BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI -620 024.

M.Sc. COMPUTER SCIENCE: CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2022-23 onwards)

Sem.	Course	Course Title	Ins. Hrs.	Credit	Exam Hrs.	Marks		Total
						Int.	Ext.	
I	Core Course – I (CC)	Mathematical Foundation for Computer Science	6	5	3	25	75	100
	Core Course – II (CC)	Problem Solving using Python and R	6	5	3	25	75	100
	Core Choice Course I (CCC)	Any One from the list	6	4	3	25	75	100
	Core Practical I (CP)	Problem Solving using Python and R	3	2	3	40	60	100
	Core Choice Practical I (CP)	Any One from the list	3	2	3	40	60	100
	Core Elective – I (CE)	Any One from the list	6	4	3	25	75	100
	Value Added Course I (VACI)	Security in Computing	-	2*	3	25	75	100*
	Total		**30**	**22**	**-**	**-**	**-**	**600**
II	Core Course III (CC)	Advanced Database Management System	6	5	3	25	75	100
	Core Course IV (CC)	Compiler Design	5	5	3	25	75	100
	Core Choice Course II (CCC)	Any One from the list	5	4	3	25	75	100
	Core Practical II (CP)	Advanced Database Management System	3	2	3	40	60	100
	Core Choice Practical II (CP)	Any One from the list	3	2	3	40	60	100
	Elective Course II (EC)	Any One from the list	5	4	3	25	75	100
	Non-major Elective Course I	Fundamentals of Information Technology	3	2	3	25	75	100
	Total		**30**	**24**	**-**	**-**	**-**	**700**
III	Core Course V (CC)	Big Data Analytics	5	5	3	25	75	100
	Core Course VI (CC)	Artificial Intelligence and Machine Learning	6	5	3	25	75	100
	Core Choice Course III (CCC)	Any One from the list	5	4	3	25	75	100
	Core Practical III (CP)	Machine Learning Lab	3	2	2	40	60	100
	Core Choice Practical III (CP)	Any One from the list	3	2	2	40	60	100
	Elective Course III (EC)	Any One from the list	5	4	3	25	75	100
	Non-major Elective II	Fundamentals of Internet	3	2	3	25	75	100
	Total		**30**	**24**	**-**	**-**	**-**	**700**
IV	Core Course – XIII (CC)	Agile Technologies	6	5	3	25	75	100
	Core Course VIII (CC)	Cloud Computing	6	5	3	25	75	100
	Entrepreneurship / Industry Based Course	Technology Innovation and Sustainable Enterprise	6	5	3	25	75	100
	Project Work	Dissertation	12	5	-	20	80	100
	Value Added Course (VAC - II)	Foundations of IoT	-	2*	3	25	75	100*
	Total		**30**	**20**	**-**	**-**	**-**	**400**
Grand Total				**90**				**2400**

***The value added courses credit will not be included in the total CGPA.**
These courses are extra-credit courses.
Instruction hours for these courses is 30 hours.

LIST OF CORE CHOICE COURSES

Core Choice Course I		Core Choice Course I Practical	
1.	Advanced Java Programming	1.	Advanced Java Programming
2.	Web Technologies	2.	Web Technologies
Core Choice Course II		**Core Choice Course II Practical**	
1.	Distributed Technologies	1.	Distributed Technologies
2.	Mobile Application Development	2.	Mobile Application Development
Core Choice Course III		**Core Choice Course III Practical**	
1.	User Interface Design and Development	1.	User Interface Design and Development
2.	Cryptography and Network Security	2.	Cryptography and Network Security

LIST OF ELECTIVE COURSES

Core Elective I	
1.	Web Services
2.	Microprocessor and Microcontrollers
3.	Computer Graphics and Multimedia
Core Elective II	
1.	E-Commerce Technologies
2.	Open Source Systems
3.	Green Computing
Core Elective III	
1.	Swarm Intelligence
2.	Block Chain Technology
3.	Digital Image Processing

SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES

Sl. No.	Types of the Course	No. of Courses	No. of Credits	Marks
1.	Core Course	8	40	800
2.	Core Choice Courses	3	12	300
3.	Core Practical	6	12	600
4.	Elective Courses	3	12	300
5.	Entrepreneurship/ Industry Based Course	1	5	100
6.	Project	1	5	100
7.	Non-Major Elective Courses	2	4	200
	Total	24	90	2400
	Value Added Courses *	2*	4*	200*

PROGRAMME OBJECTIVES:

- Practice and grow as computing professionals, conducting research and/or
- leading, designing, developing, or maintaining projects in various technical areas of computer science.
- Drives scientific and societal advancement through technological
- innovation and entrepreneurship
- To enable the students, to understand the core concepts, visualize and to apply them in the real time scenarios

PROGRAMME OUTCOMES:

After the successful completion of M.Sc (Computer Science) programme, the Graduates will be able to:

- An ability to apply mathematical model, algorithmic principles, and computer science theory in the design of real-time applications
- Get expertise in developing smart applications
- Apply computer science theory and software development concepts to construct computing-based solutions.
- Discover the opportunity for entrepreneurship and create and add value for the betterment of an individual and society at large.
- Use research-based knowledge and research methods to design, analyze, and interpret data and synthesize information to provide valid findings to serve the community.

First Year **CORE COURSE I** **Semester I**

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVE:

- Ability to apply mathematical logic to solve problems.
- Understand Propositions, tautologies, and inference rules.
- Able to formulate problems and apply the test of hypothesis

UNIT - I MATRICES:

Determinants, inverse of matrix. System of equations, Linear transformation - rank and nullity, Consistency and inconsistency of linear system of equations, rank nullity theorem, Echelon form of a matrix, and Row reduced echelon form of matrix. Eigen values and Eigen vectors.

UNIT – II POWER METHOD TO FIND THE DOMINANT EIGEN VALUES, NUMERICAL LINEAR ALGEBRA:

Gauss elimination method, Gauss Jordan Method, Jacobi Method for solving linear systems.

UNIT – III SETS:

Operations on sets, Venn Diagrams, Multi Sets, Binary Relations, Equivalence Relations, Ordering Relations, Operations on Relations, Partial Orders . Statements and Notation, Connectives, Quantified Propositions, Logical Inferences, Methods of Proof of an Implication, First Order Logic and other Methods of Proof, Rules of Inference for Quantified Propositions, Proof by Mathematical Induction.

UNIT – IV GENERATING FUNCTIONS OF SEQUENCES:

Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, the Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations

UNIT – V INTRODUCTION TO PROBABILITY:

Random variables - discrete and continuous, probability functions, density and distribution functions, mean and variance, special distributions (Binomial, Hyper geometric, Poisson, Uniform, exponential and normal). Testing of Hypothesis, Null and alternative hypothesis, level of significance, one-tailed and two tailed tests, tests for small samples- T-test, Chi-square test.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Kenneth H. Rosen, "Discrete Mathematics And Its Applications", 7th Ed, Mc Graw Hill, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition 2011.
3. Bernard Kolman, Robert Busby and Sharon Cutler Ross, "Discrete Mathematical Structures for Computer Science", 6 th Ed, PHI, 2013.
4. Walpole, R. E., Myers, R. H., Myers S L & Keying Ye, 'Probability and Statistics for Engineers and Scientists'. 8th ed, Pearson Education, 2007.
5. Eric Lehman, F. Thomson Leighton, Albert R. Meyer, "Mathematics for Computer Science", MIT 7th Ed, 2015
6. William Stein, "Elementary Number Theory: Primes, Congruences, and Secrets": A Computational Approach Springer, 2008.
7. Sipser, "Introduction to the Theory of Computation, CENGAGE Learning, 2014. 4. Ernest Davis, "Linear Algebra and Probability for Computer Science Applications ", 1st Edition, CRC Press 2012.
8. Tom M. Apostol, "Introduction to Analytic Number Theory", Springer, 1998.
9. https://mrcet.com/downloads/digital_notes/IT/MATHEMATICAL%20FOUNDATIONS%20OF%20(R17A0503).pdf
10. https://stattrek.com/tutorials/probability-tutorial
11. https://www.tutorialspoint.com/discrete_mathematics/discrete_mathematics_sets.htm
12. https://repositorio.uci.cu/jspui/bitstream/123456789/9433/1/Mathematical%20Foundation%20of%20Computer%20Science%20%28%20PDFDrive%20%29.pdf

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- Apply the basis of the mathematical applications.
- Apply iterative methods (Gauss Jordan, Gauss Elimination and Jacobi) to solve systems of linear equations.
- Understand Propositions, tautologies and inference rules.
- Use sets and operations on sets.
- Formulate problems and apply testing of hypothesis.

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First Year **CORE COURSE II** **Semester I**

PROBLEM SOLVING USING PYTHON AND R

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To understand Computational thinking using Python.
- To develop simple Python programs for solving problems.
- To make students exercise the fundamentals of statistical analysis in R environment.

UNIT – 1 INTRODUCTION TO PYTHON:

Introduction – Python overview – Getting started – Comments – Python identifiers – Reserved keywords – Variables – Standard data types – Operators – Statements and Expressions – String operations – Boolean expressions. Control Statements: The for loop – while statement – if-elif-else statement – Input from keyboard. Functions: Introduction – Built-in functions – User defined functions – Function Definition – Function Call - Type conversion – Type coercion – Python recursive function.

UNIT – II STRINGS:

Strings –Compound data type – len function – String slices – String traversal – Escape characters – String formatting operator – String formatting functions. **Tuples:** Tuples – Creating tuples – Accessing values in tuples – Tuple assignment – Tuples as return values – Basic tuple operations – Built-in tuple functions. **Lists:** Values and accessing elements – Traversing a list – Deleting elements from list – Built-in list operators & methods. **Dictionaries:** Creating dictionary – Accessing values in dictionary – Updating dictionary – Deleting elements from dictionary – Operations in dictionary - Built-in dictionary methods.

UNIT – III FILES AND EXCEPTIONS:

Introduction to File Input and Output - Writing Structures to a File - Using loops to process files Processing Records - Exception. Classes and Objects in Python: Overview of OOP – Data encapsulation – Polymorphism – Class definition – Creating objects – Inheritance – Multiple inheritances – Method overriding – Data encapsulation – Data hiding.

