MANAGEMENT** Software Measurement and Metrics – Metrics for quality – Integrating metrics - Risk Identification – Risk Projection – Risk Refinement – Risk Mitigation, Monitoring and Management – The RMMM Plan	13
Total Contact Hours		**64**

Text Book: Roger S. Pressman, Software Engineering – A Practitioner's Approach, 7/e, McGraw Hill Inc., 2010. (Unit 1: Ch. 2 Unit 2: Ch. 5 Unit 3: Ch. 8 & Ch.16 Unit 4: Ch. 17 Unit 5: Ch. 25 & Ch. 28) **References:** 1. Alistair Cockburn, Agile Software Development, 2/e ,Pearson Education, 2007 2. Richard E.Fairley, Software Engineering concepts, Mc-Graw Hill, 1984. 3. Ian Sommervillie, Software Engineering, 9/e, Addison Wesley, 2011.	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Differentiate various processes and models in software development **CO2:** Understand the metrics and estimates of software and Quality **CO3:** Analyze the risk management and review mechanisms **CO4:** Formulate the requirement and design engineering **CO5:** Use various testing techniques and strategies

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	-
CO2	3	3	3	2	2
CO3	3	3	3	-	2
CO4	2	3	3	2	2
CO5	2	3	3	2	2

Course Code & Title	19CSCU0513 LAB – VI: JAVA PROGRAMMING		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Develop the programs using all the fundamental concepts of Java programming • Utilize the existing packages for efficient programming • Help them create their own packages and databases • Demonstrate the advanced programming using threads and applets • Explain them the data storage with different file formats		

Sl.No.	Conduct	No. of Hours
	Java Programming with	
1.	Control statements, arrays	
2.	Classes, Inheritance	
3.	Packages, Interfaces	
4.	Mathematical Methods	
5.	Exception handling	48
6.	Input / Output classes	
7.	Strings	
8.	Threads	
9.	Applets and Graphics	
10.	Applications using the above concepts	
	Total Conduct Hours	**48**

Course Outcomes	**On completion of the course, students will be able to** **CO1:** Develop programs using the fundamental concepts in Java **CO2:** Demonstrate classes, objects, principles of inheritance and polymorphism, encapsulation, method overloading and to show thread priority, exception handling. **CO3:** Develop application using packages and store the data in the database. **CO4:** Design GUI using applets. **CO5:** Apply object oriented design for all real world problems.

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	3	3	2
CO3	3	3	3	3	2
CO4	3	3	3	3	2
CO5	3	3	3	3	2

SEMESTER VI

Course Code & Title	19CSCU0614 WEB TECHNOLOGIES		
Class	B.Sc. (Computer Science)	Semester	VI
Course Objectives	**The Course aims to** • Provide insight into the basics of the Web Programming • Design and implement a dynamic web applications using XHTML, JavaScript and Java Servlets		

UNIT	CONTENTS	Lecture Schedule
I	**Web Essentials** Clients, Servers, and Communication: The Internet - Basic Internet Protocols - The World Wide Web - HTTP Request Message - HTTP Response Message - Web Clients - Web Servers	12
II	**Markup Languages** XHTML - An Introduction to HTML - Basic XHTML Syntax and Semantics - Some Fundamental HTML Elements - Relative URLs - Lists - Tables - Frames - Forms - Defining XHTML's Abstract Syntax: XML - Creating HTML Document	13
III	**Style Sheets** CSS : Introduction to Cascading Style Sheets - Cascading Style Sheet Features - CSS Core Syntax - Style Sheets and HTML - Style Rule Cascading and Inheritance - Text Properties - CSS Box Model - Normal Flow Box Layout - Beyond the Normal Flow	13
IV	**Client-Side Programming** The JavaScript TM Language: History and Versions of JavaScript - Introduction to JavaScript - JavaScript in Perspective - Basic Syntax - Variables and Data Types - Statements - Operators - Literals - Functions - Objects - Arrays - Built-in Objects - JavaScript - Debuggers	14
V	**Server-Side Programming** Java Servlets: Servlet Architecture Overview - A "Hello World!" Servlet - Servlets Generating Dynamic Content - Servlet Life Cycle - Parameter Data - Sessions - Cookies - URL Rewriting - Other Servlet Capabilities - Data Storage - Servlets and Concurrency	14
Total Contact Hours		**64**

Text Book:

Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, New Delhi, India, Last Impression 2010.
(Chapters: 1, 2, 3.1-3.9, 4, ,1-5.4, 6.1-6.11)

References:

1. Julie C. Meloni, Sams Tech Yourself: HTML, CSS and JavaScript all in One, SAMS, 2014.
2. Achyut S Godole & Atul Kahate, Web Technologies, TCP/IP Architecture and Java Programming, Second Edition, Tata Mc-Graw Hill, 2010
3. Deitel H.M and Nieto T.R, Internet and World Wide Web How to Program, Fifth Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2012

Course Outcomes	**On completion of the course, students will be able to**
	CO1: Outline the basics of TCP/IP Protocols and IP address **CO2:** Design webpages using HTML **CO3:** Have practical experience in working with XML **CO4:** Generate dynamic content to webpages using JavaScript and JavaServlet **CO5:** Develop online web applications

