



Malad Kandivli Education Society's
NAGINDAS KHANDWALA COLLEGE
 OF COMMERCE, ARTS & MANAGEMENT STUDIES
 AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE

(Re-accredited (3rd cycle) by NAAC with 'A' Grade)
 ISO 9001 : 2015 Certified

Autonomous (2016-17)

Educational Excellence Award By Indus Foundation, U.S.A.
 IMC Ramkrishna Bajaj National Quality Commendation Certificate

Providing Syllabus copy of the courses highlighting the focus on employability/
 entrepreneurship/ skill development along with their course outcomes.

Sr. No.	Courses	2016-17	2017-18	2018-19	2019-20	2020-21	Total
1	Bachelor of Commerce (B.COM)	✓	✓	✓	✓	✓	5
2	Bachelor of Arts (B.A)	✓	✓	✓	✓	✓	5
3	Bachelor in Management Studies- (BMS)	✓	✓	✓	✓	✓	5
4	Bachelor of Commerce (Accounts and Finance)- BAF	✓	✓	✓	✓	✓	5
5	Bachelor of Commerce (Banking and Insurance)-BBI	✓	✓	✓	✓	✓	5
6	Bachelor of Commerce (Financial Markets)- BFM	✓	✓	✓	✓	✓	5
7	Bachelor of Science - Information Technology (B.Sc IT)	✓	✓	✓	✓	✓	5
8	Bachelor of Science- Computer Science(B.Sc CS)	✓	✓	✓	✓	✓	5
9	Bachelor of Arts- Multimedia and Mass Communication (B.A.MMC)	✓	✓	✓	✓	✓	5
10	Bachelor of Management Studies- Sports Management (BMS-SM)	X	X	✓	✓	✓	3
11	B. Com. Honours in Actuarial Studies	X	X	X	✓	✓	2
12	B.A. Honours in Apparel Design and Construction	X	X	X	✓	✓	2
13	B. Com. Honours in International Accounting	X	X	X	✓	✓	2
14	Bachelor of Management Studies- E commerce operations	X	X	X	X	✓	1
15	B.Sc. (Honours) in Integrative Nutrition & Dietetics	X	X	X	X	✓	1
16	BBA in Tourism and Travel Management	X	X	X	X	✓	1
17	B.Sc. in Interior Design	X	X	X	X	✓	1
18	Master Of Commerce-(M.COM)-Accountancy	✓	✓	✓	✓	✓	5
19	Master Of Commerce-(M.COM)-Management						
20	Master of Arts (Economics)	✓	✓	✓	✓	✓	5
21	Master of Arts (Geography)	✓	✓	✓	✓	✓	5
22	Master of Arts (Psychology)	X	X	X	✓	✓	2
23	Master of Science (Information Technology) (M.Sc IT)	✓	✓	✓	✓	✓	5
24	Master's Degree - Sports Management (MSM)	X	X	✓	✓	✓	3
25	Master of Science (Geo-informatics) (M.Sc GeoInformatics)	X	X	X	X	✓	1
							84

Matta

Prof. (Dr.) Moushumi Datta
 I/c. Principal

Nagindas Khandwala College (Autonomous)



Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

First Year

Semester I

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

COMMUNICATION SKILLS

(wef 2019-20)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Seven Cs of Effective Communication and Understanding Communication	6
2	Emotional Intelligence, Etiquette and Mannerism, Writing Business Messages and Documents	6
3	Academic Skills	6
4	Leadership and Team Building, Decision Making and Negotiation	6
5	Business ethics, Stress and Time Management	6
	Total	30

Objectives:

By the end of the course, learners will be able to:

1. To develop effective listening skills in learner so as to enable them to comprehend instructions and become a critical listener
2. To develop effective oral skills so as to enable learner to speak confidently interpersonally as well as in large groups
3. To develop effective writing skills so as to enable learner to write in clear, concise, persuasive and audience centred manner
4. To demonstrate effective use of communication technology

Course Outcome:

After completing this course, learners will be able to:

CO1: Understand the concept, channels, objectives, methods and modes of communication. (Understand)

CO2: Differentiate obstacles to communication in the business world. (Evaluate)

CO3: Sharpen the business correspondence, language and writing skills of the learner. (Remember)

CO4: Effectively use communication technology. (Apply)

CO5: Demonstrate effective presentation, visual communication and impress stage. (Analyse)



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WALAPUR, RAJGIRI - 400 084

Detailed Syllabus:

Sr. No	Modules / Units	No of Lectures
1	The Seven Cs of Effective Communication: Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness Understanding Communication: Nature and Scope of Communication, Methods of communication, Cross-cultural communication, Technology-enabled Business Communication	6
2	(Skill Development) Emotional Intelligence: Meaning and definition, Need for imotional intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, and Skills to develop Emotional Intelligence. Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette. Writing Business Messages and Documents: Business Correspondence: Letter of inquiry, letter of order, letter of complaints, sales letter, business reports, resume writing	6
3	Resume writing: Introduction, Resume, Curriculum Vitae, Job Application or Cover Letter Professional Presentation: Planning a Presentation, Preparing the Presentation, Delivering the Presentation Job Interviews: Types of job Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, FAQ During Interviews Group Discussion: Difference between Group Discussion, Panel Discussion and Debate, Importance of Group Discussions, Traits, Types of Group Discussions, Individual Traits	6
4	Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams, Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts	6
5	Business ethics: Importance of business ethics, personal integrity at work place, computer ethics, corporate social responsibility Stress and Time Management: Stress, Sources of Stress, Ways to Cope with Stress, time management, prioritising and procrastination	6

Reference Books

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford University Press, 2nd Ed.
2. Aruna Koneru, Professional Communication, Tata McGraw Hill
3. M. S. Rao, Strategies for Improving Your Business Communication, Shroff Publishers and Distributors
4. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

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Nagindas Khandwala College (Autonomous)



Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

First Year

Semester I

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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MALAD (W), MUMBAI - 400 064

WEB PROGRAMMING I

(Implemented during Academic Year 2020-21)
(wef 2019-20)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Internet and world wide web, HTML5	9
2	HTML5 Components, Style sheets	9
3	JavaScript	9
4	Document and its associated objects	9
5	JQuery and Bootstrap	9
	Total	45

Course Objectives:

By the end of the course, learners will be able to:

1. Identify and learn the Internet World with working of a website using HTML.
2. Identify the creation of dynamic websites using different components of HTML.
3. Define and describe the javascript usage.
4. State and Explain the different document object models.
5. Explain jQuery and bootstrap components.

Course Outcome:

After completing this course learners will be able to:

CO1: Apply a structured approach to identifying needs, interests, and functionality of a website. (Apply)

CO2: Design dynamic websites that meet specified needs and interests.(Create)

CO3: Design appropriate HTML, CSS, and JavaScript code from public repositories of open-source and free scripts that enhances the experience of site visitors.(Create)

CO4: Analyze the existing HTML, CSS, and JavaScript code to extend and alter its functionality, and to correct errors and cases of poor practice. (Analyse)

CO5: Create a website which is functional with all the basics and advanced HTML, CSS, Javascript along with jQuery and Bootstrap.(Apply)


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(2019-2021)

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
MUMBAI

Detailed Syllabus:

Modules	Topics	No of Lectures
1	<p>Internet and world wide web: What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address,</p> <p>World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL),</p> <p>Browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. Search engine, HTTP protocol</p> <p>HTML5: Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets</p>	9
2	<p>(Skill Development)</p> <p>HTML5 Page layout and navigation: Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.</p> <p>HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page. HTML web storage.</p> <p>Style Sheets : What are style sheets?, Why are style sheets valuable?, Different approaches to style sheets, Using Multiple approaches, Linking to style information in separate file, ,Setting up style information, Using the tag, Embedded style information.</p>	9
3	<p>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), - (Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in</p>	9


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	function, if...else, import, labelled, return, switch, var, while, with. Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, RegExp	
4	Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload	9
5	JQUERY: Introduction of jquery, syntax, selectors, events, effects, jquery html and css methods. Bootstrap: Introduction of basic bootstrap, installation, using bootstrap grid, using base css	9

References:

1. HTML5 Black Book: Covers CSS3, JAVASCRIPT, XML, XHTML, AJAX, PHP and JQUERY DreamTech Press.
2. Learning bootstrap : Aravind Shenoy, Ulrich Sossou, Packt publishing
3. Learning Jquery: Jonathan Chaffer, Karl Swedberg, Packt publishing
4. JavaScript 2.0: The Complete Reference, Thomas Powell and Fritz Schneider, Tata McGraw Hill
5. HTML5 Step by Step, Faithe Wempen, Microsoft Press

Practical: (Skill Development)

1. Use of Basic Tag
 - a. Design a webpage using different text formatting tags.
 - b. Design a webpage with links to different pages and allow navigation between webpages.
 - c. Design a webpage demonstrating all Style sheet type
2. Imagemaps, Tables, Forms and Media
 - a. Design a webpage with Imagemaps.
 - b. Design a webpage demonstrating different semantics
 - c. Design a webpage with different tables. Design a webpages using table so that the content appears well placed.
 - d. Design a webpage with a form that uses all types of controls.
 - e. Design a webpage embedding with multimedia features.
3. JavaScript
 - a. Using JavaScript design, a webpage that prints factorial / Fibonacci series / any given series.
 - b. Design a form and validate all the controls placed on the form using Java Script.
 - c. Write a JavaScript program to display all the prime numbers between 1 and 100.
 - d. Write a JavaScript program to accept a number from the user and display the sum of its digits.
 - e. Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
 - f. Write a java script program to design simple calculator.

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MUMBAI-400 054

- g. Write a java script program to validate the form.
4. Control and looping statements and Java Script references
 - a. Design a web page demonstrating different conditional statements
 - b. Design a web page demonstrating different looping statements.
5. Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, RegExp).+
6. Design a web page demonstrating different Events.
7. Design a web page demonstrating jquery events and effects.
8. Design a web page demonstrating jquery html and css methods
9. Design a web page demonstrating bootstrap
10. Demonstrate program on HTML web storage.



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MUMBAI-400 064

**Nagindas Khandwala College
(Autonomous)**



**Syllabus
Of
Course
Of**

**Bachelor of Science Computer Science
(BSC CS) Programme**

First Year

Semester II

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

**NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)**

MALAD (W), MUMBAI - 400 084

WEB PROGRAMMING II
at Semester II
(Implemented during Academic Year 2020-21)
(wef 2019-20)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	XML	9
2	PHP Basics	9
3	PHP- Working with Files	9
4	Advanced PHP and MySQL	9
5	Networking and XML Parsing	9
Total		45

Course Objectives:

By the end of the course, learners will be able to:

1. Analyze and evaluate the working of XML.
2. Apply how server-side programming works on the web.
3. Understand the working of web application with php as a server side scripting language.
4. Develop web applications using MySQL database
5. Apply the maintenance of MySQL database.