UNIT – IV DATA MANIPULATION TOOLS & SOFTWARES:

Numpy: Installation - Ndarray - Basic Operations -Indexing, Slicing, and Iterating - Shape Manipulation - Array Manipulation - Structured Arrays -Reading and Writing Array Data on Files. **Pandas:** The pandas Library: An Introduction - Installation -Introduction to pandas Data Structures - Operations between Data Structures - Function Application and Mapping - Sorting and Ranking - Correlation and Covariance - —Not a Number Data - Hierarchical Indexing and Leveling – **Reading and Writing Data:** CSV or Text File - HTML Files – Microsoft Excel Files.

UNIT – V PROGRAMMING WITH R:

Variables - Vector, matrix, arrays – List – Data Frames – Functions – Strings – Factors – Loops – Packages –Date and Time – Files - Making packages

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Python: The Complete Reference, Matrin C Brown, McGrraw-Hill, 2018.
2. Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications – SheetalTaneja, Naveen Kumar – Pearson Publication, 2018.
3. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinny, 2nd Edition,O'Reilly Media, 2017.
4. Data Analytics Using Python, Bharti Motwani, Wiley, 2020
5. Richard Cotton, "Learning R", O'Reilly, 2013
6. Python for Everybody: Exploring Data Using Python3, Dr. Charles R. Severance, 2016.
7. E Balagurusamy, ―Introduction to computing and problem solving using Python‖, McGraw Hill Publication,2016.
8. Mark Summerfield, Programming in Python 3: A Complete Introduction to the Python Language, 2nd Ed.,Addison-Wesley Professional, 2010.
9. Mark Lutz, ―Learning Python‖, 5th Ed., 2013.
10. Welsey J. Chun, ―Core Python Programming‖, Prentice Hall, 2001
11. https://realpython.com/python-practice-problems/
12. https://freepdf-books.com/impractical-python-projects-playful-programming-activitiesto-make-yousmarter-book-of-2019/
13. https://freepdf-books.com/fundamentals-of-python-first-programs-second-editionbook-of-2019
14. https://docs.python.org
15. https://www.learnpython.org/
16. https://www.javatpoint.com/python-tutorial
17. https://www.tutorialspoint.com/r/index.htm

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

- Write Python programs using Python data structures
- Develop object oriented programs in Python
- Manipulate files using Python
- Apply the Python libraries NumPy and Pandas for problem solving
- Write R programs for data visualization.

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First Year **CORE CHOICE COURSE I** **Semester I**

1) ADVANCED JAVA PROGRAMMING

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To deepen student's programming skills by analyzing the real world problem in a programmer's point of view.
- To implement the concepts in real time projects
- To enable the students to learn the ethical, historical, environmental and technological aspects of Advanced Java Programming.

UNIT – I DESIGN PATTERNS:

Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern-Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern-Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class- Tree Set class Priority Queue class - Map interface-Hash Map class- Linked Hash Map class –Tree Map class - Comparable interface -Comparator interface- Comparable vs. Comparator

UNIT – II APPLETS AND AWT:

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

UNIT – III JDBC AND JAVA NETWORKING:

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

UNIT – IV SERVLETS AND JSP:

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

UNIT – V INTERFACE:

Lambda Expressions- Method Reference- Functional Interface- Streams API, Filters- Optional Class- Nashorn- Base 64 Encode Decode- JShell(RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multiresolution Image API.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Bert Bates, Karthy Sierra, Eric Freeman, Elisabeth Robson, "Head First Design Patterns", O'REILLY Media Publishers.(1st-Unit).
2. Herbert Schildt, "Java: A Beginner Guide", Oracle Pres-Seventh Edition. (2nd and 3rd Unit).
3. Murach's, "Java Servlets and JSP", 2nd Edition, Mike Murach & Associates Publishers; 3rd Edition. (4th Unit).
4. Warburton Richard, "Java 8 Lambdas", Shroff Publishers & Distributors Pvt Ltd. (5th Unit).
5. Paul Deitel and Harvey Deitel, "Java: How to Program", Prentice Hall Publishers; 9th Edition.
6. Jan Graba, "An Introduction to Network Programming with Java-Java 7 Compatible", 3rd Edition, Springer.
7. https://www.youtube.com/watch?v=Ae-r8hsbPUo
8. https://enos.itcollege.ee/~jpoial/allalaadimised/reading/Advanced-java.pdf
9. https://www.udemy.com/course/advanced-java-programming/
10. https://www.edureka.co/blog/advanced-java-tutorial

COURSE OUTCOMES:

After completion of this course, the students will be able to:

- Understand the design patterns
- Develop a Graphical User Interface (GUI) with Applet.
- Develop a Client-Server Application with Database Maintenance.
- Develop a program using Servlet and JSP.
- Develop programs that use interfaces. Work on search engine, JSP Engines, etc.

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First Year **CORE CHOICE COURSE I** **Semester I**

2) WEB TECHNOLOGIES

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to developing professional software development skills.
- To make familiar with client server architecture.
- To get project-based experience needed for entry into web application and development careers.

UNIT – I INTERNET BASICS:

Basic Concepts – Internet Domains – IP Address – TCP/IP Protocol – The WWW – The Telnet — Introduction to HTML: Web server - Web client / browser - Tags – Text Formatting – Lists – Tables – Linking Documents - Frames.

UNIT – II JAVASCRIPT:

JavaScript in Web Pages – The Advantages of JavaScript –Writing JavaScript into HTML – Syntax – Operators and Expressions –Constructs and conditional checking – Functions – Placing text in a browser – Dialog Boxes – Form object's methods – Built in objects – user defined objects.

UNIT – III XML:

Comparison with HTML – DTD – XML elements – Content creation –Attributes – Entities – XSL – XLINK – XPATH – XPOINTER – Namespaces –Applications – integrating XML with other applications.

UNIT – IV JSP FUNDAMENTALS:

Basics – Directive basics – Page directive – The taglib directive – The include directive – JSP Standard Actions – Java Beans –Error Handling.

UNIT – V ASP:

Introduction to ASP – Objects – Components – Working with HTML forms – Connecting to Microsoft SQL Server & MS–Access Database – SQL statements with connection object – Working with record sets.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. "Web Enabled Commercial Application Development Using HTML, DHTML, Java Script, Perl CGI", Ivan Bayross, BPB Publication.

2. “XML Bible”, Elliotte Rusty Harold, 2nd Edition, Wrox Publication.
3. “Beginning Java Server Pages”, Vivek Chopra, Sing Li, Rupert Jones, Jon Eaves, John T. Bell, Wrox Publications.
4. “Practical ASP”, Ivan Bayross, BPB Publication
5. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
6. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY, 2006.
7. https://www.geeksforgeeks.org/web-technology/
8. https://study.com/academy/lesson/what-is-web-technology-definition-trends.html

COURSE OUTCOMES:

On the successful completion of this course, Students will be able to:

- Design a web page with Web form fundamentals and web control classes
- Recognize the importance of validation control, cookies and session
- Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model.
- Recognize the difference between Data list and Data grid controls in accessing data.
- Know the code optimization techniques; Understand the techniques of Internet, JavaScript, XML, JSP, ASP with a view to developing professional software development skills.

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First Year	**CORE PRACTICAL I**	**Semester I**
	PROBLEM SOLVING USING PYTHON AND R	
Code:	**(Practical)**	**Credit: 2**

(a). Implement the following concepts using Python

1. Decision Making and Looping statements.
2. Function Definition & Function call.
3. Create and Access Lists.
4. Built-In Tuple Functions.
5. Create and Access Dictionaries.
6. Files and Exceptions.

(b). Implement the following concepts using R

1. Loops with different examples.
2. Implement data frames in R.
3. Implement different data structures in R (Vectors, Lists, Data Frames)
4. Write a program to read a csv file and analyze the data in the file
5. Create pie charts and bar charts using R.

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First Year **CORE CHOICE PRACTICAL I** **Semester I**

1) ADVANCED JAVA PROGRAMMING

Code: **(Practical)** **Credit: 2**

1. Multithreading.

Create a class Parent by extending a Thread class and also create a class as Child and illustrate the concept of multithreading by applying thread class methods.

2. Collection Interfaces.

Write a program to create a List (Books) using Array List and add items to the list and traverse the items through Iterator.

3. I/O Streams

Create a class named Input Stream Reader Example and read the contents of the file using the methods File Input Stream() and Input Stream Reader().

4. Applet programming.

Design Traffic Signals using Applet methods.

5.Networking:

(i) Write an application which will retrieve IP address for given website.
(ii) Write an application which will retrieve the content of the given URL with different web-page related information.

6. Applying AWT concepts

Design a Registration form with AWT Controls.

7. Applying swing concepts

Develop a java swing Frame to retrieve the records form the Job Portal database table. Design a scientific Calculator using swing components.

8. JDBC

Design a web application for Student details with database operations insert, delete and update.

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First Year **CORE CHOICE PRACTICAL I** **Semester I**

2) WEB TECHNOLOGIES

Code: **(Practical)** **Credit: 2**

1. Write a XML program for job listing in HTML.

2. Write a JavaScript code block, which checks the contents entered in a form's text element. If the text entered is in the lower case, convert to upper case.

3. Write a JavaScript code block, which validates a username and password.

   a) If either the name or password field is not entered display an error message.
   b) The fields are entered do not match with default values display an error message.
   c) If the fields entered match, display the welcome message.

4. Write a JavaScript code to display the current date and time in a browser.

5. Write a JSP Program for user authentication.

6. Write a JSP Program for a simple shopping cart.

7. Write a JSP Program to prepare a bio data and store it in database.

8. Write an ASP Program using Response and Request Object.

9. Write an ASP Program using AdRotator Component.

10. Write an ASP program using database connectivity for student's record

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First Year	CORE ELECTIVE I 1) WEB SERVICES	Semester I
Code:	(Theory)	Credit: 4

COURSE OBJECTIVES:

- To enable the student to be familiar with distributed services, XML and web services.
- To study the use of web services in B2C and B2B applications
- To Understand the SOA, its Principles and Benefits.

UNIT – I OVERVIEW OF DISTRIBUTED COMPUTING:

Introduction to web services – Industry standards, Technologies and concepts underlying web services – their support to web services. Applications that consume web services.