Mapping of COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

Course Code & Title	19CSCU0615 INTRODUCTION TO DATA COMMUNICATION		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Know the functions of Data link layer • Understand network layer functions and protocols used in it. • Learn about transport layer, session, presentation and application layers		

UNIT	CONTENTS	Lecture Schedule
I	**DATA COMMUNICATIONS** Networks- Network Types- Internet History- Standards and Administration- Protocol Layering - TCP/IP Protocol Suite - OSI Model	12
II	**DATA AND SIGNALS** Periodic Analog Signals - Digital Signals - Transmission Impairment - Data Rate Limits – Performance	13
III	**MEDIA AND SWITCHING** Introduction - Guided Media - Unguided Media: Wireless – Introduction - Circuit-Switched Networks - Packet Switching	13
IV	**PROTOCOLS AND ACCESS** DLC Services - Data-Link Layer Protocols – HDLC - Point-To-Point Protocol (PPP) - Random Access - Controlled Access - Channelization	13
V	**NETWORK-LAYER SERVICES** Packet Switching - Routing Algorithms - Unicast Routing Protocols - Transport-Layer Protocols	13
Total Contact Hours		**64**

Text Book:

Behrouz A. Forouzan, "Data Communications and Networks" – Fifth Edition, Tata Mc-graw, Hill Edition, 2012
(Unit 1: Ch. 1.1 to 1.5 & 2.1 to 2.3 Unit 2: Ch. 3.1 to 3.6 Unit 3: Ch. 7.2 to 7.3 & 8.1 to 8.4 Unit 4: Ch. 11.1 to 11.4 & 12.1 to 12.3 Unit 5: Ch. 18.1, 18.2, 20.2, 20.3 & 23.2)

References:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Differentiate the types of Computer Networks and Models **CO2:** Understand types of communication media **CO3:** Analyze working of Data Link layer **CO4:** Examine the working of Network layer **CO5:** Describe the services of Transport layer.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	1	3
CO2	3	3	3	2	2
CO3	3	1	3	1	2
CO4	3	2	3	1	2
CO5	3	3	3	1	2

Course Code & Title	19CSCU04E3 INTRODUCTION TO ARTIFICIAL INTELLIGENCE		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Explain the basic concepts of Artificial Intelligence. • Demonstrate the methods of solving problems using Artificial Intelligence. • Outline the basic issues of knowledge representation and Inference that play an important role in AI programs. • Discuss the applications of AI such as Natural language processing, Robotics, Expert systems etc.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to AI** Artificial Intelligence: The AI Problems – The Underlying Assumption AI Technique- The level of the Model – Criteria for Success Problems, Problem Spaces and Search: Defining the Problem as a State Space Search – Production Systems Problem Characteristics – Production System Characteristics Issues in the Design of Search Programs	12
II	**Heuristic Search Techniques** Generate-and-Test – Hill Climbing Best-First Search – Problem Reduction Constraint Satisfaction – Means-Ends Analysis.	12
III	**Knowledge Representation** Representing Knowledge using Rules: Procedural versus Declarative knowledge – Logic Programming Forward versus Backward Reasoning – Matching – Control Knowledge. Knowledge Representation issues: Representations and Mappings	**12**
IV	**Predicate Logic** Using Predicate Logic: Representing Simple Facts in Logic Representing instance and Relationships Computable Functions and Predicates – Resolution – Natural Deduction.	13

V	**Introduction To NLP, Neural Nets, Game Playing, Expert Systems** Game Playing: Overview – The Minimax Search Procedure Natural Language Processing: Introduction. Connectionist Models: Introduction Hopfield Networks Learning in Neural Networks: Perceptron Expert Systems: Representing and Using Domain Knowledge	**15**
Total Contact Hours		**64**

Text Book:

Kevin Knight and Shivashankar B Nair, Artificial Intelligence, Elaine Rich, 3rd Edition, Tata Mc-Graw, Hill publications, 2014 Reprint.
(Chapters : 1 - 6 , 12.1, 12.2, 15.1, 18.1, 18.2.1, 20)

References:

1. Nils J Nilson, Principles of Artificial Intelligence, Narosa Publishing House, 1982.
2. Elaine Rich, Artificial Intelligence, Tata McGraw-Hill publications, 2008.
3. V.S.Janakiraman, K. Sarukesi, P.Gopalakrishnan, Foundations of Artificial Intelligence and Expert System, Infinity Press, 1st Edition, 2016.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Differentiate AI method of problem solving from normal method **CO2:** Identify heuristics for a given problem **CO3:** Explain the various search techniques **CO4**: Explain predicate logic **CO5**: Describe the fundamentals of Game Playing, NLP, NN and Expert Systems

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	2	3	3
CO2	1	2	3	3	2
CO3	1	3	2	3	1
CO4	1	2	2	3	1
CO5	1	3	3	3	3

Course Code & Title	19CSCU0617 Lab VI: WEB PROGRAMMING		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Explore the designing of web applications • Design and implement a dynamic web applications using HTML, Javascript , PHP and MySQL		