Course Outcome:

After completing this course learners will be able to:

- CO1: Design a structured approach to identify needs, interests, and functionality of a website. (Apply)
- CO2: Describe POST and GET in form submission using PHP(Understand)
- CO3: Design website with php sessions and cookies. (Create)
- CO4: Design and develop a full-fledged website using php with MySQL database. (Create)
- CO5: Apply and Analyze the working of website with Php and MySql. (Analyse)



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(WILSON COLONY)
INDIAN NATIONAL UNIVERSITY, DELHI

PHONE: 430 084

Detailed Syllabus

Sr. No.	Modules/Units	No of lectures
1.	(Skill Development) XML : Introduction to XML, Anatomy of an XML document, Creating XML Documents, Creating XML DTDs, XML Schemas, XSL	9
2.	PHP: Introduction of PHP, Server-side scripting. PHP BASICS: PHP syntax and variables, comments, types, constants, control structures, branching, looping, termination, functions, arrays, passing information with PHP, GET, POST	9
3.	PHP: formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems, working with files and operating systems.	9
4.	Advanced PHP and MySQL : MYSQL basics, PHP/MySQL Functions, Integrating web forms and databases, authenticating your users, Displaying queries in tables.	9
5.	Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, handling file uploads networking- E-Mail, securing your website, XML parsing	9

Comment [1]: Focusses on skill development

References:

1. XML: The Complete Reference –Heather Williamson.
2. Beginning php and mysql from novice to professional 4th edition
3. MySQL-PHP Database Applications.
4. Practical PHP and MySQL, Jono Bacon, Prentice Hall.

Practical: (Skill Development)

1. XML
 - a. Design a DTD, corresponding XML document and display it in browser using CSS.
 - b. Design an XML document and display it in browser using XSL.
 - c. Design XML Schema and corresponding XML document.
2. PHP Basics-II
 - a. Write a PHP Program to accept a number from the user and print it factorial.

Comment [2]: Focusses on skill development



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WADGAON, PUNE-411 004

Phone: 2201 400 064

b. Write a PHP program to accept a number from the user and print whether it is prime or not.

3. PHP Basics- II

a. Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.

b. Write a PHP program to display the following Binary Pyramid:

```
1
0 1
1 0 1
0 1 0 1
```

4. String Functions and arrays

a. Write a PHP program to demonstrate different string functions.

b. Write a PHP program to create one dimensional array.

5. PHP and Database

a. Write a PHP code to create: (i) Create a database College (ii) Create a table Department (Dname, Dno, Number_Of_faculty)

b. Write a PHP program to create a database named "College". Create a table named "Student" with following fields (sno, sname, percentage). Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.

c. Design a PHP page for authenticating a user.

d. Write a program to send email with attachment

6. Write a program to demonstrate use of sessions and cookies.

7. Create a shopping cart using php and Mysql.

8. Write a program to demonstrate XML parsing with php.

9. Design a web page demonstrating Platform as a service (PAAS) with google cloud.

10. Demonstrate json with php.



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MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)



Syllabus
Of
Course
Of
Bachelor of Science Computer Science
(BSC CS) Programme

Second Year

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)**

WASCO (C) ESTD. 1964 - 400 064

ADVANCED WEB PROGRAMMING - I

at Semester III

*(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Object Oriented Javascript	6
2	Advanced bootstrap	6
3	AJAX	6
4	Advanced jQuery	6
5	Introduction to JSON	6
	Total	30

Course Objective:

By the end of the course, learners will be able to:

1. Recall the JavaScript, bootstrap, jquery and learn the advanced technologies.
2. Define and describe Ajax working with partial refreshes.
3. Study the concept of json to store data.
4. Learn designing with bootstrap and jQuery
5. Develop website with latest ajax,bootstrap and jQuery and store data in json.



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Course Outcome:

After completing this course learners will be able to:

CO1: Discuss the concepts of object oriented concepts with JavaScript.(Understand)

CO2: Develop websites with bootstrap, Ajax technologies and jquery.(create)

CO3: Discuss json in web applications.(Understand)

CO4: Define and discuss major concepts, tools, techniques, and methods of web application development.(Create)

CO5: Apply the technologies learned in creation of websites.(Apply)

Detailed Syllabus

Module	Topics	No. of Lectures
1	(Skill Development) Object Oriented Javascript: Javascript - Error Handling, Javascript – Validations, Javascript – Animation, Javascript – Multimedia, Javascript – Debugging, Javascript - Image Map, Javascript – Browsers, JS form validation, JS email validation, JavaScript OOPs, JS Class, JS Objec,, JS Prototype, JS constructor Method, JS static Method, JS Encapsulation, JS Inheritance, JS Polymorphism, JS Abstraction, JS Cookies, Cookie Attributes, Cookie with multiple Name, Deleting Cookies, JavaScript Events, JS this Keyword, JS Debugging, JS Hoisting, JS Strict Mode, JS TypedArray	6
2	Advanced bootstrap: Introduction, Grid Basic, Typography, Colors, Tables, Images, Jumbotron, Alerts, Buttons, Button Groups, Badges, Progress Bars, Spinners, Pagination, List Groups, Cards, Dropdowns, Collapse, Navs, Navbar, Forms, Inputs, Input Groups, Custom Forms, Carousel, Modal, Tooltip, Popover, Toast, Scrollspy, Utilities, Flex, Icons, Media Objects, Filters, Bootstrap 4 Grid: Grid System, Stacked/Horizontal, Grid XSmall, Grid Small, Grid Medium, Grid Large, Grid XLarge	6
3	What is AJAX? Asynchronous Ajax Technologies, AJAX - Browser Support, AJAX - XMLHttpRequest, How AJAX Works?, Java AJAX, AJAX with Database, Email Finder Comment Form, AJAX - Security, AJAX – Issues, AJAX with PHP, AJAX	6

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	Applications	
4	Advanced jquery jQuery Introduction, jQuery Syntax, jQuery Selectors, jQuery Events, jQuery in HTML, jQuery Get, jQuery Set, jQuery Add, jQuery Remove jQuery CSS Classes, jQuery css(), jQuery Dimensions, jQuery Traversing, jQuery Ancestors, jQuery Descendants, jQuery Siblings, jQuery Filtering, jQuery AJAX, jQuery AJAX Intro, jQuery Load, jQuery Get/Post, jQuery Selectors, jQuery DOM	6
5	Introduction to JSON, What is JSON, JSON - Syntax, JSON - DataTypes, JSON - Objects, JSON - Schema, JSON vs XML, JSON Parse, JSON Stringify, JSON Object, JSON Array, JSON Comments, JSON with PHP, JSON with Python, JSON with Ajax, JSON with Java	6

References:

1. Javascript 2.0: The Complete reference, Thomas Powell and Fritz Schneider, 2nd Edition
2. Learning Bootstrap: Aravind Shenoy, Ulrich Sossou, Packt Publishing, 2014
3. Learning JQuery: Jonathan Chaffer, Karl Swedberg, Packt Publishing, 2013
4. Ajax for dummies, Steve Holzner

Websites: www.w3schools.com

Practicals: (Skill Development)

1. Write a program on basic object oriented javascript.
2. Write a program to
 - a) Demonstrate Form validation
 - b) Demonstrate Encapsulation, Inheritance, polymorphism, abstraction.
3. Write a program to demonstrate cookies and events.
4. Write a program to demonstrate bootstrap components.
5. Write a program to demonstrate bootstrap grid
6. Write a program to demonstrate simple Ajax and Ajax with php
7. Write a program to demonstrate advanced jquery.
8. Write a program to demonstrate jquery with ajax, jquery DOM
9. Write a program to demonstrate JSON
10. Write a program to demonstrate JSON with PHP and JSON with Ajax



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MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College

(Autonomous)



Syllabus

Of

Course

Of

Bachelor of Science Computer Science

(BSC CS) Programme

Second Year

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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MALAD (W), MUMBAI - 400 064

COMPUTER GRAPHICS AND ANIMATION

at Semester III

*(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction and Scan Conversions Algorithms	6
2	2D and 3D Transformation	6
3	Viewing in 3D and Object Rendering	6
4	Visible-Surface Determination and Curves	6
5	Animation	6
	Total	30

Course Objectives –

By the end of the course, learners will be able to:

- Introduce the different graphics systems and become familiar with the working of graphics system components.
- Understand the working of different scan conversion algorithms.
- Learn the basic principles of 2- dimensional and 3- dimensional computer graphics.
- Transform the object using various transformation techniques.
- Provide an understanding of mapping from world coordinates to device coordinates, clipping, and projections.

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- Understand the concept of illumination, shading and Visible Surface determination and different techniques involved in it.
- Have a basic understanding of Animation and its principles.

Course Outcome –

After completing this course learner will be able to:

CO1: Understand different scan conversion algorithms, apply it using programming language and define their applications. (Apply)

CO2: Discuss 2D and 3D transformations and different transformation matrix used. (Understand)

CO3: Apply various 2D transformations on a 2D object. (Apply)

CO4: Discuss different shading models and Visible-Surface Determination techniques. (Understand)

CO5: Define Animations and apply the basic principles of animation. (Remember, Apply)

CO6: Create basic 2D animation using programming language. (Create)

Detailed Syllabus

Module	Topics	No. of Lec
1	<p>(Skill Development)</p> <p>Introduction and Scan Conversions Algorithms</p> <p>Introduction to computer graphics: Introduction to computer Graphics, Computer Graphics Application, Description of some graphics devices, Hard Copy devices, display technologies, Raster-Scan Graphics Displays, CRT Raster Scan Basics, Random-Scan Display Processor, LCD displays.</p> <p>Scan conversion – Digital Differential Analyser (DDA) algorithm, Bresenhams' Line drawing algorithm. Bresenhams' method of Circle drawing, Problems of Aliasing, end-point ordering and clipping lines,</p>	6

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	Scan Converting Circles, Clipping Lines algorithms: Cohen-Sutherland, Clipping Polygons.	
2	<p>2D and 3D Transformation</p> <p>2D Transformations: Basic transformation , Matrix representation and Homogeneous co-ordinates, Rotation, Reflection, Scaling, Transformation of Points, Transformation of The Unit Square, Combined transformation, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line.</p> <p>3D Transformations: translation, rotation, scaling, composite-shears and reflections, Three dimensional viewing, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Projection and its types.</p>	6
3	<p>Viewing in 3D and Object Rendering</p> <p>Stages in 3D viewing, Canonical View Volume (CVV), specifying an Arbitrary 3D View, Examples of 3D Viewing, the Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid.</p> <p>Object Rendering: Introduction Object-Rendering, Light Modelling Techniques, Illumination Model, Shading, Flat Shading, Polygon Mesh Shading, Gouraud Shading Model, Phong Shading, Transparency Effect, Shadows, Texture and Object Representation, Ray Tracing, Ray Casting, Radiosity, Color Models.</p>	6
4	<p>Visible-Surface Determination and Curves</p> <p>Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p>Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Ellipse, Parabola, Hyperbola, Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces</p>	6
5	<p>Animation</p> <p>Principles of Animation, about motion graphics, Principles of animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects, Animation by computer, Animation file formats, Display of animated content, Introduction to Morphing, Three-Dimensional Morphing, Motion Tweening and Motion Editor, Classic tweening and Shape tweening.</p>	6



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References:

1. Computer Graphics, R. K. Maurya, John Wiley.
2. Mathematical elements of Computer Graphics, David F. Rogers, J. Alan Adams, TataMcGraw-Hill.
3. Procedural eteinem« of Computer Graphics, David F. Rogers, Tata McGraw-Hill.
4. Multimedia BASICS by Suzanne (Suzanne Weixel) Weixel, Jennifer Fulton, Karl Barksdale and CherylBeck Morse (Mar 14, 2003)

Practical (Skill Development)

1. Solve the following:
 - a) Draw a co-ordinate axis at the center of the screen.
 - b) Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in eachregion with appropriate message.
2. Draw a simple hut on the screen.
3. Write a program to implement DDA line drawing algorithm.
4. Write a program to implement Bresenham's line drawing algorithm.
5. Write a program to implement mid-point circle drawing algorithm.
6. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
7. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
8. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
9. Write a program to demonstrate 2D animation such as clock simulation or rising sun.
10. Write a program to implement the bouncing ball inside a defined rectangular window.