Unit – II XML:

Its choice for web services – network protocols to back end databases-technologies – SOAP, WSDL – exchange of information between applications in distributed environment – locating remote web services – its access and usage. UDDI specification – an introduction.

UNIT – III OUTLINE OF WEB SERVICES:

Conversation – static and interactive aspects of system interface and its implementation, work flow – orchestration and refinement, transactions, security issues – the common attacks – security attacks facilitated within web services quality of services – Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics, Mobile and wireless services – energy consumption, network bandwidth utilization, portals and services management.

UNIT – IV APPLICATION USING WEB SERVICES:

Building real world enterprise applications using web services – sample source codes to develop web services – steps necessary to build and deploy web services and client applications to meet customer s requirement – Easier development, customization, maintenance, transactional requirements, seamless porting to multiple devices and platforms.

UNIT – V TOMCAT AND AXIS SOAP SERVER:

Deployment of Web services and applications onto Tomcat application server and axis SOAP server (both are free wares) – Web services platform as a set of enabling technologies for XML based distributed computing.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide, Prentice Hall, Nov 2003.
2. Heather Williamson, "XML: The Complete Reference "Tata McGraw-Hill Education India.
3. Martin Kalin, "Java Web Services: Up and Running", O'Reilly Publishers.
4. https://en.wikipedia.org/wiki/Web_service
5. https://www.tutorialspoint.com/webservices/what_are_web_services.htm
6. https://www.javatpoint.com/what-is-web-service

COURSE OUTCOMES:

On completion of this course you should be able to:

- Understand the design principles and application of SOAP and REST based web services.
- Understand XML concepts
- Design collaborating web services according to a specification.
- Implement an application that uses multiple web services in a realistic business scenario.
- Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them.

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First Year **CORE ELECTIVE I** **Semester I**

2) MICROPROCESSOR AND MICROCONTROLLERS

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVE:

- To realize the 8086 Microprocessor Architecture, Operations, Programming,
- To understand the basics of advanced Microprocessors and 8051 with 80196 Microcontroller.
- To develop the assembly language programming.

UNIT – I 8086 ARCHITECTURE, PIN CONFIGURATION & TIMING DIAGRAM:

Register Organization of 8086 –Architecture – Signal Description – Minimum Mode 8086 System and Timings – Maximum Mode 8086 System and Timings – The 8088 Architecture – Pin configuration - Comparison of 8086 and 8088.

UNIT – II 8086 ADDRESSING MODES, INSTRUCTION SET AND ASSEMBLER DIRECTIVES:

Machine Language Instruction Formats-Addressing Modes of 8086-**Instruction Set of 8086:** Data Transfer Instructions – Arithmetic Instructions – Logical Instructions – Rotate Instructions – Shift Instructions – Branch Instructions – Flag Manipulation and Processor Control Instructions – String Instructions – Interrupts and Interrupt Service Routines – Assembler Directives and Operators – #Programming with an Assembler.

UNIT – III 8086 ASSEMBLY LANGUAGE PROGRAMMING:

Addition, Subtraction, Multiplication and Division –Multi-byte Addition and Subtraction – Complements – Shifting – Masking – Sum of a Series –Block of Data Transfer – Finding the Smallest and the Biggest Number in an Array – Arranging a Series of Numbers in Ascending and Descending Order – Length of a String – Number of Occurrences of a Character in a String – Comparison of Two Strings

UNIT – IV 80286 ARCHITECTURE:

80286 Architecture – Salient features of 80286 – Signal description of 80286 – 80286 bus interface – basic bus operations of 80286 – 80386 architecture – salient features of 80386 – addressing modes of 80386 – register organization of 80386 – data types of 80386 – Protected and virtual mode of 80386 - Pentium Microprocessor – Architecture – Instruction set of Pentium – Intel MMX – MMX architecture – MMX instruction set - Pentium Pro and Pentium II features.

UNIT – V MICROCONTROLLER 8051ARCHITECTURE:

Architecture of 8051 – Signal Descriptions of 8051-Register Set of 8051 – Important Operational Features of 8051 –Memory and I/O Addressing by 8051# –

Interrupts of 8051-Instruction Set of 8051 – Intel 16-bit Microcontroller - 80196 – 80196 architecture – Register set of 80196 – General features of 80196.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. A.K. Ray, K.M. Bhurchandi, *Advanced Microprocessors and Peripherals*, TMH Publications, Third Edition, 2013. **UNIT I :** Chapter-1 Section (1.1-1.3, 1.8-1.10) **UNIT II :** Chapter-2 Section (2.1-2.4) Chapter-3 Section (3.3), Chapter-4 Section (4.3) **UNIT III :** Chapter-3 Section (3.4) **UNIT IV :** Chapter – 9 Section (9.1 - 9.3, 10), Chapter (10.2 – 10.5, 10.7.10.10), Chapter (11.1-11.3, 11.5 – 11.7, 11.10, 11.12) **UNIT V :** Chapter-17 Section (17.2-17.8, 17.11)
2. Badri Ram, Fundamentals of Microprocessors and Microcomputers, Fifth Revised and Enlarged Edition, Dhanpat Rai Publications, 2003.
3. K.Meena, Principles of Digital Electronics, Prentice Hall of India Pvt. Ltd.. New Deihl. 2009.(ISBN :978 - 81 - 203 - 3270 • 6)
4. https://www.eletimes.com/microprocessor-vs-microcontroller-what-is-the-difference#
5. https://www.guru99.com/difference-between-microprocessor-and-microcontroller.html
6. https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm

COURSE OUTCOMES:

On completion of the course the student will be able to:

- Compare the architectures of Microprocessor and Microcontrollers;
- Differentiate the technologies associated with presentation and interaction services in 8051 with 80196.
- Distinguish and analyze the properties of Microprocessors & Microcontrollers.
- Analyze the data transfer information through serial & parallel ports.
- Get knowledge about Micro controllers.

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First Year **CORE ELECTIVE I** **Semester I**

3) COMPUTER GRAPHICS AND MULTIMEDIA

Code: **(Theory)** **Credit: 4**

UNIT – I GRAPHICS HARDWARE:

Basic of Computer Graphics, display technology, Raster Scan & Random scan display systems, Input devices.

UNIT – II BASIC RASTER GRAPHICS FOR DRAWING 2_D PRIMITIVES:

Scan converting lines, circles, ellipse; filling rectangles, polygons, generating characters; antialiasing. Matrix representation and Homogeneous coordinates, two dimensional transformations, 2D line clipping, polygon clipping algorithms, window to viewport transformation.

UNIT – III VIEWING IN 3D:

Three dimensional transformation, projections: Parallel, prospective, viewpoints.

UNIT – IV REPRESENTATION OF CURVES & SURFACES:

Bezier method, B-spline methods. Visible surface determination: Z-buffer, Algos, List priority algorithms, Scan line algorithms. Light and shading models: Illumination models, shading models for polygons, shading algorithms, Gouraud & Phong, color models like RGB, YIU, copy, HSV etc.

UNIT – V INTRODUCTION TO MULTIMEDIA:

Multimedia components; multimedia hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia tools, presentations tools, Authoring tools, presentations. Graphics animation : Tweeking, Morphing simulating accelerator, motion specification.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Foley, Van Dam, Fundamentals of Interactive Computer Graphics, Addison Wesly
2. Hearn and Baker Computer Graphics, Prentice Hall of India
3. Rogers D.F. Procedural Elements of Computer Graphics, McGraw Hill
4. R Steimnetz, K Nashtet, Multimedia Computing Communications & Appl., PHI
5. John F.K. Buford, Multimedia System, Addision Wesley
6. Prabhat K. And leigh and Kiran Thakkar, Multimedia System Design, PHI.
7. Roger S. David Mathematical Elements for Computer Graphics, McGraw Hill

8. https://www.tutorialspoint.com/computer_graphics/computer_graphics_curves.htm
9. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2479
10. https://www.tutorialspoint.com/computer_graphics/index.htm

COURSE OUTCOMES:

On completion of this course, the students will be able to:

- Understand the graphics hardware
- Get knowledge about Raster Graphics for drawing 2_D primitives
- Understand 3D Transformations
- Gain knowledge about different types of curves
- Understand Multimedia components.

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First Year	VALUE ADDED COURSE I SECURITY IN COMPUTING	Semester I
Code:	(Theory)	Credit: *2

COURSE OBJECTIVES:

- Understand various threats
- Understand Security in operating systems, database and networks
- Identify different tools

UNIT – I INTRODUCTION AND BASIC CONCEPTS:

Threats, vulnerabilities, controls; risk; Breaches; confidentiality, integrity, availability; Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

UNIT – II EXPLANATION OF MALWARE, TYPES OF MALWARE:

Virus, Worms, Trojans, Rootkits, Robots, Adware's, Spywares, Ransom wares, Zombies etc., , Malware Analysis. Open Source/ Free/ Trial Tools: Antivirus Protection, Anti Spywares, System tuning tools, Anti Phishing.

UNIT – III SECURITY IN CONVENTIONAL OPERATING SYSTEMS:

Memory, time, file, object protection requirements and techniques Identification and authentication. Trusted operating systems.

UNIT – IV DATABASE MANAGEMENT SYSTEMS SECURITY:

Database integrity, Database secrecy , Inference control , Multilevel databases.

UNIT – V NETWORK SECURITY:

Network threats: eavesdropping, spoofing, modification, denial of service attacks, Introduction to network security techniques: firewalls, intrusion detection systems. Cyber crimes and control measures.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Security in Computing", 5 th Ed, Prentice hall, 2015.
2. Michael E. Whitman, 'Information Security: incident response and disaster recovery', Cengage Learning, 2009
3. WM. Arthur Conklin, Gregory B. White, Chuck Cotheren, Dwayne Williams, Roger Lavis,"Principles of Computer Security", 4 th Ed,Mc Graw Hill 2016
4. https://www.w3schools.com/cybersecurity/index.php

5. https://www.javatpoint.com/cyber-security-tools

COURSE OUTCOMES:

- Understand the basic concepts of information security – Threats, Vulnerabilities and Controls
- Examine various malwares and program flaws
- Compare Security enabled in conventional and trusted operating systems.
- Understand various security measures in database management systems
- Gain knowledge on network threats and security techniques.