Sl.No.	CONTENTS	No. of Hours
1. 2. 3. 4. 5. 6. 7.	Web page design using HTML Tags Creation – Ordered List, Unordered List, Tables, Frames, Links, Image Anchor, Image Maps Using Form Controls with Input Tag, Cascading Style Sheets Creating XML Document Working with client-side scripting using JavaScript Working with server-side scripting using JavaServelet	48
Total Conduct Hours		**48**

Course Outcomes	On completion of the course, students will be able to
	CO1: Design webpages using HTML, CSS and XML **CO2:** Write scripts using JavaScript to develop dynamic webpages **CO3:** Develop online web applications using JavaScript and Java Servelet **CO4:** Develop web application project using web designing tools and Techniques **CO5:** Hosts the web application in the internet

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	3	2	3	3	3
CO3	3	2	3	3	3
CO4	3	2	3	3	3
CO5	3	2	3	3	3

ELECTIVES

Course Code & Title	19CSCU04E1 BIG DATA ANALYTICS		
Class	B.Sc. (Computer Science)	Semester	IV
Course Objectives	The Course aims to • Provide overview of approach facilitating data analytics on Big Data • Demonstrate the application of big data analytics technologies • Discuss about Big Data Tools and R Packages.		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction and Tools** Understanding Big Data: Concepts and Terminology Big Data Characteristics - Different types of data. Business Motivations and Drivers for Big data Adoption Big Data Analytics Lifecycle - Case Study Example	12
II	**Enterprise Technologies and Big Data Business Intelligence** Online Transaction Processing(OLTP) - Online Analytical Processing(OLAP) Extract Transform Load (ETL) - Data Warehouses - Data Marts- Traditional BI- Big Data BI- Case Study Example. Big Data Storage Concepts: Clusters - File Systems and Distributed File Systems - NoSQL – Sharding – Replication - Sharding and Replication - CAP Theorem – Case Study Example.	13
III	**Big Data Processing Concepts** Parallel Data Processing - Distributed Data Processing Processing Workloads - Cluster - Processing in Batch Mode Processing in Real-time Mode - Case Study Example	13
IV	**Big Data Tools** R, R - Hadoop – Architecture – R Packages – Classification	13
V	**R Database** R Database – RHbase, RHive – R Storm – Mongodb – Dataset basics	13
Total Contact Hours		**64**

Text Book:

Thomas Erl,WajidKhattak and Paul Buhler, Big Data Fundamentals Concepts, Driver & Techniques, 3rd Edition, Pearson publication, 2018. Chapters : 1-8

References:

1. Pam Baker , *Big Data Strategies* , 1st edition , Cengage Learning India Private Limited, 2016.
2. Dr. Anil Maheshwari, *Big Data*,1st edition , Published by McGraw Hill Education (India) Private Limited, 2017.
3. Seema Acharya and Subhashini Chellappan, *Big Data and Analytics*, 2nd edition, Wiley India Private Limited, 2017.
4. Seema Acharya, Data Analytics using R, McGraw Hill Education publication (India) Private Limited, 2018.

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Explain the fundamental concepts of Big data **CO2:** Explain the Big Data storage concepts **CO3:** Utilize Big Data processing concept **CO4:** Illustrate the Big Data Tools using R Programming packages **CO5:** Demonstrate Big Data storage using R-Database

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	3	2	1
CO2	3	3	3	3	2
CO3	1	2	3	3	2
CO4	2	2	3	2	2
CO5	3	3	3	1	3

Course Code & Title	19CSCU04E2 DATA MINING		
Class	B.Sc. (Computer Science)	Semester	IV
Course Objectives	**The Course aims to** • Explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. • Teach the basic concepts of Data Warehousing and its Architecture • Discuss the basic algorithms and techniques used in data mining		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction** Data Mining – Need for Data Mining – Kinds of Data can be Mined Kinds of Patters can be Mined – Technologies used Applications Targeted – Major Issues in Data Mining Data Objects and Attribute Types – Basic Statistical Descriptions of Data Data Visualization – Measuring Data Similarity and Dissimilarity	12
II	**Data Pre-processing** Data Preprocessing: An Overview-Data Cleaning Data Integration Data Reduction Data Transformation and Data Discretization	12
III	**Data Warehousing** Data Warehousing: Introduction- Difference between Database Systems and Data Warehouses Data Warehousing: A Multitiered Architecture Data Warehouse Models- Extraction, Transformation and Loading-Metadata Repository Data Cube: A Multidimensional Data Model Data Warehouse Design and Usage-Efficient Data Cube Computation-An Overview	15
IV	**Classification** Classification – Basic Concepts Decision Tree Induction Bayes Classification Methods	12

V	**Cluster Analysis** Cluster Analysis - Partitioning methods Hierarchical methods- BIRCH, ROCK Density based methods – DBSCAN Grid based methods : STING	13
Total Contact Hours		**64**

Text Book:

Jiawei Han, MichelineKamber and Jian Pei, *Data Mining: Concepts and Techniques*, Morgan Kauffmann Publishers , 2012.
(Chapters: 1,2,3,4.1,4.2.1,4.3,4.4.1,8.1-8.3,10.1-10.4)