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**Syllabus
Of
Course
Of**

**Bachelor of Science Computer Science
(BSC CS) Programme**

Second Year

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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EMBEDDED SYSTEMS

at Semester III

*(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction and Core Components	6
2	Embedded Hardware	6
3	Introduction to 8051 Microcontroller	6
4	Programming in C	6
5	RTOS and Trends	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. To understand the meaning, components of a basic embedded systems
2. To understand the characteristics and quality attribute of an embedded systems
3. To understand the memory structure of embedded systems and its peripheral devices
4. To understand the different aspects of programming for developing embedded systems
5. To understand the EDLC

Course Outcome:

After successfully completing this course, learners will be able to:

CO1: Describe the components of an embedded system (Understand)

CO2: Explain the memory structure and peripherals required for embedded systems (Understand)

CO3: Illustrate the pin diagram of 8051 Microcontroller with its structure (Analyse)

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CO4: Write programs for embedded systems (Apply)

CO5: Create basic Embedded Products for the market (Create)

Detailed Syllabus

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems</p> <p>Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.</p>	6
2	<p>Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p> <p>Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM, ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.</p> <p>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.</p>	6
3	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p>	6
4	<p>8051 Programming in C: Variables, Declaring a variable, Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs, structure of embedded program, infinite loop, compiling, linking and debugging, functions.</p>	6
5	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p>Design and Development: Embedded system development</p>	6


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Environment –IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life- cycle, trends in embedded industry.	
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References:

1. Shibu K.V, —Introduction to Embedded SystemsI, McGraw Hill.2014
2. Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time InterfacingI, Third Edition Cengage Learning, 2012
3. Raj Kamal, —Embedded Systems-Architecture, Programming and DesignI, 3 edition,TMH.2015
4. Lyla, —Embedded SystemsI, Pearson , 2013
5. David E. Simon, —An Embedded Software PrimerI, Pearson Education, 2000.

Practical: (Skill Development)

1. A. To interface 8 LEDs at Input-output port and create different patterns.
B. To demonstrate timer working in timer mode and blink LED without using any loop delay routine.
2. Configure timer control registers of 8051 and develop a program to generate given time delay.
3. To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.
4. Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen.
5. To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 9 with fixed time delay.
6. A. Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
B. Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
C. Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
7. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction
8. Generate traffic signal
9. Implement Temperature controller
10. Implement Elevator control


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Syllabus

Of

Course

Of

Bachelor of Science Computer Science

(BSC CS) Programme

Second Year

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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HYBRID MOBILE APPLICATION DEVELOPMENT - I

at Semester III

(Implemented during Academic Year 2020-21)

(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	AngularJS Introduction	6
2	AngularJS Components	6
3	Introduction to Ionic Software setup	6
4	Ionic Components	6
5	JS Components	6
	Total	30

Course Objective:


By the end of the course, learners will be able to:

1. Focus in this course is on the basic understanding of web frameworks and
2. Develop API's for user interface design by Angular JS and Ionic Framework for Mobile Application Development.
3. On the completion of the course, students will be able to develop Hybrid mobile applications.

Learning Outcome:

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

- CO1: Create a fully functional HTML5 app for any of the three OSes
- CO2: Use PhoneGap to package HTML5 apps into native apps
- CO3: Understand mobile application development and deployment process.
- CO4: Understand jQuery and jQuery Mobile architecture.
- CO5: Learn how to build apps with the Ionic framework


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Detailed Syllabus

Module	Topics	No. of Leccs
1	(Skill Development) AngularJS Introduction, AngularJS Expressions, AngularJS Modules, AngularJS Directives, AngularJS Model, AngularJS Data Binding, AngularJS Controllers, AngularJS Scopes, AngularJS Filters, AngularJS Services, AngularJS Http, AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation	6
2	AngularJS Tables, AngularJS Select, AngularJS SQL, AngularJS API, AngularJS Includes, AngularJS Animations, AngularJS Routing, AngularJS Application, AngularJS AJAX, AngularJS Views, AngularJS Scopes, AngularJS Services, AngularJS Dependency Injection, AngularJS Custom Directives, AngularJS Internationalization	6
3	Introduction to Ionic: Mobile Hybrid Architecture, What is Apache Cordova?, What is Ionic?, Features of Framework, Framework Advantages, Framework Limitation, Software setup: Install Node.js, Install Git, Install Bower, Install Gulp, Install Sublime Text, Install Cordova and Ionic CLI, The platform guide, Creating First Ionic App, The browser developer tools setup, The Ionic project structure, The config.xml file, The www folder, Scaffolding the tabs template, Scaffolding the side menu template, generator-ionic, Installing generator-ionic	6
4	Ionic Colors, Content, Header, Footer, Buttons, Lists, Cards, Forms, Toggle, Checkbox, RadioButton, Range, Select, Tabs, Grid, Icons, Padding	6
5	JS ActionSheet, JS Backdrop, JS Content, JS Form, JS Events, JS Header, JS Footer, JS Keyboard, JS List, JS Loading, JS Modal, JS Navigation, JS Popover, JS Popup, JS Scroll, JS Side Menu, JS Slide Box, JS Tabs, Cordova Integration, Admob, Camera, Facebook, In App Browser, Native Audio, GeoLocation, Media, Splashscreen	6

References:

1. Pro AngularJS – Adam Freeman
2. AngularJS Programming by example - AgusKurniawan
3. AngularJS UI Development – Amit Ghart, Matthias Nehlsen.
4. Learning Ionic - Build Hybrid Mobile Applications with HTML5 - Arvind Ravulavaru
5. Ionic Framework by Example - Sani Yusuf
6. Full Stack Mobile App with Ionic Framework - Hoc Phan
7. Ionic Framework - Building Mobile Apps with Ionic Framework - Michael Bohner



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Practical: (Skill Development)

1. Ionic 4-Create and build first project or application (Android and iOS)
2. Ionic 2/Ionic 4-Adding Cordova Android Platform
3. Ionic 2/Ionic 4-Create, Generate and Add Pages
4. Ionic CLI v3-start command templates and options
5. Ionic 4/Ionic 2 Modals and Understanding Ionic 2 Navigation
6. Learn Ionic 4-what is a component and page? and how to use them?
7. Ionic 4-Lazy Loading Modules
8. Theming and Styling Ionic 2 Apps
9. Developing Ionic Apps Entirely in The Browser-Mocking SQLite Native Plugin
10. Playing videos with Ionic 2/Ionic 4 and Cordova Video Player plugin
11. Using PouchDB and SQLite with Ionic 4: A CRUD Example
12. Ionic 4-Create a Nearby Restaurants App with Geolocation Plugin, Google Maps and Places API



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Syllabus
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(BSC CS) Programme

Second Year

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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THEORY OF COMPUTATION I

at Semester III

*(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Mathematical Theory and Algebraic Structures	6
2	Introduction and General Concepts of Automata Theory	6
3	Regular Expressions and Finite Automata	6
4	Regular Languages and Finite Automata	6
5	Pumping Lemma for regular Languages	6
	Total	30

Objective:

The theoretical foundations of computer science have expanded substantially in recent years. The objective of this course is to:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing
3. To explain the hierarchy of problems arising in the computer sciences.
4. To construct automata for any given pattern and find its equivalent regular expressions

Outcome:

After completing this course the learner will be able to:

CO1: Express computer science problems as mathematical statements and to formulate proofs. (Understand)

CO2: Develop a machine model for the computing problem (Create)

CO3: Use basic concepts of finite automata techniques (Apply)

CO4: Represent a pattern as regular expression (Understand)

CO5: Design Finite Automata for different Regular Expressions and Languages (Create)



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Ph. No. 022-2610084

Detailed Syllabus

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Review of Mathematical Theory: Sets, Functions, Logical statements, Propositional Logic, Propositional equivalences, Predicates and Quantifiers, Proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions</p> <p>Algebraic Structures: Properties, Semi Group, Groups, Subgroups, Abelian Group, Cyclic Groups, Lagrange's Theorem, Normal subgroups, Rings, Euclidean ring, Fields, Introduction to Vector Space – Basis , Dimension.</p>	6
2	<p>Introduction to automata theory: Introduction to regular expressions, Finite Automata, Structural Representations, Finite state automata – Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with ϵ-Transitions, Eliminating ϵ-transitions, Equivalence of NFA and DFA, Conversion of NFA to DFA, Finite automata with output (Moore and Mealy machines)</p> <p>General Concepts of Automata Theory: Alphabets Strings, Languages, Applications of Automata Theory, Formal representation of languages –Chomsky Classification.</p>	6
3	<p>Regular Expression (RE): Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions.</p> <p>Regular Expressions and Finite Automata: The Operators of regular Expressions, Building Regular Expressions, Precedence of Regular-Expression Operators, Precedence of Regular-Expression Operators Finite Automata and Regular Expressions: From DFA's to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States.</p>	6
4	<p>Regular Languages and Finite Automata: Regular grammars and FA, FA for regular grammar, Regular grammar for FA.</p> <p>Converting Regular Expressions to Automata: Converting Regular Expressions to NFA, Myhill-Nerode Theorem, Equivalence of Deterministic and Nondeterministic Finite Automata, Minimization of Deterministic Finite Automata</p>	6

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5	Properties of Regular Languages: A Criterion for Regularity, Pumping Lemma for Regular Languages, Applications of the Pumping Lemma Closure Properties of Regular Languages, Decision Properties of Regular Languages.	6
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References:

1. Kenneth H. Rosen, "Discrete Mathematics And Its Applications", 7th Ed, McGrawHill, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition 2011.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", Second Edition, Prentice-Hall, 2001
3. John Hopcroft, Rajeev Motowani, and Jeffrey Ullman, Automata Theory, Languages, and Computation

Additional Reading:

1. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria & Sons
2. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
4. Compiler Design By Alfred V Aho, Addison Wesley
5. Introduction to the Theory of Computation By Michael Sipser
6. Peter Dehning, Jack B. Dennis, "Machines, Languages and Computation", Second Edition, Prentice-Hall, 1978
7. Harry R. Lewis, Christos H. Papadimitriou, "Elements of the theory of computation", Second Edition, Prentice-Hall, 1998

Practical (Skill Development)

- Preparation of power-point presentation, which include videos, animations, pictures, graphics for better understanding theory and practical work. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the LMS, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.

OR

- Mini-project based on the implementation aspects of the theory topics covered. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered

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Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

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ADVANCED JAVA

*at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Networking and Servlets	6
2	JDBC and Cookies	6
3	JSP and MVC	6
4	Enterprise JavaBeans	6
5	Java Persistence API and Web Services	6
Total		30

Pre-Requisite: To study Advanced Java basic knowledge of core java is needed..

Course Objectives – By the end of the course, learners will be able to:

- Learn to perform socket programming in java.
- Get an understanding on Enterprise Java and the servlet technology.
- Explain the database connection using JDBC.
- Understand the concept of cookies and session tracking in java.
- Work with JSP, EJB and implement it.