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First Year **CORE COURSE III** **Semester II**

ADVANCED DATABASE MANAGEMENT SYSTEM

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- Understand Relational Model
- Get knowledge about SQL as well as NoSql
- Understand transaction management

UNIT – I INTRODUCTION:

Database System Applications – Purpose of Database Systems -View of Data – Database Languages - Relational Databases – Database Design - Data Storage and Querying - Transaction Management, Database Architecture -Database Users and Administrators

UNIT – II RELATIONAL MODEL:

Structure of Relational Database - Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations- Design Phases – Pitfalls in Design – Attribute types –ER diagram – Database Design for Banking Enterprise – Functional Dependence – Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF).

UNIT – III INTRODUCTION TO SQL:

SQL Data Definition, Basic Structure of SQL Queries - Additional Basics Operations, Set Operations - Null Values, Aggregate Functions - Nested Subqueries, Modification of the Database

Intermediate SQL: Join Expression, Views - Transactions, Integrity Constraints - Data Types and Schemas, Authorization

Advanced SQL: Accessing SQL from Programming Language, Functions and Procedures, Triggers

UNIT – IV TRANSACTIONS AND RECOVERY:

Transactions: Transaction Concept– Simple Transaction Model – Storage Structure - Transaction Atomicity and Durability. Transaction Isolation – Serializability - Transaction Isolation and Atomicity – Transaction Isolation Levels – Implementation of Isolation Levels – Transactions as SQL Statements Recovery Systems: Failures Classification – Storage Recovery and Atomicity – Recovery Algorithm Buffer Management – Failure with Loss of Nonvolatile Storage - Early Lock Release and Logical Undo Operations - Remote Backup Systems

UNIT – V NOSQL DATABASE AND BIG DATA STORAGE SYSTEM:

Introduction to NoSQL Systems - The CAP Theorem - Document Based NoSQL Systems and MangoDB - NoSQL key value Stores - Column based or Wide Column NoSQL Systems - NoSQL graph Databases and Neo4j

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Database System Concepts, 6/e, Avi Silberchartz, Henry F. Korthand S. Sudarsha, Mc Graw– Hill Higher Education, International Edition, 2013.
2. Ramesh Elmasri and Shamkant B.Navathe, Fundamentals of Database Systems,7thEdition,Pe arson,NewDelhi,2016
3. Database Principles, 2/e, Peter Rob, Carlos Coronol, Steven A.Morris, KeeleyCrokett, Cengage Learning, 2013
4. Database System Concepts, PeterRob, CarlosCoronel, CengageLearning,2008.
5. DatabaseDevelopmentandManagement,LeeChao,AuerbachPublications,2010
6. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Sadalage, P. &Fowler, PearsonEducation, 2013
7. Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQLMovement,1stEdition,LucPerkins,EricRedmond,etal.O'ReilleyPublishers,2018
8. https://www.javatpoint.com/dbms-normalization
9. https://www.mongodb.com/nosql-explained
10. https://www.geeksforgeeks.org/database-recovery-techniques-in-dbms/

COURSE OUTCOMES:

- Revise the components, functions and various database Design techniques used for modelling the databases management system.
- Examine the clauses and functions of SQL and write optimal queries in the above languages.
- Design entity-relationship diagrams to represent simple Database application scenarios and can apply the database schema Normalization rules and techniques to criticize and improve the data base design.
- Analyze the concept of transaction processing, concurrent transaction processing and recovery procedures.
- Employ the NoSQL database concepts

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First Year **CORE COURSE IV** **Semester II**

COMPILER DESIGN

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- Define the design and intrinsic functioning of compilers
- Identify the purpose and functions of phases of the compiler
- Describe the Contents and data structures for Symbol table with errors

UNIT – I INTRODUCTION TO COMPILERS:

Compilers - Analysis - Synthesis model of compilation - Analysis of the source program - The phases of a compiler -Cousins of the compiler - Compiler construction tools - Error handling.

UNIT – II LEXICAL ANALYZER:

Lexical analysis - Role of lexical analyzer - Tokens, Patterns and lexemes - Input buffering - Specification of tokens - Regular expressions - Recognition of tokens - Transition diagrams - Implementing a transition diagram - Finite Automata - Regular expression to NFA - Conversion of NFA to DFA

UNIT – III SYNTAX ANALYZER:

Syntax analysis - Role of parser - Context-free grammars - Derivations - Writing a grammar - Top Down parsing - Recursive descent parsing - Predictive parsers - Non-recursive predictive parsers - Construction of predictive parsing tables - Bottom up parsing - Handles - Shift reduce parser - Operator precedence parsing - LR parsers - Canonical collection of LR (0) items -Constructing SLR parsing tables.

UNIT – IV INTERMEDIATE CODE GENERATION:

Intermediate code generation - Intermediate languages - Graphical Representation - Three Address Code - Assignment statements - Boolean expressions - Flow of Control Statements - Case Statements - .Syntax directed translation of case statements

UNIT – V CODE OPTIMIZATION AND CODE GENERATION:

An Organization for an Optimizing Compiler - the Principle sources of optimization - Function Preserving Transformations - Common Subexpression - Copy propagation - Optimization of basic blocks - The use of Algebraic identities - Loops in flow graphs - Code generation - issues in the design of a code generator - The target machine.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. "Compilers: Principles, Techniques, and Tools", Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Second Edition, Pearson Addison Wesley, 2007.
2. Compiler Construction Principles and Practice – D.M. Dhamadhere, McMillan India Ltd., Madras, 1983.
3. Alfred V. Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers, Principles, Techniques and Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.
4. Alfred V. Aho, Jeffrey D Ullman, "Principles of Compiler Design", Addison Wesley, 1988.
5. David Galles, "Modern Compiler Design", Pearson Education, 2008

COURSE OUTCOMES:

On completion of the course, students will be able to

- Understand the fundamentals of a compiler.
- Get knowledge about the context-free grammars and various parsing techniques.
- Understand the lexical analyzer and syntax analyzer of Compiler.
- Understand the types and sources of errors, from the compilers perspective.
- Know the procedures and principles involved in the machine code generation.

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First Year **CORE CHOICE COURSE II** **Semester II**

1) DISTRIBUTED TECHNOLOGIES

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To provide ideas to be able to compare the architectures of distributed systems;
- To know the art of developing ASP.NET pages with web server and HTML controls;
- To become familiar with the disconnected data access technology in ADO.NET.

UNIT – I OVERVIEW OF DISTRIBUTED COMPUTING:

Introduction to distributed Computing – Challenges involved in establishing remote connection – Strategies involved in remote computation –Current Distributed computing practices through Dot Net and Java technologies - Client server architecture: 2-tier model - 3-tier model - n-tier model.

UNIT – II ARCHITECTURE AND JAVA BEANS:

J2EEarchitecture - DOTNET architecture - MVC Architecture – JavaBeans – Enterprise Java Beans – Distributed Object models – RMI – XML-JSP.

UNIT – III ADVANCED ASP.NET:

AdRotator, Multiview, Wizard and Image Map Controls – Master Pages – Web Parts - Security in ASP, NET – State Management in ASP, NET – Mobile Application development in ASP. NET- Uses of these controls and features in Website development.

UNIT – IV ADVANCED ADO.NET:

Disconnected Data Access – Grid view, Details View, Form View controls – Crystal Reports – Role of ADO.NET in Distributed Applications.

UNIT – V WEB SERVICES:

Role of Web services in Distributed Computing –WSDL, UDDI, SOAP concepts involved in Web Services – Connected a Web Service to a Data Base – Accessing a Web Service through ASP.NET application.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Walther, ASP. NET 3.5, SAMS Publication, 2008.

2. Justin Couch, Daniel H. Steinberg, “J2EE Bible”, Wiley India(P) Ltd, New Delhi, 2002
3. Platt S David, “Introducing Micorsoft .Net”, Prentice Hall of India, New Delhi,2005.
4. Paul Tremblett, “Instant Enterprise Java y – Beans”, Tata McGraw Hill Publishing Company, New Delhi, 2001
5. Stephanie Bodoff, Dale Green, Eric Jendrock, “The J2EE tutorial”, Addison-Wesley, 2002
6. Hitesh Seth, “Microsoft .NET: kick start”, Sams Publishing, 2004
7. K.Meena, R.Sivakumar, A.B.Karthlck Anand Babu, Dot Net Technologies, Himalaya Publishing House Pvt., Ltd., Bangalore, 2016, (ISBN:978 -93-5037-938-9)

COURSE OUTCOMES:

On completion of the course the student will be able to:

- Compare the architectures of distributed systems;
- Differentiate the technologies associated with presentation and interaction services;
- Have sound knowledge in developing applications with components;
- Understand the art of developing ASP.NET pages with web server and HTML controls;
- Become familiar with the disconnected data access technology in ADO.NET.

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First Year	CORE CHOICE COURSE II 2) MOBILE APPLICATION DEVELOPMENT	Semester II
Code:	(Theory)	Credit: 4

COURSE OBJECTIVE:

- A good understanding on the Mobile Environment
- To Know the Architecture of the Mobile Application
- To Understand the Features of Android

UNIT – I INTRODUCTION TO MOBILE APPLICATIONS:

Native and web applications - Mobile OS and Databases. Introduction to Android: History - Features – OSS – OHA - Versions - Android devices - Setting up software – IDE. Introduction to iOS – iOS features –user interface - Using Wifi – iPhone marketplace.

UNIT – II ANDROID ARCHITECTURE:

Android Stack - Linux Kernel - Android Runtime - Dalvik VM - Application Framework - Android emulator - Android applications development - Virtualization – APIs – Android File system – A Basic Android Application - Deployment. Android Activities: The Activity Lifecycle – Lifecycle methods – Creating Activity.

UNIT – III INTENTS:

Intent Filters – Activity stack. Android Services: Simple services – Binding and Querying the service – Executing services. Broadcast Receivers: Creating and managing receivers – Receiver intents. Content Providers: Creating and using content providers – Content resolver.

UNIT – IV ANDROID UI:

Android Layouts – Attributes – Layout styles - Linear – Relative – Table – Grid – Frame – Menus - Lists and Notifications - Input Controls: Buttons - Text Fields – Checkboxes - alert dialogs – Spinners - rating bar - progress bar.