References:

1. Hongbo DLL, *Data Mining Techniques and Applications: An Introduction*, Cengage Lmg Business Press, 2010.
2. Jiawei Han, Micheline Kamber, *Data Mining: Concepts and Techniques*, 3rd Edition Morgan Kauffmann Publishers, 2011.
3. Udit Agarwal, *Data Mining & Data Warehousing*, 1st Edition, S.K.Kataria& sons Publication, 2016.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1**: Comprehend the fundamental principles of data mining **CO2:** Explain the data extraction and transformation techniques. **CO3:** Describe Data Warehouse architecture and multidimensional data model **CO4:** Illustrate the use of decision tree induction for mining classification rules and other classification methods **CO5:** Explain the different types of clustering methods used in Cluster analysis.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	3	3
CO2	2	2	3	3	2
CO3	2	3	2	3	2
CO4	3	2	2	3	2
CO5	3	3	3	3	3

Course Code & Title	19CSCU0203 Management Information Systems		
Class	B.Sc. (Computer Science)	Semester	II
Course Objectives	The Course aims to • providing a foundation to information system • Imparting e-business systems • Provide enterprise business support systems		

UNIT	CONTENTS	Lecture Schedule
I	**Foundation of Information Systems in Business** Foundation Concepts – Information Systems in Business – The Components of Information Systems	12
II	**Competing with Information Technology** Fundamentals of Strategic Advantage – Using Information Technology for Strategic Advantage	13
III	**e-Business Systems** e-Business Systems – Functional Business Systems	13
IV	**Enterprise Business Systems** Getting All the geese Lined up: Managing at the Enterprise Level – Enterprise Resource Planning: The Business Backbone – Supply Chain Management: The Business Network.	13
V	**Electronic Commerce Systems** Electronic Commerce Fundamentals – e-Commerce Applications and issues.	13
Total Contact Hours		**64**

Text Book:

James A O Brien, George M Marakas and Ramesh Behl, "Management Information Systems", Tata McGraw Hill Education Private Limited, 2010.
(**Unit I** – Chapter 1, **Unit II** – Chapter 2, **Unit III** – Chapter 7, **Unit IV** – Chapter 8, **Unit V** – Chapter 9)

References:

Kenneth C. Laudon , Jane P. Laudon, Management Information Systems: Managing the Digital Firm 15th Edition, Kindle Edition, Pearson, 2017

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Know the fundamentals of information systems **CO2:** Learn the strategic advantages of IT **CO3:** Know the functional business systems **CO4:** Plan the enterprise business **CO5:** Learn e-commerce applications

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	2	3
CO2	3	2	2	1	3
CO3	3	3	3	2	3
CO4	2	3	3	1	3
CO5	2	3	3	1	3

Course Code & Title	19CSCU05E1 MOBILE COMPUTING		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	The Course aims to • Learn about the importance of mobile devices and merits of its communication strategies in present scenario. • Develop smart phone applications for mobile communications		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction, Wireless Transmission and Medium Access Control** Need for Mobile Computing, Mobile and Wireless Devices, Simplified Reference Model. Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Spread Spectrum and Cellular Systems. SDMA, FDMA, TDMA, CDMA, comparisons.	13
II	**Telecommunication System and Satellite System** GSM – Services, Architecture, Interface, Protocols, Localization, Calling, Handover and Security, UMTS and IMT 2000– Standardization, Architecture, Interface, Network, Handover. Satellite System: History, Applications, Basics, Routing, Localization, Handover.	13
III	**Wireless Lan** Wireless Lan : IEEE 802.11 – Architecture, Physical Layer, MAC Layer, HIPERLAN 1, Bluetooth – Architecture, Link Management and Security.	13
IV	**Mobile Network Layer** Mobile Network Layer: Mobile IP – Goals, Packet Delivery Strategies, Registration, Tunneling and Reverse Tunneling, Mobile Ad–hoc Networks – Routing Strategies.	13
V	**WAP and WML** Wireless Application Protocol: Architecture, Protocols, WML, WML Script, Applications.	12
Total Contact Hours		**64**

Text Books: 1. Jochen Schiller, Mobile Communication, 2/e, Pearson Education, Delhi 2008. 2. Singhal Sandeep and Bridgm Thomas, The Wireless Application Protocol, Pearson Education, India, 2001. **Reference:** Wireless Application Protocol: "Writing Applications for the Mobile Internet", Sandeep Signal et al.	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Familiarize the types of mobile and wireless devices available and their features. To understand the role of antenna, cellular systems and types of medium access controls. **CO2:** Understand different types of telecommunication systems and their role into mobile and wireless communication networks. Primarily focuses the roaming and handover procedures adopted by different systems. **CO3:** Identify the types of wireless LAN architecture and protocols. **CO4:** learn the structure, features and transmission techniques of mobile IP. **CO5:** Learn the coding using WML script, an up gradation of HTML and XML for mobile applications

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	3	3
CO2	2	2	3	3	3
CO3	2	3	2	3	3
CO4	3	2	2	3	3
CO5	3	3	3	3	3