Course Outcome – After completing this course learner will be able to:

CO1: Develop networking concept using Socket Programming. (Create)

CO2: Understand Enterprise Application and Java EE architecture. (Understand)

CO3: Explain the concept of servlet, JDBC and apply it through coding. (Understand, Apply)

CO4: Learn and analyse the concept of cookies and session tracking in Java. (Analyse)

CO5: Create applications using servlet, JSP, EJB along with implementation of database. (Create)

CO6: Basic understanding of JavaBean, Web services and their applications. (Understand)


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Detailed syllabus:

Sr. No	Modules	No. of Lectures
1	UNIT 1 (Skill Development) Networking (Socket Programming): The java.net package, Connection oriented transmission – Stream Socket Class. Creating a Socket to a remote host on a port (creating TCP client and server) Simple Socket Program Example. Introduction to Java EE: What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server. Java EE Architecture, Server and Containers: Types of System Architecture, Java EE Server, Java EE Containers. Server side programming with Java Servlet: Introduction, The need for Dynamic content, Java Servlet Technology, Lifecycle of a Servlet, a simple welcome servlet, Servlet API, Handling get and post request (HTTP), Handling data from HTML to servlet, Retrieving data from database to servlet(Servlet-JDBC).	6
2	UNIT 2 Database Programming with JDBC: Introduction, JDBC Architecture, Types of Drivers, Basic JDBC program Concept, Making database Connection, Standard Statement, PreparedStatement, Callable statement ResultSet, Executing SQL commands, Executing queries, Metadata and Transaction. Cookies: Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing The Colors Of A Page. Session tracking: Introduction, Lifecycle of HTTP Session, Methods of session tracking- User Authorization, URL rewriting, Hidden form fields.	6
3	UNIT 3 JSP: Why use Java Server Pages? JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? Simple first JSP program, JSP architecture. Implicit Objects, Scripting elements – Declarations, Expressions, and Scriptlets, Comments, JSP Directives, Action elements- forward, include, use bean, get and set property. JSP with database. Java Beans: Introduction, Components of JavaBean, JavaBeans Properties. Examples. MVC: What is MVC? History of MVC, Features of MVC, MVC architecture, Components of MVC, Examples- A simple implementation	6



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	of MVC using Java, Advantages and Disadvantages.	
4	UNIT 4	
	<p>Introduction To Enterprise JavaBeans: What is EJB? Benefits of EJB, When to use EJB? Enterprise bean architecture, types of enterprise bean.</p> <p>Working With Session Beans: Introduction, When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.</p> <p>Working with Message Driven Beans: Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.</p> <p>Java Naming and Directory Interface: Introduction to naming and directory services, What is JNDI? Basic lookup.</p>	6
5	UNIT 5	
	<p>Persistence, Object/Relational Mapping And JPA: What is Persistence? Persistence in Java, Object/Relational Mapping.</p> <p>Introduction to Java Persistence API: The Java Persistence API, JPA, ORM, Database and Application, Architecture of JPA, How JPA Works and its specification.</p> <p>Introduction to Hibernate: What is Hibernate? Why Hibernate? Hibernate, Database and the application, Component of hibernate application, Architecture of hibernate</p> <p>Writing Hibernate Application: Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPs, Running the hibernate Application</p> <p>Web services: Introduction, Web service components, SOAP, RESTful, SOAP v/s REST, Java Web services API. Building a web services using JAX-WS.</p>	6

Reference books

1. The Complete Reference Java- Herbert Schildt 7th edition, McGraw Hill.
2. Java EE 7 For Beginners :Sharanam Shah, Vaishali Shah : SPD : First : 2017
3. Java EE 8 Cookbook : Build reliable applications with the most or robust and mature technology for enterprise development : Elder Moraes : Packt : First : 2018
4. Advanced Java Programming :Uttam Kumar Roy : Oxford Press : 2015
5. Core Java for Beginners by Sharanam Shah



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Practical List (Skill Development)

1. Implement a program on Socket Programming.

2. Implement the following Simple Servlet applications.

- a. Create a simple calculator application using servlet.
- b. Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed".
- c. Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.

3. Implement the following Servlet applications.

- a. Design database for student administration. Develop servlet(s) to perform CRUD operations. The program should do the following:-
 - i. Insert details for a new student.
 - ii. View all the details of the students.
 - iii. Update details of existing student.
 - iv. Delete details of a student.
- b. Develop Simple Servlet Question Answer Application using Database.

4. Programs on cookies and session in servlet.

- a. Create a servlet that uses Cookies to store the number of times a user has visited servlet.
- b. Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.

5. Demonstrate following JSP programs.

- a. Create Customer table in CUST database. Perform select, insert and delete operations on Customer table using JSP.
- b. Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
- c. Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.

6. Implement following JSP applications

- a. Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
- b. Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.



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7. Javabean program

- a. Write a Student class with three properties. The useBean action declares a JavaBean for use in a JSP. Write Java application to access JavaBeans Properties.

8. Demonstrate following EJB applications.

- a. Create a Currency Converter application using EJB.
- b. Develop a Simple Room Reservation System Application Using EJB.
- c. Develop simple shopping cart application using EJB [Stateful Session Bean].

9. Implement the following EJB applications with different types of Beans.

- a. Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
- b. Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
- c. Develop simple Marks Entry Application to demonstrate accessing Database using EJB.

10. Implement following Hibernate applications.

- a. Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
- b. Develop a Hibernate application to store and retrieve employee details in MySQL Database.

11. Programs on web services.

- a. Develop a simple "Hello World" Web Service with SOAP in Java.
- b. Develop a Simple Web Service and Client with JAX-WS.



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**Syllabus
Of
Course
Of
Bachelor of Science Computer Science
(BSC CS) Programme**

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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ADVANCED WEB PROGRAMMING - II

at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	AngularJS Introduction	6
2	AngularJS Components	6
3	Node.js Introduction	6
4	Node.js Components	6
5	Node.js with MongoDB	6
Total		30

Pre-requisite: Student must have completed ADVANCED WEB PROGRAMMING – I course in Semester III.

Course Objectives:

By the end of the course, learners will be able to:

1. Understand and learn Angular JS concepts and develop web applications with its components.
2. Understand and learn Node JS environment and develop web applications with MongoDB database.
3. Explain and implement the components of AngularJS.
4. Develop web applications with Node JS
5. Implement MongoDB with Node JS


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Course Outcome:

After completing this course learners will be able to:

CO1: Understand the concept of Angular JS (Understand)

CO2: Describe the working of Angular JS with its components. (Understand)

CO3: Recognize the concept of Node JS usage in web application. (Analyse)

CO4: Ability to develop web application with Angular JS and Node JS.(Apply)

CO5: Create and develop node JS applications with MongoDB. (Create)

Detailed syllabus:

Mod ule	Topics	No. of Lecc
1	(Skill Development) AngularJS Introduction, AngularJS - MVC Architecture, AngularJS Expressions, AngularJS Modules, AngularJS Directives, AngularJS Model, AngularJS Data Binding, AngularJS Controllers, AngularJS Scopes, AngularJS Filters, AngularJS Services, AngularJS Http, AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation	6
2	AngularJS Tables, AngularJS Select, AngularJS SQL, AngularJS API, AngularJS Includes, AngularJS Animations, AngularJS Routing, AngularJS Application, AngularJS AJAX, AngularJS Views, AngularJS Scopes, AngularJS Services, AngularJS Dependency Injection, AngularJS Custom Directives, AngularJS Internationalization	6
3	Node.js Introduction, Node.js - Introduction, Node.js - Environment Setup, Node.js Modules, Node.js HTTP Module, Node.js File System, Node.js URL Module, Node.js REPL Terminal, Node.js Package Manager (NPM), Node.js Callbacks Concept, Node.js NPM, Node.js Event Loop, Node.js Event Emitter	6



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4	Node.js Buffers,Node.js Streams,Node.js File System,Node.js Global Objects,Node.js Utility Modules,Node.js Upload Files,Node.js Email,Node.js Web Module,Node.js Express Framework,Node.js RESTFul API,Node.js Scaling Application,Node.js Packaging	6
5	Node.js with MongoDB: MongoDBIntroduction, MongoDB Create Database, MongoDB Create Collection, MongoDBInsert, MongoDBFind, MongoDBQuery, MongoDBSort, MongoDBDelete, MongoDB Drop Collection, MongoDBUpdate, MongoDBLimit, MongoDBJoin	6

References:

1. Pro AngularJS – Adam Freeman,APress,2014
2. AngularJS Programming by example - AgusKurniawan,PE Press
3. AngularJS UI Development – Amit Ghart, Matthias Nehlsen,Packt Publishing
4. Beginning Node.js – Basarat Ali Syed,APress, 2014
5. Node.js Web Development – David Herron,Packt Publishing,2018
6. Getting MEAN with Mongo, Express, Angular and Node – Simon Holmes,Manning Publications,2018.

Practical: (Skill Development)

1. Write a program on basic Angular JS
2. Write a program to demonstrate AngularJS form and validation.
3. Write a program to demonstrate AngularJS Ajax and AngularJS views
4. Write a program to demonstrate Node.js Package Manager.
5. Write a program to demonstrate Node.js Event Emitter.
6. Write a program to demonstrate Node.js Buffer
- 7 Write a program to demonstrate Node.js email
8. Write a program to demonstrate Node.js with json
9. Write a program to demonstrate Node.js with MongoDB with its operations.
10. Write a program to demonstrate Node.js with MongoDBLimit and MongoDBJoin



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Syllabus
Of
Course
Of
Bachelor of Science Computer Science
(BSC CS) Programme

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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HYBRID MOBILE APPLICATION DEVELOPMENT - II

at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction to React	6
2	Templating using JSX	6
3	Working with state and Props	6
4	React Components	6
5	React Modules	6
Total		30

Pre-requisite: Student must have completed HYBRID MOBILE APPLICATION DEVELOPMENT - I course in Semester III.

Course Objective:

By the end of the course learner will be able to:

1. Focus in this course is on the basic understanding of web frameworks and API's for user interface design by Angular JS and Ionic Framework for Mobile Application Development.
2. On the completion of the course, students will be able to develop Hybrid mobile applications.

Learning Outcome:

On completion of the course learner will be able to:

CO1: Learn how to build single page applications with React JS (Understand)

CO2: Use and Install React-Native dependencies for MAC and Windows Run Android and IOS simulator (Apply)

CO3: Understand and Learn the key concepts of the NodeJS (Understand)


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CO4: Understand Nodejs, learn rapidly growing web server technology, Nodejs & understand how NodeJS works with Node course! (Understand)
 CO5: Learn how to Style with React-Native and flex-box rules (Analyse)

Detailed syllabus

Module	Topics	No. of Lec
1	(Skill Development) Introduction to React: What is React?, Why React?, React version history, React 16 vs React 15, Just React - Hello World, Using create-react-app, Anatomy of react project, Running the app, Debugging first react app	6
2	Templating using JSX: Working with React, createElement, Expressions, Using logical operators, Specifying attributes, Specifying children, Fragments, Component: Significance of component architecture, Types of components, Functional, Class based, Pure, Component Composition	6
3	Working with state and Props: What is state and its significance, Read state and set state, Passing data to component using props, Validating props using propTypes, Supplying default values to props using default-Props	6
4	Rendering Lists, Event Handling, Understanding component lifecycle and handling errors. Working with Forms, Context, Code Splitting, Hooks, Routing with react route, Redux, Immutable.js, React Redux, Redux Middleware	6
5	Unit Testing, Webpack Primer, Isomorphic React	6

References:

1. Learning React: Functional Web Development with React and Redux - Book by Alex Banks and Eve Porcello
2. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React. Js - Book by Robin Wieruch
3. ReactJS by Example - Building Modern Web Applications with React - Book by Prathamesh Sonpatki


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Practical: (Skill Development)

1. Install create-react-app and create a new react project.
2. Create JSX expressions with different javascript expression, apply css via className and styles, use conditionals.
3. Create a stateful component and stateless component. Pass data from parent component to child component using props. Implement child to parent communication using callbacks.
4. Create component which renders lists iteratively using map function of array.
5. Handle different synthetic events.
6. Create a stateful component and implement lifecycle methods. Implement try catch mechanism using error boundaries.
7. Create a component that uses different form controls.
8. Create components that get applied with multiple themed styles using context to store theme info globally and apply to all components
9. Create react application that implements code splitting and lazy load components using React, lazy and suspense features.
10. Create a functional component that uses the ability of state and life cycle features
11. Install and setup router, configure routing rules, implement declarative and imperative navigation.
12. Create actions, reducer and store. Dispatch actions and subscribe to store changes
13. Create immutable List, map and set. Perform CRUD operations.