UNIT – V WORKING WITH DATABASES:

SQLite – coding for SQLite using Android - Publishing and Internationalizing mobile applications - mobile application deployment: Game, Clock, Calendar, Convertor, Phone book.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Barry Burd, "Android Application Development – All-in-one for Dummies", 2ndEdition, Wiley India, 2016.
2. Lauren Darcey, Shane Conder, "Sams Teach Yourself Android Application Development in 24 hours", 2nd edition, Pearson Education, 2013.
3. Jerome (J. F) DiMarzio, "Android – A Programmer"s Guide", McGraw HillEducation, 8th reprint, 2015.
4. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6Development: Exploring the iOS SDK",Apress, 2013.
5. http://www.developer.android.com

COURSE OUTCOMES:

On completion of the course the student will be able to:

- Understand the features and challenges of mobile devices.
- Know the differences between native app development, web app development and hybrid app development
- Apply the UI components, multimedia usage, permissions, Storage usage, read and write operations in storage
- Understand and apply the UI design for the given problem
- Design an application based on the user requirements

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First Year **CORE PRACTICAL II** **Semester II**

ADVANCED DATA BASE MANAGEMENT SYSTEM

Code: **(Practical)** **Credit: 2**

Implement the following Concepts:

- Tables Creations, Sorting, Setting relation between tables
- Queries using single and multiple tables
- Exception Handling
- Cursor and Triggers
- Import & Export Tables
- Indexing and Query Processing
- Reports

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First Year **CORE CHOICE PRACTICAL II** **Semester II**

1) DISTRIBUTED TECHNOLOGIES

Code: **(Practical)** **Credit: 2**

List of Programs:

1. RMI application with a server and more than one client.
2. RMI application with Database Connectivity
3. Webpages using JSP Scriptlet.
4. Webpage using JSP of java beans.
5. Performing XML transformation using XML and XSL coding.
6. Create XML Schema.
7. Creation of a table and insertion of a few records using Disconnected Access.
8. Viewing records using GridView, Details View, Form View Controls.
9. Generation of a crystal report from an existing database.
10. Web page that uses of Ad Rotator Control.

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First Year	CORE CHOICE PRACTICAL II 2) MOBILE APPLICATION DEVELOPMENT	Semester II
Code:	(Practical)	Credit: 2

LIST OF EXPERIMENTS:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Implement an application that implements Multi threading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that creates alarm clock.

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First Year **ELECTIVE COURSE II** **Semester II**

1) E-COMMERCE TECHNOLOGIES

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVE:

The course should enable the students to:

- Get knowledge about e-commerce framework.
- Explain electronic system for payment.
- Understand the usage of multimedia systems for e-commerce

UNIT – I ELECTRONIC COMMERCE FRAMEWORK:

Electronic Commerce Framework – Electronic Commerce and Media Convergence The Anatomy of E-Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce Organization Applications. The Network Infrastructure for Electronic Commerce: Components of the High way – Network Access Equipment – Global information Distribution Networks.

UNIT – II THE INTERNET AS A NETWORK INFRASTRUCTURE:

The Internet Terminology – NSFNET Architecture and components – National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization :Telco/Cable/On-Line Companies - National Independent ISPs –Regional Level ISPs – Local –level ISPs – Internet Connectivity options.

UNIT – III ELECTRONIC COMMERCE AND THE WORLD WIDE WEB:

Architectural Framework for Electronic Commerce – World Wide Web as the Architecture – Technology behind the Web – Security and the Web, Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications – mercantile process model – mercantile models from the consumers perspective.

UNIT – IV ELECTRONIC PAYMENT SYSTEMS:

Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Credit Card – Based Electronic Payment Systems– Risk and Electronic Payment Systems – Designing Electronic Payment Systems. Interorganizational Commerce and EDI: Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues. Business – EDI: Legal, Security and Privacy issues.

UNIT – V ADVERTISING AND THE MARKETING ON THE INTERNET:

The New Age of Information Search and Retrieval – Electronic Commerce Catalogs – Information filtering – Consumer – Data Interface – Emerging Tools. On Demand Education and Digital Copyrights: Computer based Education and Training – Technological Components of Education on demand. Software Agents:

Characteristics and Properties of Agents – The Technology behind Software Agents – Applets, Browsers and Software Agents.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. "Frontiers of Electronic Commerce", Ravikalakota & Andrew Whinston, Adison Wesley, 2000.
2. "Electronic Commerce", Pete Loshin & Paul A.Murphy, Second edition, Jaico Publishing House, 2000.
3. https://www.investopedia.com/terms/e/ecommerce.asp
4. https://www.techtarget.com/searchcio/definition/e-commerce
5. https://www.shopify.in/encyclopedia/what-is-ecommerce

COURSE OUTCOMES:

On completion of this course, the students will be able to:

- Gain the understanding of the concepts of Electronic commerce and its application;
- Classify different services providers and their services and tools
- Understand the ecommerce framework.
- Gain the knowledge on E-Payment system.
- Understand e-commerce transactions with respect to Internet.

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First Year **ELECTIVE COURSE II** **Semester II**

2) OPEN SOURCE SYSTEMS

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To understand open-source licenses and learn the implications for users, developers and the software community.
- To become familiar with and become adapt using the tools of open source development.
- To learn GNU and practice open-source programming techniques.

UNIT – I OVERVIEW OF FREE/OPEN SOURCE SOFTWARE:

Overview of Free/Open Source Software - Definition of FOSS & GNU - History of GNU/Linux and the free software movement -Advantages of free software and GNU/Linux –Licensing - Types of licensing, Intellectual Proprietary Right, Commercial License vs. Open source license- Open Source Licensing, Contract and Copyright Law: Basic principles of copyright law, contract and copyright, open source software licensing, Issues with copyrights and patents, warranties.

UNIT – II LINUX:

Linux OS Installation and Hardware Configuration - Configure disk partitions & file systems and install a GNU/Linux distribution -Basic shell commands - Logging in, Listing files, editing files, copying/moving files, viewing file contents, changing file modes and permissions, process management User and group management -File ownerships and permissions.

UNIT – III OPEN SOURCE TOOLS AND TECHNOLOGIES FOR HARDWARE AND E-MAIL SERVER:

Configuring additional hardware -Sound cards -Displays & display cards-Network cards-Modems -USB drives -CD writers -The OS boot up process -Performing everyday tasks using GNU /Linux - Accessing the Internet -Playing music - Editing documents and spreadsheets -Sending and receiving email -Copy files from disks and over the network -Playing games - Writing CDs -X Window system configuration and utilities -Configure X windows -Detect display devices - Installing software -From source code as well as using binary packages -Setting up email servers Using postfix -(SMTP services) -Courier (IMAP & POP3 services) - Squirrel mail (web mail services)

UNIT – IV UNDERSTANDING GNU LIBRARIES, COMPILERS AND LINKER:

GNU compiler tools - The C compiler (gcc) and the C++ compiler (g++) - Linking against object archives (.a libraries) and dynamic shared object libraries (.so libraries) -Generating statically linked binaries and libraries -Generating dynamically linked libraries -Using the GNU debugging tools -Gdb to debug programs -Graphical debuggers like ddd -Memory debugging/profiling libraries mpatrol and valgrind -Introduction to Bash, sed & awk scripting.

UNIT –V OPEN SOURCE PROGRAMMING TECHNIQUES:

Application Programming -Basics of the X Windows server architecture -Qt programming -Gtk+ programming - Execution Environment - Programming GUI applications with localization support, Open Source Equivalent of existing commercial software.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. N.B. Venkateshwarlu (Ed), "Introduction to Linux: Installation and Programming", B S Publishers; 2005. (NRCFOSS Publication
2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition, Oreilly Media, 2009
3. https://www.geeksforgeeks.org/introduction-to-open-source-and-its-benefits/
4. https://developers.redhat.com/blog/2021/04/30/the-gdb-developers-gnu-debugger-tutorial-part-1-getting-started-with-the-debugger

COURSE OUTCOMES:

On completion of the course, student will be able to

- Understands the importance of open source and how it can be used in efficient manure.
- Gain knowledge on Linux.
- Configure Hardware using open source tools
- Get experience with GNU Libraries.
- Understand various system software tools.

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First Year **ELECTIVE COURSE II** **Semester II**

3) GREEN COMPUTING

Code: **(Theory)** **Credit: 4**

UNIT – I FUNDAMENTALS:

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT – II GREEN ASSETS AND MODELING:

Green Assets: Buildings, Data Centres, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT – III GRID FRAMEWORK:

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data centre – Green Grid framework.

UNIT – IV GREEN COMPLIANCE:

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT – V CASE STUDIES:

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies, August 2012.
3. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Centre: steps for the Journey, Shroff/IBM rebook, 2011.
4. John Lamb, ―The Greening of IT, Pearson Education, 2009.
5. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry, Lulu.com, 2008

6. Carl speshocky, —Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
7. Wu Chun Feng (editor), —Green computing: Large Scale energy efficiency, CRC Press

COURSE OUTCOMES:

- Understand Green IT fundamentals
- Get knowledge about green assets and models
- Understand Grid framework
- Know the green compliance
- Know the ERBS concepts.

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First Year **NON MAJOR ELECTIVE I** **Semester II**

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Code: **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

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- To understand the revolution in computers and communications
- To know about various application software
- To understand the information systems and software development

UNIT – I INFORMATION TECHNOLOGY:

Introduction – Information systems – Definition of computer and system – Software and Data - IT in business and Industry – IT in the Home and at Play – It in Education and Training – IT in Entertainment and the Arts – IT in Science, Engineering, and Mathematics – Global Positioning System.

UNIT – II INTRODUCTION TO COMPUTERS:

History of computers, Types of computers, Characteristics of computers, Basic Anatomy of a computer, Applications of computer – Memory – Memory types.