Course Code & Title	19CSCU05E2 CLOUD COMPUTING		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Classify the various Cloud computing applications • Understand the architecture of Cloud computing • Know the Cloud computing standards		

UNIT	CONTENTS	Lecture Schedule
I	**UNDERSTANDING CLOUD COMPUTING** History of Cloud computing - Cloud Computing Architectural Framework - Types of Clouds - pros and cons of cloud computing - difference between web 2.0 and cloud - key challenges in cloud computing - Major Cloud players - Cloud Deployment Models - Virtualization in Cloud Computing - types of virtualization - Parallelization in Cloud Computing - cloud resource management - dynamic resource allocation - Optimal allocation of cloud models	12
II	**CLOUD SERVICE MODELS** Software as a Service (SaaS) - Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing	13
III	**CLOUD DEPLOYMENT MODELS** Deployment of applications on the cloud - Hypervisor - Case studies - Xen, VMware, Eucalyptus - Amazon EC2, KVM, Virtual Box, Hyper-V	13
IV	**CLOUD COMPUTING FOR EVERYONE** Cloud data centres - Energy efficiency in data centre - Mobile cloud computing service models - Collaboration with services and applications: CRM management - Project management - Email - on line database - calendar - schedules - Word Processing - Presentation - Spreadsheet - Databases - Desktop - Social Networks and Groupware	13
V	**CLOUD SECURITY** Cloud security - Security threats and solutions in clouds - Auditing protocols - dynamic auditing - storage security - Privacy preserving - Fully Homo-morphic Encryption - big data security - Cloud availability - DoS attacks - Fault tolerance management in cloud computing - Cloud computing in India	13
Total Contact Hours		**64**

Text Book: Anthony T.Velte, Toby J. Velte Robert Elsenpeter, Cloud Computing a Practical Approach, TATA Mc-Graw - Hill, New Delhi, 2010 **References:** 1. Judith Hurwitz, Bloor.R, Kanfman.M, Halper.F, (2010), "Cloud Computing for Dummies", Wiley India Edition. 2. Gautam Shroff, (2010), "Enterprise Cloud Computing" ,Cambridge University press. 3. Ronald Krutz and Russell Dean Vines, (2010), "Cloud Security", Wiley-India pvt. Ltd. 4. Michael Miller – Que, Cloud Computing: Web-Based Applications, That Change the Way You Work and Collaborate Online - 2008 5. Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Gain knowledge in Basics of Cloud computing. **CO2:** Understand Cloud Computing architecture **CO3:** Learn frameworks such as Map Reduce. **CO4:** Discuss practical applications of cloud computing **CO5:** Know CRM management

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	3
CO2	3	2	3	3	3
CO3	3	3	3	1	3
CO4	3	2	3	2	3
CO5	3	2	3	2	3

Course Code & Title	19CSCU05E3 ENTERPRISE RESOURCE PLANNING		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Classify the different types of business processes • Provide existing business models underlying in ERP • Impart the future trends in ERP systems		

UNIT	CONTENTS	Lecture Schedule
I	**Enterprise Resource Planning** Introduction - basic concepts-benefits of ERP and limitations - Evolution of ERP - Materials Requirements Planning (MRP) - Manufacturing Resource Planning (MRP II) - Business modelling	12
II	**ERP and its related Technologies** Data Mining - Data Warehousing - Business Process Reengineering - Decision Support System (DSS) - Management Information System (MIS) - Executive Information System (EIS) – OLAP	13
III	**ERP for Manufacturing Processes** Distribution requirements planning (DRP) - Master production schedule - ERP for manufacturing processes - Distribution requirements planning (DRP)	13
IV	**Master Production Schedule** ERP software selection - Risks Factors-Role of consultants - Modules in an ERP software package - Finance-sales and distribution-plant	13
V	**Future Directions of ERP** Mobile ERP system Case Studies of ERP implementation - Problems - challenges and software solution for the enterprises - performance indicators of an ERP package	14
Total Contact Hours		**64**

Text Book:

Alexis Leon, "Enterprise Resource Planning", Tata Mc-Graw-Hill, 3rd Edition, 2014.

References:

1. Bret Wagner, Ellen Monk, "Enterprise Resource Planning", Cengage Learning, 3rd Edition, 4th Edition, 2013.
2. Sandeep Desai, Abhishek Srivastava, "ERP to E2RP A Case Study Approach", Prentice Hall of India, Delhi, 2013.