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Syllabus
Of
Course
Of

Bachelor of Science Computer Science
(BSC CS) Programme

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

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INTERNET OF THINGS

at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	SoC and Raspberry Pi.	6
2	ARM 8 Architecture and Programming Raspberry Pi	6
3	Programing interfaces	6
4	Useful Implementations and Introduction to IoT	6
5	IoT Security and IoT Service as a Platform	6
Total		30

Pre-requisite: Student must have completed EMBEDDED SYSTEMS course in Sem III.

Course Objective:

1. To assess the vision and introduction of IoT.
2. To Understand IoT Market perspective.
3. To Implement Data and Knowledge Management and use of Devices in IoT Technology.
4. To Understand State of the Art - IoT Architecture.
5. To classify Real World IoT Design Constraints, Industrial Automation in IoT

Course Outcome:

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

CO1: Describe the meaning and different components of Internet of Things, also the principles of Internet (Understand)

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CO2: Explain and prototype an embedded product. (Analyse)

CO3: Illustrate the physical design of the system and work with online components API for security, polling, etc. (Apply)

CO4: Describe the the memory management of an embedded system and write the codes for embedded product (Understand)

CO5: To create a small model representing the automation in IoT. (Create)

Detailed syllabus:

Module	Topics	No. of Lectures
1	(Skill Development) SoC and Raspberry Pi. System on Chip: What is System on chip? Structure of System on Chip. SoC products: FPGA, GPU, APU, Compute Units.	6
2	ARM 8 Architecture: SoC on ARM 8. ARM 8 Architecture Introduction Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi. Raspberry Pi Boot: Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware. Programming Raspberry Pi Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands	6
3	Programing interfaces: Introduction to Node.js, Python, NodeRed Raspberry Pi Interfaces: UART, GPIO, I2C, SPI	6
4	Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera. Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program. IoT and Protocols	6
5	IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP. IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED. IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability.	6

Reference:

Learning Internet of Things, Peter Waher, Packt Publishing(2015) 2) Mastering the Raspberry Pi, Warren Gay, Apress(2014)


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Additional Reference(s):

Abusing the Internet of Things, Nitesh Dhanjani, O'Reilly

Practical: (Skill Development)

1. Preparing Raspberry Pi: Hardware preparation and Installation
2. Linux Commands: Exploring the Raspbian
3. GPIO: Light the LED with Python
4. GPIO: LED Grid Module: Program the 8X8 Grid with Different Formulas
5. SPI: Camera Connection and capturing Images using SPI
6. Real Time Clock display using PWM.
7. Stepper Motor Control: PWM to manage stepper motor speed.
8. Node RED: Connect LED to Internet of Things
9. Stack of Raspberry Pi for better Computing and analysis
10. Create a simple Web server using Raspberry Pi



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**Syllabus
Of Course
Of**

**Bachelor of Science Computer Science
(BSC CS) Programme**

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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MULTIMEDIA SYSTEMS

at Semester IV

(Implemented during Academic Year 2020-21)

(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction, Hardware and Software	6
2	Compression and Multimedia Objects	6
3	Audio and Video Compression	6
4	Multimedia with Internet and Animation	6
5	Multimedia-looking towards Future	6
Total		30

Pre-requisite: Student must have completed COMPUTER GRAPHICS AND ANIMATION course in Semester III.

Course Objectives –

By the end of the course, learners will be able to:

- Become multimedia/graphics designers and engineers in their areas of expertise.
- Understand the basic components of multimedia and different compression techniques used.
- Get an understanding of Animation and Virtual Reality.
- Implement different techniques for creating animated videos and edit different images using softwares.
- Apply different effects and color coding on various objects.



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Course Outcome –

After completing this course learner will be able to:

CO1: Use different compression techniques of text, audio, video and apply basics of animation. (Apply)

CO2: Understand different file formats used for text, image, audio and video and compare between them. (Understand, Analyze)

CO3: Apply different animation on character, object, etc. Apply text effects, color variations on objects. (Apply)

CO4: Use different software for animation purposes and create a small animation clip and enhance graphics images using different software's. (Create)

CO5: Create different logos, cards and websites using multimedia software. (Create)

CO6: Discuss the concept of Virtual reality and its applications. (Understand)

Detailed syllabus:

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Introduction, Hardware and Software</p> <p>Introduction to Multimedia: Definition, History of Multimedia, characteristics of multimedia, multimedia building blocks/components, Multimedia elements, Multimedia architecture, analog and digital representations, evolving technologies for multimedia, Multimedia applications.</p> <p>Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production, Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.</p>	9



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2	<p>Compression and Multimedia Objects</p> <p>Compression and coding: Definitions, need of data compression, types of compression, basic compression techniques- run length, Huffman's coding. Text, Graphics and Image data representation: Text, using text in multimedia, text file formats(txt,doc, rtf, pdf), text compression techniques. Basic Image fundamentals, image File formats - (BMP, TIFF, JPEG, GIF), image acquisition, graphics/image data types, color models in images, image processing and software, Image enhancement, image compression techniques.</p>	6
3	<p>Audio and Video Compression</p> <p>Audio and Audio compression: Introduction, Acoustics, Sound Waves, Types and Properties of Sounds, Psycho-Acoustics, Components of an Audio Systems, Digitization of audio, synthesizers, MIDI, digital audio processing, Quantization and Transmission of audio, Audio File Formats, audio compression techniques, audio processing software. Video and video compression: Introduction, types of video signal, television system, video color spaces, digital video, digital video processing, video file formats, video compression techniques, video recording and storage formats, video processing software</p>	6
4	<p>Multimedia with Internet and Animation:</p> <p>Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.</p> <p>Animation: Basics of animation, types of animation, principles of animation, use of animation, traditional animation, computer based animation, OpenGL overview</p>	6
5	<p>Multimedia-looking towards Future</p> <p>Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.</p> <p>Virtual Reality: Concept, Forms of VR, VR applications, VR</p>	6



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	devices: Hand Gloves, Head mounted tracking system, VR chair, VCR, 3D Sound system, Head mounted display.	
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References:

1. Ranjan Parekh, "Principles of Multimedia", 2/E, Tata McGraw-Hill, ISBN: 1259006506
2. Ze-Nian Li, Marks S. Drew, "Fundamentals of Multimedia", Pearson Education
3. Keyes, "Multimedia Handbook", TMH, 2000.
4. R. Steinmetz and K. Naharstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
5. S. Rimmer, 2000, Advanced Multimedia Programming, PHI, New Delhi.

Practical: (Skill Development)

(Flash (1-5), Photoshop (6-8), Dreamviewer (9-10))

1. To Move an object, to move an object in the path
2. Text flip, Text color change,
3. Creating a link using texts and objects, change the color of the object.
4. Shape Tweening and Using shape hints, Motion tweening, hybrid tweening.
5. Character Animation, Object Animation, Drawing Images
6. To create a greeting card, Create background picture
7. Text and Photo effects, editing images.
8. Designing Logos
9. Creating menu bar
10. Creating Pages and sites


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**Nagindas Khandwala College
(Autonomous)**



**Syllabus
Of Course
Of**

**Bachelor of Science Computer Science
(BSC CS) Programme**

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

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MULTIMEDIA SYSTEMS

at Semester IV

(Implemented during Academic Year 2020-21)

(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction, Hardware and Software	6
2	Compression and Multimedia Objects	6
3	Audio and Video Compression	6
4	Multimedia with Internet and Animation	6
5	Multimedia-looking towards Future	6
Total		30

Pre-requisite: Student must have completed COMPUTER GRAPHICS AND ANIMATION course in Semester III.

Course Objectives –

By the end of the course, learners will be able to:

- Become multimedia/graphics designers and engineers in their areas of expertise.
- Understand the basic components of multimedia and different compression techniques used.
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Course Outcome –

After completing this course learner will be able to:

CO1: Use different compression techniques of text, audio, video and apply basics of animation. (Apply)

CO2: Understand different file formats used for text, image, audio and video and compare between them. (Understand, Analyze)

CO3: Apply different animation on character, object, etc. Apply text effects, color variations on objects. (Apply)

CO4: Use different software for animation purposes and create a small animation clip and enhance graphics images using different software's. (Create)

CO5: Create different logos, cards and websites using multimedia software. (Create)

CO6: Discuss the concept of Virtual reality and its applications. (Understand)

Detailed syllabus:

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Introduction, Hardware and Software</p> <p>Introduction to Multimedia: Definition, History of Multimedia, characteristics of multimedia, multimedia building blocks/components, Multimedia elements, Multimedia architecture, analog and digital representations, evolving technologies for multimedia, Multimedia applications.</p> <p>Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production, Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.</p>	9


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2	<p>Compression and Multimedia Objects</p> <p>Compression and coding: Definitions, need of data compression, types of compression, basic compression techniques- run length, Huffman's coding. Text, Graphics and Image data representation: Text, using text in multimedia, text file formats(txt,doc, rtf, pdf), text compression techniques. Basic Image fundamentals, image File formats - (BMP, TIFF, JPEG, GIF), image acquisition, graphics/image data types, color models in images, image processing and software, Image enhancement, image compression techniques.</p>	6
3	<p>Audio and Video Compression</p> <p>Audio and Audio compression: Introduction, Acoustics, Sound Waves, Types and Properties of Sounds, Psycho-Acoustics, Components of an Audio Systems, Digitization of audio, synthesizers, MIDI, digital audio processing, Quantization and Transmission of audio, Audio File Formats, audio compression techniques, audio processing software. Video and video compression: Introduction, types of video signal, television system, video color spaces, digital video, digital video processing, video file formats, video compression techniques, video recording and storage formats, video processing software</p>	6
4	<p>Multimedia with Internet and Animation:</p> <p>Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.</p> <p>Animation: Basics of animation, types of animation, principles of animation, use of animation, traditional animation, computer based animation, OpenGL overview</p>	6
5	<p>Multimedia-looking towards Future</p> <p>Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.</p> <p>Virtual Reality: Concept, Forms of VR, VR applications, VR</p>	6



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 (AUTONOMOUS)
 MALAD (W), MUMBAI - 400 084

devices: Hand Gloves, Head mounted tracking system, VR chair, VCR, 3D Sound system, Head mounted display.	
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References:

1. Ranjan Parekh, "Principles of Multimedia", 2/E, Tata McGraw-Hill, ISBN: 1259006506
2. Ze-Nian Li, Marks S. Drew, "Fundamentals of Multimedia", Pearson Education
3. Keyes, "Multimedia Handbook", TMH, 2000.
4. R. Steinmetz and K. Naharstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
5. S. Rimmer, 2000, Advanced Multimedia Programming, PHI, New Delhi.