UNIT – III Software:

Kinds of Software - The five types of Applications software - Word processing – Spreadsheets - Database software, Presentation graphics software - Communications software System Software – Operating system - functions

UNIT – IV COMPUTER NETWORKS:

Introduction – Definition Computer Networks - Types of Networks – Local Area Network – Metropolitan Area Network - Wide Area Network – Personal Area Network - internet – Intranet – firewalls - Network Topology – Bus – Ring – Hybrid – Star

UNIT – V BASIC INTERNET CONCEPTS:

Analog and Digital Signals - modems and communication Software, ISDN lines, and Cable Modems - Definition of Internet - The World Wide Web - Connecting to the Internet – Browsing the web – Web browser – Uniform Resource Locator (URL) – E-mail communication.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Dennis P.Curtin, Kim dolwy, KunL AWN, Xrhleen morin, Information

Technology, the breaking wave, TMH 2000.
2. Stacey C Sawyer, Brain K Williams, Sarah E Hutchinson Using Information Technology –Brief Version
3. A Practical Introduction to Computer and Communications Third Edition, McGraw Hill Companies 2011
4. James O'Brien – Introduction to Information systems. 16th edition, 2005.
5. The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, Douglas E. Comer, Pearson, 2000
6. https://www.javatpoint.com/internet
7. http://www.steves-internet-guide.com/networking/

COURSE OUTCOMES:

At the end of the course, the students will be able:]

- To know the latest trends in information technology
- To understand the fundamentals of computers
- To gain knowledge about networks
- To acquire knowledge about different software
- To understand Internet basics

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Second Year **CORE COURSE V** **Semester III**

BIG DATA ANALYTICS

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVE:

1. To impart knowledge in Fundamentals of Big Data Analytics.
2. To make aware of technologies and databases.
3. To impart knowledge on Hadoop and Map Reduce Fundamentals

UNIT – I INTRODUCTION TO BIG DATA:

Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment

UNIT – II BIG DATA ANALYTICS:

Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

UNIT – III BIG DATA TECHNOLOGIES AND DATABASES:

Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of Cassandra

UNIT – IV HADOOP FOUNDATION FOR ANALYTICS:

History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures

UNIT – V MAPREDUCE AND YARN FRAMEWORK:

Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd., 2016
2. “Big Data” by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.
3. “Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics” by Soumendra Mohanty, Madhu Jagadeesh and Harsha Srivatsa, Apress Media, Springer Science + Business Media New York, 2013
4. Mining of Massive Datasets”, Anand Rajaraman, Jure Leskovec, Jeffery D. Ullman, Springer, July 2013.
5. “Hadoop: The definitive Guide”, Tom White, O'Reilly Media, 2010.
6. https://www.techtarget.com/searchbusinessanalytics/definition/big-data-analytics
7. https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

COURSE OUTCOMES:

Upon completion of the course, the student are expected to:

- Understand the big data environment.
- Understand the concepts of analytics
- Understand the unstructured databases.
- Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.
- Reveal the MapReduce technologies.

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Second Year **CORE COURSE VI** **Semester III**

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

1. Understand the problem-solving methods using state space search
2. Apply the formal knowledge representation and reasoning for a problem
3. Implement and apply the supervised and unsupervised machine leaning algorithms

UNIT – I INTRODUCTION TO MACHINE LEARNING:

Introduction ,Components of Learning , Learning Models , Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

UNIT – II SUPERVISED AND UNSUPERVISED LEARNING:

Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception, Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.

UNIT – III ENSEMBLE AND PROBABILISTIC LEARNING:

Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures.

UNIT – IV REINFORCEMENT LEARNING AND EVALUATING HYPOTHESES:

Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance

UNIT – V INTRODUCTION OF AI:

Definition of AI- AI Problems – Underlying Assumption – Al technique – Level of the Model - Criteria for Success. Problems, Problem Spaces, Search: Defining the Problem as State Space Search - Production Systems - problem Characteristics – Production System Characteristics

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCE BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar " Foundations of Machine Learning", MIT Press,2012.
3. Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.
4. MACHINE LEARNING - An Algorithmic Perspective, Second Edition, Stephen Marsland, 2015.
5. Stuart J. Russell and Norvig, Artificial Intelligence – A Modern Approach, Second Edition, Pearson Education, 2007
6. Elaine Rich, Kevin Knight, Shivashankar B Nair, *Artificial Intelligence,* Third Edition, Tata McGraw-Hill Education Private Limited, Seventh Reprint 2011.
7. K.Meena & R.Dhanapal, Artificial Intelligence and Expert Systems, International Books, Tlruchlrappalll,2001.(ISBN :81 - 900811 - 1 - x)
8. CharuC.Aggarwal,"DataClassificationAlgorithmsandApplications",CRCPress,2014.
9. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
10. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
11. Vinod Chandra S.S and Anand Hareendran S.,Artificial Intelligence and Machine Learning, PHI Learning Private Limited, 2014
12. https://www.analyticsinsight.net/the-difference-between-artificial-intelligence-and-machine-learning/
13. https://marutitech.com/artificial-intelligence-and-machine-learning/

COURSE OUTCOMES:

- Recognize the characteristics of Machine Learning techniques that enable to solve real world problems
- Recognize the characteristics of machine learning strategies
- Apply various supervised learning methods to appropriate problems
- Identify and integrate more than one techniques to enhance the performance of learning
- Understand basic AI Techniques

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Second Year **CORE CHOICE COURSE III** **Semester III**

1. USER INTERFACE DESIGN AND DEVELOPMENT

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To learn new emerging web technologies.
- To gain knowledge and skills required for web development careers.
- To develop skills in the use and application of specific methods in user experience design.

UNIT – I HTML, XML, CSS& RWD:

Introduction To HTML- DHTML , XML – Structuring XML document using DTD – Schemas – XML parsers – DOM – SAX presentation technologies – XSL – XFORMS – XHTML – Transformations – XSLT – XLINK – XPATH – XQuery. Responsive Web Design-Intro-Fluid Grid-Viewport-Media Queries-Images. Introduction To CSS-Syntax, Selectors-Types of style sheets.

UNIT – II CLIENT SIDE SCRIPTING:

Java Script – Advantages – Data types – Variables – Operators – Control statements – Functions – Objects and arrays – Windows and frames – Forms. AJAX – XML Http Request (XHR) – Create Object – Request – Response – Ready state.

UNIT – III SERVER SIDE SCRIPTING:

Introduction To PHP – Data Types – Control Structures – Arrays - Function – Html Form with PHP –Form Handling & Validation - File Handling – Cookies – Sessions – Filters – Exception Handling - Database Connectivity With MySQL.

UNIT – IV ANGULAR JS & JQUERY:

Angular JS Expression – Modules – Directives – Data Binding – Controllers – Scopes – Filters – Services – Tables – Events – Form – Validation. Query Syntax – Selects – Events – jQuery Effects – jQuery – jQuery HTML – jQuery Traversing.

UNIT – V UX & UI:

UX Introduction -Elements of UX Design- UX Design Process- Research Methods and Tools-Understanding User Needs and Goals. UX Design Process: Visual Design Principles-Information Design and Visualization-Interaction Design Prototyping Tools-Usability Test. UI Introduction-User Interface Components - Tools and Processes.

REFERENCES:

1. Jeffrey C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, 2009.

2. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009.
3. Ken Williamson, Learning AngularJS: A Guide to AngularJS Development, O'Reilly, 2015.
4. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development, John Wiley and Sons Inc., 2014.
5. CallumMacrae, Learning from JQuery, O'Reilly, 2013.
6. K.Meena, R.Slvakumar,A .B.Karthick Anand Babu, Web Programming with PHP and Mysql, Himalaya Publications. Mumbai, 2012.(ISBN :978- 93 - 5051 - 581• 5)
7. Steve Krug, Dont Make Me Think,2nd Edition, New Riders Publishing, USA, 2006.
8. https://docs.angularjs.org/tutorial
9. https://developer.mozilla.org/en-US/docs/Learn/JavaScript
10. https://www.javatpoint.com/jquery-tutorial

COURSE OUTCOMES:

On completion of the course, student will be able to:

- Work with XML technologies.
- Design web page to perform form validation using client-side scripting language.
- Implement new technologies such as Angular JS and JQuery.
- Develop web applications using server-side scripting language.
- Effectively select and utilize design thinking processes and UX/UI tools.

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Second Year **CORE CHOICE COURSE III** **Semester III**

2. CRYPTOGRAPHY AND NETWORK SECURITY

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- Describe various terminologies in network security.
- Learn the different types of security algorithms.
- Understand the different standards in algorithms and technologies in security

UNIT – I COMPUTER NETWORK SECURITY CONCEPTS:

Computer Security Concepts –The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – Fundamental Security Design Principles – Attack Surfaces and Attack Trees – A model for Network Security.

UNIT – II CLASSICAL ENCRYPTION TECHNIQUES:

Symmetric Cipher Model – Substitution Techniques – Transportation Techniques – Rotor Machines – Steganography. Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure – The Data Encryption Standard (DES) – A DES example – The strength of DES – Block Cipher Design Principles.

UNIT – III ADVANCED ENCRYPTION STANDARD:

Finite Filed of Arithmetic – AES Structure – AES Transformation Functions – AES key Expansion – An AES Example – AES Implementation. Block Cipher Operation: Multiple Encryption and Triple DES – Electronic Code Book – Cipher Block Chaining mode – Cipher Feedback Mode – Output Feedback Mode – Counter Mode.

UNIT – IV PUBLIC KEY CRYPTOGRAPHY AND RSA:

Principles of Public Key Cryptosystems – The RSA Algorithm. Other Public key Cryptosystems: Diffiehell man Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Secure Hash Algorithm (SHA).

UNIT – V WIRELESS NETWORK SECURITY:

Wireless Security – Mobile Device Security – IEEE 802.11 Wireless LAN Overview – IEEE 802.11 Wireless LAN Security. Electronic Mail Security.

REFERENCES:

1. William Stallings. Cryptography and Network Security. Uttar Pradesh: Pearson India Education Services Pvt. Ltd, 2018.
2. Behrouz A. Forouzan and Debdeep Mukhopadhyay. Cryptography and Network Security. New Delhi: Tata McGraw Hill Education Private Limited, 2011.