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Differentiate the software lifecycle for traditional and ERP software **CO2:** Demonstrate different approaches for ERP software selection and deployment. **CO3:** Examine the integration of ERP modules and its sub-modules **CO4:** Compare Re-engineered business processes of chosen enterprise system. **CO5:** Know the future trends in ERP systems

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	1	3	2
CO2	1	1	2	2	3
CO3	2	2	3	3	3
CO4	2	2	2	2	3
CO5	3	3	2	2	2

Course Code & Title	19CSCU05S1 MOBILE APPLICATION DEVELOPMENT		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	The Course aims to • Learn about different types of mobile devices • Explain about modern mobile operating systems • Design the various kinds of mobile applications		

UNIT	CONTENTS	Lecture Schedule
I	Getting Started - Overview of Android and Android SDK - Getting to know your Android development environment - Writing your first Android application - Running and debugging your application - Test your application on device	8
II	Android Applications - The Big Picture: Android architecture - Android application model - Overview of Android application building blocks - Application design guidelines - Application lifecycle	8
III	Building User Interface: Overview of Android's view structure - Android built-in layouts - Defining a layout in XML - Android built-in Views - Event handling - Building custom views and layouts	8
IV	Building Android Applications: AndroidManifest.xml file - the control file - Building activities - Building intents - Building and using services – Notifications - Building and using content providers	8
Total Contact Hours		32

Text Book:

John Lombardo, Blake Meike, Rick Rogers, Zigurd Mednieks, "Android Application Development" , O'Reilly Media, Inc, 2009

Reference:

Barry Burd, "All-in-one for Dummies – 2nd Edition", 2015

Course Outcomes	On successful completion of the course, the students will be able to
	CO1: Describe the types of mobile devices and mobile platforms **CO2:** Summarize the basic structure of mobile operating systems and their architecture **CO3:** Setup programming tools for a mobile application developer **CO4:** Design various mobile application **CO5:** Recognize runtime environment for mobile application

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	3
CO2	3	2	3	2	3
CO3	3	3	1	3	3
CO4	3	3	3	3	2
CO5	1	1	3	3	3

Course Code & Title	19CSCU05S2 FUNDAMENTALS OF STATISTICS AND SPSS		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	The Course aims to • Discuss basic descriptive and inferential statistics • Learn the main features of SPSS • Perform statistical analysis with SPSS		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to statistics** SPSS introduction and overview, Statistical terms-mean, median, mode, standard deviation, variance, frequency, hypothesis, nominal and ordinal variable and standard error. Windows in SPSS – Data editor, output viewer, syntax editor etc., Basic file types – different file types in SPSS.	8
II	**Types of windows in SPSS** Data editor organization - variable view - data view, Entering and editing data in SPSS data editor, Reading data from spreadsheet, database and text file, Data transformation- computing variable, Functions: arithmetic, statistical and string functions, Recode: into same variable, into different variable - Automatic Recode.	8
III	**File Handling Techniques** File handling and file transformation introduction - Sort cases, Merging data files – variable merge and case merge, Splitting a data file and apply different analysis, Different ways to select cases from a data set, Working with output viewer and draft viewer, formatting output. Pivot table basics and advantages of pivot table.	8
IV	**Analyzing Data** Analyzing data: frequencies - descriptive – crosstabs,Multiple response analysis, T-tests: one-sample, independent and paired test, One way analysis of variance - Linear regression, Charts: introduction - types - creating and editing.	8
Total Contact Hours		**32**

Text Book:

R.SN. Pillai and Bhagavathi,"Statistical Methods", S.Chand and Company Limited, Reprint 2007.

Reference:

Kiran Pandya , SmrutiBulsari , Sanjay Sinha, "SPSS in Simple Steps" Dreamtech Press, 2011

Course Outcomes	**On successful completion of the course, the students will be able to**
	CO1: Analyze the basic workings of SPSS and perform basic statistical analyses **CO2:** Perform data checking and create tables and charts **CO3:** Demonstrate the data management tasks in SPSS application **CO4:** Recognize the various file handling techniques in SPSS **CO5:** Perform advanced analysis in SPSS

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	2	2	2	1
CO2	3	1	2	2	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	2	2	3	3	3

Course Code & Title	19CSCU05S3 SKILL DEVELOPMENT FOR EMPLOYABILITY		
Class	B.Sc. (Computer Science)	Semester	V
Course Objectives	The Course aims to • Develop the knowledge of Aptitude • Enable the critical reasoning ability • Induce the skills for the preparation of competitive examinations		

UNIT	CONTENTS	Lecture Schedule
I	**General English 1**	8
	Verbs- Synonyms- Antonyms- Articles- Prepositions -Idioms and Phrases - Cloze test – Substitution –Spotting Errors.	
II	**General English 2**	8
	Vocabulary – Comprehension – spelling - Active Voice and Passive Voice - Sentence Arrangement-Para Completion - Joining Sentences.	
III	**Aptitude**	8
	Number Systems- Decimals and Fractions – Percentage - Ratio & Proportion - Profit & Loss - Simple & Compound Interest - Discount – Time & Work - Time & Distance- H.C.F. and L.C.M. - Problems on Ages.	
IV	**Reasoning**	8
	Analogy -Letter and Symbol Series – Arithmetic Reasoning – Blood Relation Qualms - Classification – Coding Decoding – Direction – Series Completion.	
Total Contact Hours		**32**

Text Books:

1. Hari Mohan Prasad & Uma Rani Sinha ,"Objective English for Competitive Examinations", , Tata McGraw Hill Edition Pvt. Ltd, 2013 (Unit 1 & 2)
2. R.S. Agarwal ,"Quantitative Aptitude", S. Chand Publications, 2017 (Unit 3 & 4)