Practical: (Skill Development)

(Flash (1-5), Photoshop (6-8), Dreamviewer (9-10))

1. To Move an object, to move an object in the path
2. Text flip, Text color change,
3. Creating a link using texts and objects, change the color of the object,
4. Shape Tweening and Using shape hints, Motion tweening, hybrid tweening.
5. Character Animation, Object Animation, Drawing Images
6. To create a greeting card, Create background picture
7. Text and Photo effects, editing images.
8. Designing Logos
9. Creating menu bar
10. Creating Pages and sites



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Syllabus Of
Course
Of
Bachelor of Science Computer Science
(BSC CS) Programme

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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SOFTWARE ENGINEERING

at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction to Software Engineering and SDLC	6
2	Introduction to Software Requirements Specifications	6
3	System Design and Object-oriented design using UML	6
4	Software Measurement and Metrics and Testing	6
5	Project management and Software Maintenance and Risk Analysis	6
	Total	30

Course Objective:

By the end of the course, learners will be able to:

- Understand the basic theory of software engineering.
- Understand the software development life cycle
- Understand and apply the basic project management practices in real life projects.
- Understanding of approaches to verification and validation including static analysis, and reviews.
- Describe software measurement and software risks.

Learning Outcome:

After completing this course, learners will be able to:

- CO1: Decompose the given project in various phases of a lifecycle. (Analyse)
CO2: Choose appropriate process model depending on the user requirements. (Evaluate)
CO3: Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.(Apply)
CO4: Know various processes used in all the phases of the product. (Understand)
CO5: Apply the knowledge, techniques, and skills in the development of a software product. (Apply)


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Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Introduction to Software Engineering: Introduction to Software, Types of Software, Classes of Software, Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Myths, Software Applications, Software-Engineering Processes, Programs Versus Software Products.</p> <p>Software-Development Life-Cycle Models Software-Development Life-Cycle, Waterfall Model, Prototyping Model, Spiral Model, Evolutionary Development Model, Iterative-Enhancement Model, RAD Model, Agile Model.</p>	6
2	<p>Introduction to Software Requirements Specifications Requirement Engineering, Process of Requirements Engineering, Information Modeling, Data-Flow Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS Documents, SRS Validation, Components of SRS, Characteristics of SRS.</p> <p>Software Reliability and Quality Assurance Verification and Validation, Software Quality Assurance, Software Quality, International Standard Organization (ISO), Comparison of ISO-9000 Certification and the SEI-CMM, Reliability Issues, Reliability Metrics, Reliability Growth Modeling, Reliability Assessment.</p>	6
3	<p>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus, The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design.</p> <p>Object-oriented design using UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram.</p>	6
4	<p>Software Measurement and Metrics: Software Metrics, Halstead's Software Science, Function-Point Based Measures, Cyclomatic Complexity</p> <p>Software Testing: Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test Case Design.</p>	6


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5	<p>Project management: Revision of Project Management Process, Role of Project Manager, Project Management Knowledge Areas, Managing Changes in requirements, Software-Project Estimation, Constructive Cost Model (COCOMO).</p> <p>Software Maintenance and Risk Analysis: Software as an Evolution Entity, Software-Configuration Management Activities, Change-Control Process, Software-Version Control, Software-Configuration Management, Need for Maintenance, Categories of Maintenance, Maintenance Costs, Software-Risk Analysis and Management.</p>	6
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References:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGrawHill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. Software Engineering & Testing , B.B.Agarwal, S.P.Tayal, M.Gupta.

Practical: (Skill Development)

1. Problem Statement on Case Study/Mini Project
2. Requirement Analysis through various techniques
3. Use Case Diagram
4. Class Diagram
5. Activity Diagram
6. Sequence Diagram
7. State Machine Diagram
8. Component Diagram
9. Project Management
 - Computing FP
 - Gantt chart
 - Estimation Effort and schedule
10. Basic Testing



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(BSC CS) Programme

Second Year

Semester IV

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SYSTEM PROGRAMMING
at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Linux Utilities	6
2	Files and Directories	6
3	Process and signal	6
4	Inter Process Communications, message queues, semaphores	6
5	Shared Memory and sockets	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the basics of OS concepts efficient scripts and utilities are to be used.
2. Learn the concept of files and directories.
3. Describe the working of process and signals.
4. Describe the concept of IPC, semaphores, memory and sockets.
5. Design and implement code generators using C and gdb

Course Outcome:

After the completion of the course, the students would be able to

CO1: Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve problems.(Apply)

CO2: Develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication.(Analyse)

CO3: Develop the basic skills required to write network programs using sockets.(Apply)

CO4: Design and implement system utility programs.(Create)

CO5: Describe UNIX file systems and process control.(Understand)


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Detailed Syllabus

Module	Topics	No. of Lectures
1	<p>(Skill Development)</p> <p>Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text Processing utilities and backup utilities.</p> <p>sed- scripts, operation, address, commands, applications, awk- execution, fields and records, scripts, operations, patterns, actions, associative arrays, string and mathematical functions, system commands in awk, applications.</p> <p>Shell programming with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and Redirection, Here documents, Running a shell scripts, The shell as a programming language, Shell meta characters, File name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, Test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts</p>	6
2	<p>Files and Directories: File Concept, File types ,File system Structure, File meta data – Inodes, Kernel support for files, System calls for I/O operations – open, create, read, write, lseek, dup2. File status information – stat family, file and record locking, fcntl function, Links – Soft links & hard links – symlink, link, unlink.</p> <p>Directories – creating, removing, changing directories – mkdir, rmdir, chdir, obtaining current working directory – getcwd, directory contents, scanning directories – opendir, readdir, closedir, rewinddir functions.</p>	6
3	<p>Process : Process concepts, layout of C program image in main memory, process environment –environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control- process creation. Replacing a process image, Waiting for a process, process termination, zombie process, orphan process, system call interface form process management – fork, vfork, exit, wait, waitpid, exec family, process groups, session and controlling terminal, difference between threads and processes.</p> <p>Signal- Introduction to signals, Signal generation and</p>	6



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	handling, Kernel support for signal, Signal function, unreliable signals, reliable signals, Kill, raise, alarm, pause, abort, sleep functions.	
4	Inter Process Communications:- Introduction to IPC, IPC between processes on a single computer, IPC between processes on different systems, pipes – creating, IPC between related processes using Unnamed Pipes, FIFOs – creation, IPC between unrelated processes using FIFO (named pipes), difference between named and unnamed pipes, popen and pclose library functions. Message Queues – kernel support for messages, APIs for Message Queues, client/server examples. Semaphores – Kernel support for semaphores, APIs for semaphores, FILE locking with semaphores.	6
5	Shared Memory:- Kernel support for Shared memory, APIs for shared memory, shared memory examples. Sockets:- Introduction to Berkeley Sockets, IPC over a network, client/server model, Sockets Address Structure(UNIX Domain & Internet Domain), Socket System calls for connection oriented Protocol and connectionless protocol, Example client/server programs – single server-client connection, multiple simultaneous clients, socket options – setsockopt and fcntl system calls, comparison of IPC mechanisms.	6

References:

1. Unix concepts and Applications, 4th Edition, Sumitabha Das, TMH.
2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Willey India Edition.

Practical: (Skill Development)

1. Installation of Unix/Linux operating system
2. Basic Commands
3. Write a shell script program to display list of user currently logged in
4. Shell script program to check whether given file is a directory or not.
5. Write a program using sed command to print duplicated lines of Input.
6. Write a grep/egrep script to find the number of character, words and lines in a file.
7. Write an awk script to develop a Fibonacci series.
8. Write a shell script to change the priority of processes.
9. Write a shell script program to check variable attributes of file and processes.
10. To execute programs using gdb to utilize its various features like breakpoints, conditional breakpoints etc.

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Syllabus
Of
Course
Of

Bachelor of Science Computer Science
(BSC CS) Programme

Second Year

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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THEORY OF COMPUTATION II
at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Context Free Grammar (CFG)	6
2	CFG and PDA	6
3	PDA and language of PDA	6
4	LBA and Turing Machine	6
5	Turing Machine and Halting Problem	6
Total		30

Pre-requisite: Student must have completed THEORY OF COMPUTATION I course in Semester III.

Objectives:

By the end of the course learner will be able to:

1. To familiarize Regular grammars, context free grammar
2. To design a context free grammar for any given language
3. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
4. To understand Turing machines and their capability
5. To understand undecidable problems and NP class problems
6. participate in GATE, PGCET and other competitive examinations

Outcome:

On completion of the course learner will be able to:

CO1: Design Finite Automata's for different Regular Expressions and Languages (apply)

CO2: Construct context free grammar for various languages (create)

CO3: solve various problems of applying normal form techniques, push down automata and Turing Machines (apply)

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CO4: apply this basic knowledge of Theory of Computation in the computer field to solve computational problems and in the field of compiler also. (apply)

CO5: demonstrate the working of Turing machines and their capability (understand)

CO6: To explain undecidable problems and NP class problems (understand)

Detailed syllabus:

Module	Topics	No. of Lectures
1	(Skill Development) Introduction to Grammar: The Languages of a Grammar, and types of Grammars, Regular Grammar, Conversion of FA to grammar. Context-Free Grammars(CFG): Definition of Context-Free Grammars, Derivation Trees (Parse trees), Constructing Parse Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings.	6
2	Applications of Context-Free Grammars: Parsers, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity From Grammars, Leftmost Derivations as a Way to Express Ambiguity, Inherent Ambiguity. Minimization of CFG's, Chomsky Normal form and Greibach Normal form. Language acceptability by PDA through empty stack and final state	6
3	Pushdown Automata: Definition Formal Definition of Pushdown Automata, A Graphical Notation for PDA's, Instantaneous Descriptions of a PDA Languages of PDA: Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata, From PDA's to Grammars	6
4	Linear Bounded Automata and Turing Machines: Formal definition and behavior, Context sensitive language and linear bounded automata (LBA) Turing Machine (TM) – Basics and formal definition, Transition Diagrams for Turing Machines, TM as a language acceptor, Turing Machines and Computers, TM as a computer of integer functions, Types of TMs.	6
5	Turing Machines and Halting Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Universal Turing machine, The Halting problem.	6

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<p>Recursively Enumerable Languages, Recursive languages, Properties of Recursively Enumerable Languages and Recursive Languages, Decidability and Halting Problem.</p> <p>Un-decidability: Undecidable problems about TMs, Decidability, Post's correspondence problem (PCP), undecidability of PCP.</p>	
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References:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages and Computation, 3rd edition, Pearson Education, India.
2. L. P Mishra, N. Chandrashekar (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
3. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria & Sons
4. Michael Sipser, Introduction to the Theory of Computation, Thomson Course Technology, 2006

Practical: (Skill Development)

- Preparation of power-point presentation, which include videos, animations, pictures, graphics for better understanding theory and practical work. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the LMS, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.

OR

- Mini-project based on the implementation aspects of the theory topics covered. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered



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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester V

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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ARTIFICIAL INTELLIGENCE

*at Semester V
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	AI, Intelligent Agents, Problem Solving by searching	15
2	Learning from Examples	15
3	Learning probabilistic models	15
	Total	45

Course Objective:

To create appreciation and understanding of both the achievements of AI Students will able to:

- Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents and the theory underlying those achievements.
- To introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems
- To impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.
- To create an understanding of the basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.