3. AtulKahate. Cryptography and Network Security. New Delhi: Tata McGraw Hill Education Private Limited, 2010. 3. Richard E. Smith. Internet Cryptography. Delhi: Pearson Education Pvt. Ltd, 2000.
4. https://kanchiuniv.ac.in/coursematerials/Cryptography_Network%20Security%20Dr_K_Anitha.pdf
5. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
6. https://www.ecpi.edu/blog/crypotgraphy-and-network-security

COURSE OUTCOMES:

On completion of the course, students should be able to:

- Remember the terminologies used in security.
- Learn the encryption techniques
- Understand the various advanced encryption techniques.
- Know the public key cryptography techniques
- Understand wireless network security

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Second Year	**CORE PRACTICAL III**	**Semester III**
	MACHINE LEARNING	
Code:	**(Practical)**	**Credit: 2**

Implement the following concepts using C/Java/Python

1. Cleaning and Pre-processing Data
2. Feature Extraction
3. Simple Linear Regression Models
4. K Nearest Neighbors
5. K-means clustering
6. Classification
7. Support Vector Machines

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Second Year **CORE CHOICE PRACTICAL III** **Semester III**

1. USER INTERFACE DESIGN AND DEVELOPMENT

Code: **(Practical)** **Credit: 2**

List of Exercises

1. Create an Internal and External Style sheet.
2. Working with XML and CSS.
3. Write a JavaScript code to perform form validation.
4. Working with AJAX.
5. Working with Angular JS Directives.
6. Working with Angular JS Expressions.
7. Working with jQuery Selectors.
8. Working with jQuery Events and Effects.
9. Program to perform PHP Form Validation.
10. Program to demonstrate PHP Form Handling.

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Second Year	**CORE CHOICE PRACTICAL III**	**Semester III**
	2. CRYPTOGRAPHY AND NETWORK SECURITY	
Code:	**(Practical)**	**Credit: 2**

Implement the following concepts using C/Java

1. Implement Caesar cipher encryption-decryption.
2. Implement Playfair cipher encryption-decryption.
3. To implement Simple DES or AES.
4. To implement Simple AES.
5. Implement Diffi-Hellmen Key exchange Method.
6. Implement RSA encryption-decryption algorithm.
7. Write a program to generate SHA-1 hash.
8. Implement a digital signature algorithm.

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Second Year **ELECTIVE COURSE III** **Semester III**

1. SWARM INTELLIGENCE

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- Understand basic concepts of self-organization, meta heuristic, and explain popular swarm intelligent algorithms.
- Gain knowledge about state space search algorithms in AI.
- Comprehend the different forms of Optimization techniques

UNIT - I INTRODUCTION TO SWARM INTELLIGENCE:

Essence of an Algorithm, Algorithms and Self – Organization, Links between Algorithms and Self-Organization, Characteristics of Metaheuristics; Swarm Intelligence based algorithms – Ant Algorithms; Bee Algorithms; Particle Swarm Optimization and Krill Herd Algorithms; Strategies for state space search in AI- Depth First and Breadth First Search Heuristic Search- Best First Search and Hill Climbing.

UNIT – II ANT COLONY OPTIMIZATION (ACO):

Theoretical Considerations, Combinatorial optimization and meta heuristic, Stigmergy, Convergence Proofs, ACO Algorithm, ACO and Model Based Search, Variations Of ACO: Elitist Ant System (EAS), Minmax Ant System (MMAS) and Rank Based Ant Colony System (RANKAS), ACO Algorithm for Travelling Salesperson problem, ACO algorithm for feature selection.

UNIT – III PARTICLE SWARM OPTIMIZATION:

Principles of Bird Flocking and Fish Schooling, Evolution of PSO, Operating Principles, PSO Algorithm, Neighbourhood Topologies, Convergence Criteria, Variations of PSO.

UNIT – IV ARTIFICIAL BEE COLONY (ABC) OPTIMIZATION:

Behaviour of real bees, ABC Algorithm, Variations of ABC: Abcgbest and Abcgbestdist, Case Study: Application of ABC algorithm in solving Travelling Salesman Problem, Knapsack Problem and for feature selection.

UNIT – V KRILL HERD OPTIMIZATION:

Herding Behaviour of Krill Swarms, Lagrangian Model of Krill Herding, Methodology, Application of Krill Herd Algorithm in Feature Selection.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Xin-She Yang, Zhihua Cui, Renbin Xiao, Amir Hossein Gandomi, Mehmet Karamanoglu, "Swarm Intelligence and Bio-Inspired Computation, Theory and Applications", Elsevier 2013.
2. Marco Dorigo and Thomas Stutzle, "Ant Colony Optimization", MIT Press,
3. Cambridge, England, 2004.
4. Ben Coppin, "Artificial Intelligence Illuminated", Jones and Bartlett Publishers, 2004.
5. Kennedy J and Russel C Eberhart, "Swarm Intelligence", Morgan Kaufmann Publishers, USA, 2001.
6. https://www.routledge.com/Swarm-Intelligence-Algorithms-A-Tutorial/Slowik/p/book/9780367496142
7. http://www.swarmintelligence.org/tutorials.php

COURSE OUTCOMES:

- Apply Ant colony optimization for solving Travelling Salesperson problem and to solve problems related to feature selection.
- Analyse the performance of ACO
- Understand PSO's roles in selecting important features from datasets.
- Apply ABC algorithm in solving knapsack problem
- Describe Krill Herd Optimization algorithm and its application in solving real life problems

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Second Year **ELECTIVE COURSE III** **Semester III**

2. BLOCK CHAIN TECHNOLOGY

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To understand the history, types and applications of Blockchain
- To acquire knowledge about cryptography and consensus algorithms.
- Deploy projects using Web3j and design blockchain based applications.

UNIT – 1 INTRODUCTION TO BLOCKCHAIN:

Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.

UNIT – II BLOCKCHAIN ARCHITECTURE:

Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)

UNIT – III BLOCKCHAIN-BASED FUTURES SYSTEM:

Project presentation- Futures smart contract: Blockchain oracles- Web3j: Setting up the Web3J- Installing web3j- Wallet creation, Java client: The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract

UNIT – IV BLOCKCHAINS IN BUSINESS AND CREATING ICO:

Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance- Blockchainas-a-Service- Initial Coin Offering (ICO): Project setup for ICO implementation- Token contracts- Token sale contracts-Contract security and testing the code.

UNIT – V DISTRIBUTED STORAGE IPFS AND SWARM:

Ethereum Virtual Machine- Swarm and IPFS: Installing IPFS, Hosting our frontend: Serving your frontend using IFPS, Serving your frontend using Swarm, IPFS file uploader project: Project setup the web page

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018.
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.
3. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media Inc, 2015.
4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.
5. https://www.simplilearn.com/tutorials/blockchain-tutorial/blockchain-technology
6. https://www.ibm.com/in-en/topics/what-is-blockchain
7. https://www.investopedia.com/terms/b/blockchain.asp

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- Contentedly discuss and describe the history, types and applications of Blockchain
- Gains familiarity with cryptography and Consensus algorithms.
- Create and deploy projects using Web3j.
- Implement an ICO on Ethereum
- Design blockchain based application with Swarm and IPFS

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Second Year **ELECTIVE COURSE III** **Semester III**

3. DIGITAL IMAGE PROCESSING

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVE:

- To study the various concepts, methods and algorithms of digital image processing
- To study image transformation, image enhancement, image restoration and image compression techniques.
- To study image compression techniques

UNIT – I CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS :

Light, Luminance, Brightness and Contrast, Eye, The Monochrome Vision Model, Image Processing Problems and Applications, Vision Camera, Digital processing System, 2-D Sampling Theory, Aliasing, Image Quantization, LloydMaxQuantizer, Dither, Color Images, Linear Systems And Shift Invariance,FourierTransform, ZTransform, Matrix Theory Results, Block Matrices and Kronecker Products.

UNIT – II IMAGE TRANSFORMS:

2-D orthogonal and Unitary transforms, 1-D and 2-DDFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-loeve, Singular value Decomposition transforms.

UNIT – III IMAGE ENHANCEMENT:

Point operations - contrast stretching, clipping and thresholding density slicing, Histogram equalization, modification and specification, spatial operations – spatial averaging, low pass, high pass, bandpass filtering, direction smoothing, medium filtering, generalized cepstrum and homomorphic filtering, edge enhancement using2-D IIR and FIR filters, colorimage enhancement.

UNIT – IV IMAGE RESTORATION:

Image observation models, sources of degradation, inverse and Wiener filtering, geometric mean filter, non linear filters, smoothing splines and interpolation, constrained least squares restoration.

UNIT – V IMAGE DATA COMPRESSION AND IMAGE RECONSTRUCTION FROM PROJECTIONS:

Image data rates, pixel coding, predictive techniques transform coding and vector DPCM, Block truncation coding, wavelet transform coding of images, color image coding. Random transform, back projection operator, inverse random transform, back projection algorithm, fan beam and algebraic restoration techniques.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 1995.
2. Sid Ahmed M.A., "Image Processing", McGraw Hill Inc, 1995.
3. Gonzalaz R. and Wintz P., "Digital Image Processing", Addison Wesley, 2nd Ed,1987
4. https://www.tutorialspoint.com/dip/index.htm
5. https://en.wikipedia.org/wiki/Digital_image_processing
6. https://www.javatpoint.com/digital-image-processing-tutorial

COURSE OUTCOMES:

At the end of this course, students should able to

1. Review the fundamental concepts of a digital image processing system a
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques.
4. Interpret Image compression standards, and Interpret image segmentation and representation techniques.
5. Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various disease using image such as tumour, cancer etc.

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Second Year **NON MAJOR ELECTIVE II** **Semester III**

FUNDAMENTALS OF INTERNET

Code: **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- Study the basic concepts of Internet
- Understand the services provided by the Internet
- Acquire the knowledge about E-Commerce

UNIT – I THE INTERNET: INTRODUCTION:

From Computers to the Internet - Advantages of the Internet – Major Internet Services – Hardware and Software in the Internet Age. Evolution and Growth of the Internet: Birth of the Internet – Current Networking Technologies – Next Generation Networking.

UNIT – II GETTING ONLINE:

Types of Internet Accounts – Selecting Internet Service Providers – Electronic Mail: Advantages of E-mails – E-mail addresses – Mail transfer protocols – Working of E-mail system. World Wide Web: Architecture of the World Wide Web – Types of websites – Uniform Resource Locator – Domain Name System – Web Pages and Web Links – Visiting Web Pages – Using Internet Explorer – Searching the Web – Google and Yahoo Search Engines.

UNIT – III HOSTING AND PROMOTING WEBSITES:

Structure of Websites – Web Development tools – Microsoft Front Page –Adobe Dreamweaver – Visual Studio. NET – Hosting Websites – Getting a Domain /name – Visitor Analysis and Statistics – Website Promoting methods.