References:

1. R.S. Agarwal,Objective General English, S.Chand Publications, 2017
2. R.V.Praveen,Quantitative Aptitude and Reasoning, PHI Publishers, 2016

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Analyze the basics of English Grammar **CO2:** Practice to solve the comprehensive questions **CO3:** Develop the learner to communicate effectively and appropriately in real life situation **CO4:** Find solution to the mathematical problems **CO5:** Ability to solve various critical reasoning problems

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	2	3	2	3	2
CO3	3	3	2	3	3
CO4	3	2	3	3	3
CO5	2	3	2	3	3

Course Code & Title	19CSCUO5S4 FINANCIAL ACCOUNTING SOFTWARE		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Prepare financial statements in accordance with appropriate standards. • Interpret the business implications of financial statement information • Establish accounting information for planning and control		

UNIT	CONTENTS	Lecture Schedule
I	Basics of Accounting, Type of accounts , Rules of Debit and Credit, Voucher Entry, Ledger Posting, Final Accounts Preparation - Cash Book, Ratio Analysis, Depreciation, Stock Management, Adjustment Entries - Cash/Funs flow – GST	8
II	Introduction to Tally, features and Advantages – Implementing accounts in Tally - Familiarization with the Tally interface Company creation, Account Creation, Voucher Entry in Tally.	8
III	Inventory Information - Creating Stock groups- Stock categories - Creating Stock items - Creating Godowns - Voucher type - Pure Inventory Vouchers - Purchase/Sales orders and invoices	8
IV	Reports - Trial Balance- Balance Sheet - Profit and Loss account - Stock summary - Ratio analysis - Day Book - Bank Reconciliation Statement - Payroll Module - TDS Module - GST Module.	8
Total Contact Hours		**32**

Text Book:

Dr. Namrata Agrawal, Tally 9, , Dreamtech Press, New Delhi, Dream Tech Press, 2007

Reference:

Official Guide to Financial Accounting Using Tally. ERP 9 with GST (Release 6.4), Tally Education, Kindle Edition, 2018

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Develop practical skills in using a computerized accounting system **CO2:** Understand the concepts of the integrated structure of a computerized accounting system **CO3:** Analyze the procedure of preparing account transactions **CO4:** Apply the skills to develop an appreciation and expertise in the use of other accounting software **CO5:** Develop the capacity to apply the above skills to practical Accounting Problems and procedures

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	3
CO2	2	2	3	3	2
CO3	2	2	3	3	3
CO4	1	3	2	3	3
CO5	3	3	3	2	3

MODULAR COURSES

Course Code & Title	19CSCU06M1 INFORMATION TECHNOLOGY FOR RURAL DEVELOPMENT (ITRD)		
Class	B.Sc. (Computer Science)	Semester	VI
Course Objectives	The Course aims to • Provide the basics of ICT technology • Impart the basic skills in ICT Applications • Understand the importance of ICT in Rural development		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to ICTs for sustainable Development** Introduction to Information and Communication Technology (ICT – Role of ICTs in Sustainable Development - Current Status of ICTs in Sustainable Development – Global and India Scenario – Potential of ICTs in various fields - impact of information Technologies on GDP growth	8
II	**Information** Internet and world wide web – community radio - technology-user interface – design of relevant ICT products and services	8
III	**ICT Applications** Applications of ICT in education – Health (telehealth, telemedicine and health informatics) - Gender Equality, Agriculture	8
IV	**ICT Applications** Applications of ICT in Rural Industry - e-Governance, tele centres, Mobiles for development - climate change and disaster management - ICT Networks for water management	8
Total Contact Hours		**32**

Text Book:

Dr. M. Vanaja, Dr. S. Rajasekar, Information & Communication Technology (ICT) In Education Paperback, 2016

Reference:

Prof. T. Mrunalini, Prof. A. Ramakrishna, Information & Communication Technology (ICT) in Education, Paperback, 2016

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Understand various ICT tools and techniques **CO2:** Realize the importance of ICT in rural development **CO3:** Select the right tools for right applications **CO4:** Analyse various existing ICT products **CO5:** Realize the use of ICT in sustainable development

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	3
CO2	2	2	3	3	3
CO3	1	1	3	3	3
CO4	1	2	3	3	3
CO5	2	2	3	3	3

Course Code & Title	19CSCU06M2 FREE AND OPEN SOURSE SOFTWARE		
Class	**B.Sc. (Computer Science)**	**Semester**	**V**
Course Objectives	**The Course aims to** • Expose the students to the context and operation of free and open • source software (FOSS) communities and associated software projects. • Familiarise with participating in a FOSS project • Learn some important FOSS tools and techniques		