Learning Outcomes:

On completion of the course students will be able to:

CO1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.(Level: Understand)

CO2. Apply these techniques in applications which involve perception, reasoning and learning.(Level: Apply)

CO3. Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals. (Level: Apply)

CO4. Acquire the knowledge of real world Knowledge representation. (Level:Apply)

CO5. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system. (Level: Analyze)

CO6. Use different machine learning techniques to design AI machine and enveloping applications for real world problems.(Level: Create)



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Detailed Syllabus

Module	Topics	Lectures
1	What Is AI: Foundations, History and State of the Art of AI. Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents. Problem Solving by searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.	15
2	Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning	15
3	Learning probabilistic models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm. Reinforcement learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning.	15

Textbook(s):

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson, 2010.

Additional Reference(s):

- 1) Artificial Intelligence: Foundations of Computational Agents, David L Poole, Alan K. Mackworth, 2nd Edition, Cambridge University Press, 2017.
- 2) Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017
- 3) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2013

Practical: (Skill development and employability)

1. Implement Breadth first search algorithm for Romanian map problem.
2. Implement Iterative deep depth first search for Romanian map problem.
3. Implement A* search algorithm for Romanian map problem.
4. Implement recursive best-first search algorithm for Romanian map problem.
5. Implement decision tree learning algorithm for the restaurant waiting problem.
6. Implement feed forward back propagation neural network learning algorithm for the restaurant waiting problem.
7. Implement Adaboost ensemble learning algorithm for the restaurant waiting problem.
8. Implement Naive Bayes' learning algorithm for the restaurant waiting problem.
9. Implement passive reinforcement learning algorithm based on adaptive dynamic programming (ADP) for the 3 by 4 world problem
10. Implement passive reinforcement learning algorithm based on temporal differences (TD) for 3 by 4 world problem.



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**Syllabus
Of Course
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**Bachelor of Science Computer Science
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Third Year

Semester V

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(To be implemented during Academic Year- 2020-2021)

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GAME PROGRAMMING
at Semester V
(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Mathematics for Computer Graphics, DirectX Kickstart	10
2	DirectX Pipeline and Programming	10
3	Introduction to Rendering Engines, Unity Engine, Scripting, XR	10
	Total	30

Course Objectives:

1. To understand the basic mathematics required for computer graphics.
2. To understand and implement different 2D and 3D transformations
3. To understand the concept and stages of directx implementation
4. To perform programs for directx using its library
5. To understand XR and unity engine for developing games

Course Outcomes:

After successful completion of this course, learners will be able to:

- CO1: Explain the mathematics concepts required for Computer Graphics. (Understand)
- CO2: Describe and write the programs for different 2D and 3D transformations (Understand)
- CO3: Illustrate the different stages of DirectX Pipelining (Analyse)
- CO4: To generate different textures using DirectX programming (Analyse and Apply)
- CO5: Create 2D and 3D Games in Unity Programming (Create)


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Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>(Skill Development & Employability)</p> <p>Mathematics for Computer Graphics, DirectX Kickstart: Cartesian Coordinate system: The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule Vectors: Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas Transformations: 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU?</p>	10
2	<p>DirectX Pipeline and Programming: Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels Direct3D 11 Rendering Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM) Understanding Meshes or Objects, Texturing, Lighting, Blending. Interpolation and Character Animation: Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions Curves: Circle, Bezier, B-Splines Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line</p>	10
3	<p>Introduction to Rendering Engines: Understanding the current market Rendering Engines. Understanding AR, VR and MR. Depth Mappers, Mobile Phones, Smart Glasses, HMD's</p> <p>Unity Engine: Multi-platform publishing, VR + AR: Introduction and</p>	10


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<p>working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing.</p> <p>Scripting: Scripting Overview, Scripting Tools and Event Overview</p> <p>XR: VR, AR, MR, Conceptual Differences. SDK, Devices</p>	
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Textbook(s):

- 1) Mathematics for Computer Graphics, John Vince, Springer-Verlag London, 5th Edition, 2017
- 2) Mathematics for 3D Game Programming and Computer Graphic, Eric Lengyel, Delmar Cengage Learning, Delmar Cengage Learning, 2011
- 3) Introduction To 3D Game Programming With DirectX® 11, Frank D Luna, Mercury Learning And Information, 2012.
- 4) <https://docs.unity3d.com/Manual/index.html> - Free

Additional Reference(s):

- 1) Computer Graphics, C Version, Donald Hern and Pauline Baker, Pearson Education, 2nd Edition, 1997
- 2) HLSL Development Cookbook, Doron Feinstein, PACKT Publishing, 2013

Practical:(Skill Development & Employability)

1. Setup DirectX 11, Window Framework and Initialize Direct3D Device
2. Buffers, Shaders and HLSL (Draw a triangle using Direct3D 11)
3. Texturing (Texture the Triangle using Direct 3D 11)
4. Lightning (Programmable Diffuse Lightning using Direct3D 11)
5. Specular Lightning (Programmable Spot Lightning using Direct3D 11)
6. Loading models into DirectX 11 and rendering.

Perform following Practical using online content from the Unity Tutorials Web--sites:

<https://unity3d.com/learn/tutorials/s/interactive-tutorials>

7. <https://unity3d.com/learn/tutorials/s/2d-ufo-tutorial>

8. <https://unity3d.com/learn/tutorials/s/space-shooter-tutorial>

9. <https://unity3d.com/learn/tutorials/s/roll-ball-tutorial>

10. <https://unity3d.com/learn/tutorials/topics/vr/introduction?playlist=22946>



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Phone: 011-26101111, 26101112, 26101113, 26101114, 26101115, 26101116, 26101117, 26101118, 26101119, 26101120, 26101121, 26101122, 26101123, 26101124, 26101125, 26101126, 26101127, 26101128, 26101129, 26101130, 26101131, 26101132, 26101133, 26101134, 26101135, 26101136, 26101137, 26101138, 26101139, 26101140, 26101141, 26101142, 26101143, 26101144, 26101145, 26101146, 26101147, 26101148, 26101149, 26101150, 26101151, 26101152, 26101153, 26101154, 26101155, 26101156, 26101157, 26101158, 26101159, 26101160, 26101161, 26101162, 26101163, 26101164, 26101165, 26101166, 26101167, 26101168, 26101169, 26101170, 26101171, 26101172, 26101173, 26101174, 26101175, 26101176, 26101177, 26101178, 26101179, 26101180, 26101181, 26101182, 26101183, 26101184, 26101185, 26101186, 26101187, 26101188, 26101189, 26101190, 26101191, 26101192, 26101193, 26101194, 26101195, 26101196, 26101197, 26101198, 26101199, 26101200

Nagindas Khandwala College (Autonomous)



Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester V

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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INFORMATION AND NETWORK SECURITY

*at Semester V
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction, Classical Encryption Techniques, Public-Key Cryptography and RSA	15
2	Key Management, Message Authentication and Hash Functions, Digital Signatures and Authentication, Authentication Applications	15
3	Electronic Mail Security, IP Security, Web Security, Intrusion, Malicious Software, Firewalls	15
	Total	45

Course Objective:

The objectives of this course can be illustrated as:

- To provide conceptual understanding of network security issues, challenges and mechanisms.
- To develop basic skills of secure network architecture and explain the theory behind the security of different cryptographic algorithms.
- To describe common network vulnerabilities and attacks, defense mechanisms against network attacks, and cryptographic protection mechanisms.

Learning Outcome:

After completion of this Course, students will be able to:

CO1:List and briefly describe security risks and mitigation strategies for an organization that is about to connect its network to the Internet and communicate with other companies via email. (Level:Understand)

CO2:Explain the differences between the three major goals of information security: confidentiality, integrity and availability, and can list and explain one technique for ensuring each. (Level:Analyze)

CO3:Explain how public key cryptography can be used to ensure the identity of the sender of an encrypted message.(Level:Analyze)

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CO4: Describe network security services and mechanisms. (Level:Analyze)

CO5: Understand the Symmetrical and Asymmetrical cryptography.
(Level:Understand)

CO6: Apply on various concepts to Data integrity, Authentication, Digital Signatures.
(Level:Understand)

Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm.	15
2	Key Management: Public-Key Cryptosystems, Key Management, Diffie-Hellman Key Exchange Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC Digital Signatures and Authentication: Digital Signatures, Authentication Protocols, Digital Signature Standard Authentication Applications: Kerberos, X.509 Authentication, Public-Key Infrastructure	15
3	Electronic Mail Security: Pretty Good Privacy, S/MIME IP Security: Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction Intrusion: Intruders, Intrusion Techniques, Intrusion Detection Malicious Software: Viruses and Related Threats, Virus Countermeasures, DDOS Firewalls: Firewall Design Principles, Types of Firewalls	15


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Textbook(s):

1) Cryptography and Network Security: Principles and Practice 5th Edition, William Stallings,
Pearson,2010

Additional Reference(s):

- 1) Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2013.
- 2) Cryptography and Network, Behrouz A Fourouzan, Debdeep Mukhopadhyay, 2nd Edition, TMH, 2011

Practical: (Skill Development & Employability)

1. Write programs to implement the following Substitution Cipher Techniques: Caesar Cipher and Monoalphabetic Cipher
- 2 Write programs to implement the following Substitution Cipher Techniques: Vernam Cipher and Playfair Cipher
- 3 Write programs to implement the following Transposition Cipher Techniques: Rail Fence Cipher and Simple Columnar Technique
- 4 Write program to encrypt and decrypt strings using DES Algorithm and AES Algorithm
- 5 Write a program to implement RSA algorithm to perform encryption / decryption of a given string.
- 6 Write a program to implement the Diffie-Hellman Key Agreement algorithm to generate symmetric keys.
- 7 Write a program to implement the MD5 algorithm compute the message digest.
- 8 Write a program to calculate HMAC-SHA1 Signature
- 9 Write a program to implement SSL.
- 10 Configure Windows Firewall to block: A port, An Program, A website


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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

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LINUX SERVER ADMINISTRATION

*at Semester V
(Implemented during Academic Year 2018-19)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction, Single-Host Administration, Networking and Security	15
2	Internet Services- 1	15
3	Internet Services- 2	15
	Total	45

Objective:

On completion of this course you should be able to:

- Understand the role and responsibilities of a Linux system administrator
- Install and configure the Linux operating system
- Manage the resources and security of a computer running Linux at a basic level
- Make effective use of Linux utilities, and scripting languages
- Configure and manage simple TCP/IP network services on a Linux system

Course Outcome:

After completing this course learners will be able to:

- CO1: Describe fundamental concepts of software quality assurance. (Understand)
- CO2: Explore test planning and its management. (Analyze)
- CO3: Understand fundamental concepts of software automation. ((Understand)
- CO4: Demonstrate the quality management, assurance, and quality standard to software system.(Understand)
- CO5: Apply Selenium automation tool for testing web based application. (Apply)



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Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction: Technical Summary of Linux Distributions, Managing Software Single-Host Administration: Managing Users and Groups, Booting and shutting down processes, File Systems, Core System Services, Process of configuring, compiling, Linux Kernel Networking and Security: TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security	15
2	Internet Services: Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, Open LDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security	15
3	Intranet Services: Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications File Servers, Email Services, Chat Applications, Virtual Private Networking	15

Textbook(s):

1. Linux Administration: A Beginner's Guide, Wale Soyinka, Seventh Edition, McGraw-Hill Education, 2016
2. Ubuntu Server Guide, Ubuntu Documentation Team, 2016

Additional Reference(s):

- 1) Mastering Ubuntu Server, Jay LaCroix, PACKT Publisher, 2016


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Practical: (Skill development and employability)

- Practical shall be performed using any Linux Server (with 8GB RAM).