UNIT – IV ELECTRONIC COMMERCE:

E-Business and E-Commerce – Types of business in the internet – MCommerce - Marketing Strategies on the Web – Making Payments in Virtual Stores – Shopping in Virtual Stores –Cookies and E-Commerce – Major issues of E-commerce and M-Commerce – Future of Ecommerce

UNIT – V BLOGS AND SOCIAL NETWORKING:

Blogs – Uses of Blogs – Blogs System Components – Steps for Blogging – Building a Blog site – Social Networking – Etiquette in networking sites. Internet Security: Importance of Internet Security – Internet Threats – Identity theft and Cybersquatting – Hacking – Spamming and Spoofing – Phishing and Pharming - Firewalls and Intrusion Prevention Systems –Internet Security Precautions-

Unit – VI Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. The Internet A User's Guide Second Edition by K.L. James – PHI Learning Private Limited
2. Internet, World Wide Web, How to program, 4th Edition, Paul Deital, Harvey M Deitel,Pearson
3. Learning Internet & Email, 4th Revised Rdition, Ramesh Bangia, Khanna Book Publishing Co Pvt Ltd.
4. Internet & Ecommerce, C. Nellai Kannan, NELS Publications.
5. https://www.tutorialspoint.com/e_commerce/index.htm
6. https://www.javatpoint.com/blog

COURSE OUTCOMES:

At the end of the course, the students will be able:

- To acquire knowledge about Domain name system
- To understand E-Commerce
- To know the blogs
- To understand the fundamentals of social networks
- To Gain the knowledge about Internet threats

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Second Year **CORE COURSE VII** **Semester IV**

AGILE TECHNOLOGIES

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To understand Agile development and testing.

UNIT – I INTRODUCTION:

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT – II AGILE PROCESS:

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT – III AGILITY AND KNOWLEDGE MANAGEMENT:

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT – IV AGILITY AND REQUIREMENTS ENGINEERING:

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT – V AGILITY AND QUALITY ASSURANCE:

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.
3. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
4. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system;
- Perform iterative software development processes: how to plan them, how to execute them.
- Develop techniques and tools for improving team collaboration and software quality.
- Understand requirement engineering
- Understand quality assurance

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Second Year	CORE COURSE VIII CLOUD COMPUTING	Semester IV
Code:	(Theory)	Credit: 5

COURSE OBJECTIVE:

- To be Familiar with the Cloud Architecture
- To Understand about Cloud Service Models
- To Know the Concept of Virtualization in Cloud Computing

UNIT – I INTRODUCTION TO CLOUD:

Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments. Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V**.**

UNIT – II CLOUD COMPUTING ARCHITECTURE:

Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance

UNIT – III DEFINING THE CLOUDS FOR ENTERPRISE:

Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. Scaling a cloud infrastructure - Capacity Planning, Cloud Scale. Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management**.**

UNIT – IV ANEKA:

Cloud Application Platform Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, FabricServices, FoundationServices, ApplicationServices, Building Aneka Clouds, InfrastructureOrganization, LogicalOrganization, Private Cloud Deployment Mode, Public Cloud Deployment Mode,Hybrid Cloud Deployment
Mode, Cloud Programming and Management,Aneka SDK, Management Tools.

UNIT – V CLOUD APPLICATIONS:

Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese Cloud Application Architectures, First Edition, O"Reilly Media 2009
3. Cloud Computing and SOA Convergence in Your Enterprise A Step-by-Step Guide by David S. Linthicum from Pearson 2010.
4. Cloud Computing 2 nd Edition by Dr. Kumar Saurabh from Wiley India 2012.
5. Cloud Computing – web based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.
6. http://index-of.co.uk/Cloud-Computing-Books/Essentials%20of%20cloud%20computing%20(2015).pdf
7. http://dhoto.lecturer.pens.ac.id/lecture_notes/internet_of_things/CLOUD%20COMPUTING%20Principles%20and%20Paradigms.pdf
8. https://www.javatpoint.com/aneka-in-cloud-computing
9. https://www.javatpoint.com/cloud-computing-architecture

COURSE OUTCOMES:

On completion of this course, the students will be able to:

- Understand the concept of virtualization and how this has enabled the development of Cloud Computing
- Know the fundamentals of cloud, cloud Architectures and types of services in cloud
- Understand scaling, cloud security and disaster management
- Design different Applications in cloud
- Explore some important cloud computing driven commercial systems.

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Second Year	**ENTREPRENEURSHIP / INDUSTRY BASED COURSE TECHNOLOGY INNOVATION AND SUSTAINABLE ENTERPRISE**	**Semester IV**
Code:	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- Provide information, frameworks, and tools for identifying and pursuing sustainable business opportunities
- Inform students of the changing dynamics of nature–human interdependencies globally
- Examine examples of innovators implementing successful green strategies

UNIT – I INNOVATION:

Need - Objectives of innovation - Technology innovation - its importance - Knowledge Management- need - Business strategies related to knowledge management - Knowledge Management Approaches-Transformation of an enterprise through Knowledge Management - Creating Knowledge Management System in Organization Establishing Knowledge Management through IT-Organizational culture for Knowledge Management - Future of Knowledge Management

UNIT – II TECHNOLOGY TRANSFER AND JOINT VENTURES:

Policy, Procedure & Practices-India's Technology base and Capabilities-Preference of Indian Technology-major Constraints and problems- Operational constraints-Problems in Indian Business Environment Problems in Finalization of Agreement-Major Problems in Technology transfer Collaboration Agreements, R& D, Import Substitution, Scaling, Diagrams- Patterns and Intellectual Property rights.

UNIT – III WEB MARKETING:

Meaning- Benefits of Web Marketing-Myths and Facts in Web Marketing Web Psychology: Understanding the Internet mind- The Internet and the Law: Copyright, Censorship, Privacy, Jurisdiction- Do's and Don'ts on Web

UNIT – IV WEB MARKETING STRATEGIES:

Choosing the strategy- Online store fronts -Target Marketing Attracting Customers- Web Advertising - E-Mail Marketing-Instant market research - Securities Issues

UNIT – V ENTERPRISE RESOURCE PLANNING:

The E- Business backbone -Meaning- ERP decision Enterprise Architecture Planning- ERP Implementation- The Future of ERP Applications- Procurement-Business Blueprint Planning.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Knowledge Management for Competitive advantage-Harish chandra Chaudharaty, Excel Books Publications, New Delhi
2. Technology Transfer and Joint Ventures Abroad-R.R.Azad, Deep& deep Publications, New Delhi
3. Web Advertising and marketing thomas J Kuegler,Jr. #rd Edition-Prentice-Hall of India, New Delhi
4. e-Business Roadmap for Success- Dr.ravi Kalakota- Perason Education
5. "Frontiers of Electronic Commerce", Ravi Kalakota, Andrew B. Whinston, Addition -Wesley, 2000
6. The Lean Startup by Eric Ries,Publisher : Eric Ries, 2017
   Start Up India :
7. http://www.startupindia.gov.in/pdffile.php7title =Startup%20India%20Action%20Planandtype =Actionandq=Action%20Plan.pdfandcontentt ype=Actionandsubmenupoint=action
8. About – Entrepreneurship Development Institute of India (EDII) :
9. http://www.ediindia.org/institute.html
   EDII – Centres :
10. http://www.ediindia.org/centres.html
    The National Institute for Entrepreneurship and Small Business Development Publications:
11. http://niesbud.nic.in/Publication.html

Course Outcomes:

At the end of the course, the students will be able to:

- Identify entrepreneurial traits.
- Develop comprehensive business plans.
- Prepare plans to manage the enterprise effectively.
- Acquire knowledge about Web Marketing
- Understand ERP techniques

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Second Year **PROJECT** **Semester-IV**

Code: **Credit: 5**

Each candidate shall be required to take up a Project Work and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the student in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT /EVALUATION /VIVA-VOCE:

1. PROJECT REPORT EVALUATION (Both Internal & External):

I. Plan of the Project - 20 marks

II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc and presentation of the report. - 45 marks

III. Individual initiative - 15 marks

2. VIVA-VOCE / INTERNAL& EXTERNAL - 20 marks

TOTAL **- 100 marks**

PASSING MINIMUM:

	Vivo-Voce 20 Marks	**Dissertation 80 Marks**
Project	40% out of 20 Marks (i.e. 8 Marks)	40% out of 80 marks (i.e. 32 marks)

A candidate shall be declared to have passed in the Project work if he/she gets not less than 40% in each of the Project Report and Viva-voce but not less than 50% in the aggregate of both the marks for Project Report and Viva-voce.

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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Second Year	VALUE ADDED COURSE II FOUNDATIONS OF IOT	Semester IV
Code:	(Theory)	Credit: 2

COURSE OBJECTIVES:

- To understand the concepts of Internet of Things
- To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.

UNIT – I INTRODUCTION TO IOT:

Introduction to IoT, Current technological trends and future prospects, - Evolution of IoT , Business Scope, Relation with embedded system

UNIT – II BASIC ARCHITECTURE OF AN IOT:

From M2M to IoT, M2M towards IoT, IoT Value Chains, An emerging industrial structure for IoT.

UNIT – III ELEMENTS OF IOT:

Application Sensors & Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN & LPWA,

UNIT – IV OVERVIEW OF IOT SUPPORTED HARDWARE PLATFORMS:

Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Wearable Development Boards.

UNIT – V COMMUNICATION AND CONNECTIVE TECHNOLOGIES:

IoT Communication Model, Cloud computing in IoT, IoT in cloud architecture, Logging on to cloud, Selecting and Creating cloud service , cloud based IoT platforms - IBM Watson, Google cloud.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi.
2. Architecting the Internet of Things, Springer publications. Author(s):Dieter Uckelmann, Mark Harrison, Florian Michahelles.
3. Internet of Things with Arduino Cookbook, Packt Publications. Author(s): Marco Schwatrz.
4. Internet of Things and Data Analytics, Hwaiyu Geng ,2017,Wiley Publications
5. https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/

6. https://fiware-tutorials.readthedocs.io/en/1.0.0/iot-sensors/

COURSE OUTCOMES:

On Completion of the course, student will be able:

- To learn and understand the technology and current trends in Internet of things.
- To understand the various elements of IoT system and hardware devices.
- To learn the programming languages and platforms for building IoT applications.
- To understand the cloud computing and its relevance for developing IoT applications.
- To understand IoT connective technologies

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