UNIT	CONTENTS	Lecture Schedule
I	**Philosophy** Notion of Community - Guidelines for effectively working with FOSS community - Benefits of Community based Software Development - Requirements for being open, free software, open source software - Four degrees of freedom - FOSS Licensing Models - FOSS Licenses - GPL- AGPL - LGPL - FDL - Implications - FOSS examples.	8
II	**Libre Office** Introduction & Installation (Linux & Windows)- Typing-Formatting-Typing - Inserting objects & Inserting pictures - Printing-Viewing, saving **Calc:** Introduction - How to work with cells, sheets - Formatting - Basic data manipulation **Impress:** Introduction - Creating a presentation - Viewing a presentation - Inserting pictures in document	8
III	**Linux OS** Linux basics - Installation - Ubuntu desktop - Synaptic packet manager - Basic commands - General Purpose utilities in Linux - File system - Working with regular files - File attributes - Redirection & pipes - Linux processes - Linux environment - Basic system administration - Simple filters	8
IV	**QCAD** Introduction to QCAD -Drawing Methods in QCAD- Using Modification Tools to stretch, Mirror, Scale & Rotate - **Blender for 3D animation :**Installing in Windows - 3D Cursor - Moving in 3D Space - Camera View - Basic Description - Change Window types - File Browser and Info Panel Windows	8
Total Contact Hours		**32**

Text Book: Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition,OReilly Media, 2009. **References:** 1. Philosophy of GNU URL: http://www.gnu.org/philosophy/. 2. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin made-easy/. 3. www.spokenturorials.org 4. Libre office: http://www.libreoffice.org.	
Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Promotes technology and the use of open source software **CO2:** Execute project using Open source technology to meet the industry needs & problems **CO3:** Enable Open Source awareness among the students. **CO4:** Migrating proprietary software lab to open source lab. **CO5:** Ability to build and modify one or more Free and Open Source Software packages.

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	2	2	3	3	3
CO3	1	3	3	3	3
CO4	3	3	2	2	2
CO5	3	3	2	2	3

Course Code & Title	19CSCU06M3 Cyber Security and IT Act		
Class	B.Sc. (Computer Science)	Semester	VI
Course Objectives	The Course aims to • Provide basic knowledge of cyber threats • Impart the security mechanisms • Introduce the cyber laws		

UNIT	CONTENTS	Lecture Schedule
I	**Introduction to Cyber Security** Overview of Cyber Security - Internet Governance – Challenges and Constraints - Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage - Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace	8
II	**Cyber Security Vulnerabilities and Cyber Security Safeguards** Cyber Security Vulnerabilities-Overview vulnerabilities in software, Weak Authentication - Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Deception, Denial of Service Filters, Ethical Hacking, Firewalls - Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management	8
III	**Intrusion Detection and Prevention** Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection - Anti-Malware software, - Security Information Management, Network Session Analysis, System Integrity Validation	8
IV	**Cyberspace and the Law** Introduction, Cyber Security Regulations - Roles of International Law, the state and Private Sector in Cyberspace - Cyber Security Standards. The INDIAN Cyberspace - National Cyber Security Policy 2013	8
Total Contact Hours		**32**

Text Book:

Vakul Sharma, Information Technology Law and Practice, 3rd Edition, Universal Law Publishing Co. Pvt. Ltd., 2012.

References:

1. Universal's Concise Commentary, The Information Technology Act, 2000 Universal Law Publishing Co. Pvt. Ltd.,2016.
2. William Stallings, Cryptography and Network Security: Principles and Practices, Seventh Edition, Pearson Education Asia, 2016

Course Outcomes	On successful completion of the course, the students will be able to **CO1:** Understand the various types of attacks and threats **CO2:** Recognize the different types of existing solutions in security **CO3:** Familiarize with the secure web application **CO4:** Know the cyber laws **CO5:** Understand the standards and regulations in cyber security

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	1	3
CO2	3	2	3	1	3
CO3	3	3	3	1	3
CO4	3	2	2	2	3
CO5	3	2	1	2	3

Course Code & Title	19CSCU06M4 SYSTEM ADMINISTRATION AND MAINTENANCE		
Class	**B.Sc. (Computer Science)**	**Semester**	**VI**
Course Objectives	**The Course aims to** • Import Installation procedures • Provide back up and formatting techniques • Provide the understanding of configuration and scheduling		

UNIT	CONTENTS	Lecture Schedule
I	**System Start up and Operation** Disk Partitioning - File system Installation - File system – Device Manipulation Process	8
II	**User/Group Security and Permissions** Log Analysis - Start-up Scripts - Configuration Files Print - Spooling File Formats	8
III	**Firewalls** Security - Privacy - Backup - Scheduling Maintenance Functions	8
IV	**Media Access** DNS Service: Concepts - DNS Service: Configuration - DNS Service: Client Resolver - File Service	8
Total Contact Hours		**32**

Text Book:

Jan Bergstra and Mark Burgess, Handbook of Network and System Administration, 2008

Reference:

Eleen Frisch, Essential System Administration, 3rd Edition, O'Reilly Media, Inc., 2002.

Course Outcomes	**On successful completion of the course, the students will be able to** **CO1:** Understand different file systems **CO2:** Recognise the device manipulation processes **CO3:** Configure the computer systems **CO4:** Resolve issues in file services **CO5**: Know Backup and recovery

Mapping COs with PSOs:

CO Vs PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	1	2	3
CO2	3	2	2	1	3
CO3	3	3	3	2	3
CO4	2	3	3	1	3
CO5	2	3	3	1	3