- Internet connection will be required so that Linux server (command line mode) can be connected to Internet.

1. Install DHCP Server in Ubuntu 16.04
2. Initial settings: Add a User, Network Settings, Change to static IP address, Disable IPv6 if not needed, Configure Services, display the list of services which are running, Stop and turn OFF auto-start setting for a service if you don't need it, Sudo Settings
3. Configure NTP Server (NTPd), Install and Configure NTPd, Configure NTP Client (Ubuntu and Windows)
4. SSH Server : Password Authentication Configure SSH Server to manage a server from the remote computer, SSH Client : (Ubuntu and Windows)
5. Install DNS Server BIND, Configure DNS server which resolves domain name or IP address, Install BIND 9, Configure BIND, Limit ranges you allow to access if needed.
6. Configure DHCP Server, Configure DHCP (Dynamic Host Configuration Protocol) Server, Configure NFS Server to share directories on your Network, Configure NFS Client. (Ubuntu and Windows Client OS)
7. Configure LDAP Server, Configure LDAP Server in order to share users' accounts in your local networks, Add LDAP User Accounts in the OpenLDAP Server, Configure LDAP Client in order to share users' accounts in your local networks. Install phpLDAPadmin to operate LDAP server via Web browser.
8. Configure NIS Server in order to share users' accounts in your local networks, Configure NIS Client to bind NIS Server.
9. Install MySQL to configure database server, Install phpMyAdmin to operate MySQL on web browser from Clients.
10. Install Samba to share folders or files between Windows and Linux.



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**Syllabus Of Course
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(BSC CS) Programme**

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Semester V

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(To be implemented during Academic Year- 2020-2021)

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Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapters have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.

Comment [1]: Focuses on employability

I. OBJECTIVES

- Describe the Systems Development Life Cycle (SDLC).
- Evaluate systems requirements.
- Complete a problem definition.
- Evaluate a problem definition.
- Determine how to collect information to determine requirements.
- Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.
- Work on data collection methods for fact finding.
- Construct and evaluate data flow diagrams.
- Construct and evaluate data dictionaries.
- Evaluate methods of process description to include structured English, decision tables and decision trees.
- Evaluate alternative tools for the analysis process.
- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
- Decide the S/W requirement specifications and H/W requirement specifications.
- Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- Design and evaluate system outputs.
- Design and evaluate systems inputs.
- Design and evaluate validity checks for input data.
- Design and evaluate user interfaces for input.
- Design and evaluate file structures to include the use of indexes.
- Estimate storage requirements.
- Explain the various file update processes based on the standard file organizations.
- Decide various data structures.
- Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.

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- Perform normalization for the unnormalized tables for RDBMS related projects
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.
- Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.
- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
- Develop of the ability to assess the implications of work performed.


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- Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles
- Develop of the ability to communicate effectively.

II . SOFTWARE AND BROAD AREAS OF APPLICATION

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), TeL/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket programming
NETWORK/WIRELESS TECHNOLOGIES	-
REALTIME OPERATING SYSTEM/ EMBEDDED SKILLS	LINUX, Raspberry Pi, Arduino, 8051
APPLICATION AREAS	Financial / Insurance / Manufacturing / Multimedia / Computer Graphics / Instructional Design/ Database Management System/ Internet / Intranet / Computer Networking- Communication Software development/ E-Commerce/ ERP/ MRP/ TCP-IP programming / Routing protocols programming/ Socket programming

III. Project Report

PROJECT REPORT:

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

CHAPTER 1: INTRODUCTION

1.1 Background
 1.2 Objectives
 1.3 Purpose, Scope, and Applicability
 1.3.1 Purpose
 1.3.2 Scope
 1.3.3 Applicability
 1.4 Achievements
 1.5 Organisation of Report



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CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

- 3.1 Problem Definition
- 3.2 Requirements Specification
- 3.3 Planning and Scheduling
- 3.4 Software and Hardware Requirements
- 3.5 Preliminary Product Description
- 3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

- 4.1 Basic Modules
- 4.2 Data Design
 - 4.2.1 Schema Design
 - 4.2.2 Data Integrity and Constraints
- 4.3 Procedural Design
 - 4.3.1 Logic Diagrams
 - 4.3.2 Data Structures
 - 4.3.3 Algorithms Design
- 4.4 User interface design
- 4.5 Security Issues
- 4.6 Test Cases Design

CHAPTER 5: IMPLEMENTATION AND TESTING

- 5.1 Implementation Approaches
- 5.2 Coding Details and Code Efficiency
 - 5.2.1 Code Efficiency
- 5.3 Testing Approach
 - 5.3.1 Unit Testing
 - 5.3.2 Integrated Testing
 - 5.3.3 Beta Testing
- 5.4 Modifications and Improvements
- 5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

- 6.1 Test Reports
- 6.2 User Documentation

CHAPTER 7: CONCLUSIONS

- 7.1 Conclusion
 - 7.1.1 Significance of the System
- 7.2 Limitations of the System
- 7.3 Future Scope of the Project

REFERENCES

GLOSSARY



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SOFTWARE TESTING AND QUALITY ASSURANCE

at Semester V

(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Software Testing and Introduction to quality, Verification and Validation, Software Testing Techniques	15
2	Software Testing Strategies, Software Metrics, Defect Management	15
3	Software Quality Assurance, Quality Improvement, Quality Costs	15
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. To understand different Testing Techniques
2. To understand Verification and Validation Techniques
3. Introduce basic concepts of software testing
4. Understand white box, block box, object oriented, web based and cloud testing
5. Understand the importance of software quality and assurance software systems development.

Course Outcome:

After completing this course learners will be able to:

CO1: Describe fundamental concepts of software quality assurance. (Understand)

CO2: Explore test planning and its management. (Analyze)

CO3: Understand fundamental concepts of software automation. ((Understand)

CO4: Demonstrate the quality management, assurance, and quality standard to software system.(Understand)

CO5: Apply Selenium automation tool for testing web based application. (Apply)



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Detailed Syllabus:

Module	Topics	No. of Lectures
1	Software Testing and Introduction to quality : Introduction, Nature of errors, an example for Testing, Definition of Quality , QA, QC, QM and SQA , Software Development Life Cycle, Software Quality Factors Verification and Validation : Definition of V & V , Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough Software Testing Techniques : Testing Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testing and its types	15
2	Software Testing Strategies : Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing Software Metrics : Concept and Developing Metrics, Different types of Metrics, Complexity metrics Defect Management: Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.	15
3	Software Quality Assurance : Quality Concepts, Quality Movement, Background Issues, SQA activities, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, , SQA Plan , Six sigma, Informal Reviews Quality Improvement : Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts Quality Costs : Defining Quality Costs, Types of Quality Costs, Quality Cost Measurement, Utilizing Quality Costs for Decision-Making	15

Textbook(s):

1. Software Engineering for Students, A Programming Approach, Douglas Bell, 4 th Edition,, Pearson Education, 2005
2. Software Engineering – A Practitioners Approach, Roger S. Pressman, 5 th Edition, Tata McGraw Hill, 2001
3. Quality Management, Donna C. S. Summers, 5 th Edition, Prentice-Hall, 2010.
4. Total Quality Management, Dale H. Besterfield, 3 rd Edition, Prentice Hall, 2003

Additional Reference(s):

1. Software engineering: An Engineering approach, J.F. Peters, W. Pedrycz , John Wiley, 2004
2. Software Testing and Quality Assurance Theory and Practice, Kshirsagar Naik, Priyadarshi Tripathy , John Wiley & Sons, Inc. , Publication, 2008
3. Software Engineering and Testing, B. B. Agarwal, S. P. Tayal, M. Gupta, Jones and Bartlett Publishers, 2010


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Practical: (Skill Development & Employability)

1. Install Selenium IDE; Write a test suite containing minimum 4 test cases for different formats.
2. Conduct a test suite for any two web sites.
3. Install Selenium server (Selenium RC) and demonstrate it using a script in Java/PHP.
4. Write and test a program to login a specific web page.
5. Write and test a program to update 10 student records into table into Excel file
6. Write and test a program to select the number of students who have scored more than 60 in anyone subject (or all subjects).
7. Write and test a program to provide total number of objects present / available on the page.
8. Write and test a program to get the number of items in a list / combo box.
9. Write and test a program to count the number of check boxes on the page checked and unchecked count.
10. Load Testing using JMeter, Android Application testing using Appium Tools, Bugzilla Bug tracking tools



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WEB SERVICES

*at Semester V
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Web services basics	15
2	The REST Architectural style	15
3	Developing Service-Oriented Applications with WCF	15
	Total	45

Course Objectives:

By the end of the course, learners will be able to:

1. Understand and learn Web Services
2. Describe XML concepts
3. Analyze the RESTful web service.
4. Describe Service Oriented Architecture
5. Understand paradigms needed for testing Web Services with REST and WCF

Course Outcome:

After completing this course learners will be able to:

CO1: Create and consume web services to efficiently use market leading environment tools.(Create)

CO2: Develop web services to identify and select the appropriate framework components.(Create)

CO3: Discuss and Develop RESTful web services and WCF web services(Create)

CO4: Understand the principles of SOA.(Understand)

CO5: Apply and Analyze RESTful web services.(Apply)



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Detailed Syllabus:

Modules	Topics	No. of Lectures
1	Web services basics : What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simpleWeb Services across platform	15
2	The REST Architectural style : Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services	15
3	Developing Service-Oriented Applications with WCF : What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming, WCF Feature Details. Web Service QoS.	15

Textbook(s):

- 1) Web Services: Principles and Technology, Michael P. Papazoglou, Pearson Education Limited, 2008
- 2) RESTful Java Web Services, JobineshPurushothaman, PACKT Publishing, 2nd Edition, 2015
- 3) Developing Service-Oriented Applications with WCF, Microsoft, 2017
<https://docs.microsoft.com/en-us/dotnet/framework/wcf/index>


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Additional Reference(s):

- 1) Leonard Richardson and Sam Ruby, RESTful Web Services, O'Reilly, 2007
- 2) The Java EE 6Tutorial, Oracle, 2013

Practical: (Skill Development & Employability)

1. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius and vice a versa.
2. Write a program to implement the operation can receive request and will return a response in two ways. a) One - Way operation b) Request –Response
3. Write a program to implement business UDDI Registry entry.
4. Develop client which consumes web services developed in different platform.
5. Write a JAX-WS web service to perform the following operations. Define a Servlet / JSP that consumes the web service.
6. Define a web service method that returns the contents of a database in a JSON string. The contents should be displayed in a tabular format.
7. Define a RESTful web service that accepts the details to be stored in a database and performs CRUD operation.
8. Implement a typical service and a typical client using WCF.
9. Use WCF to create a basic ASP.NET Asynchronous JavaScript and XML (AJAX) service.
10. Demonstrates using the binding attribute of an endpoint element in WCF.



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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester V

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

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WIRELESS SENSOR NETWORKS AND MOBILE COMMUNICATIONS

*at Semester V
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction, Sensor Node Hardware and Network Architecture	15
2	Medium Access Control Protocols, Routing Protocols, Transport Control Protocols	15
3	Introduction, Wireless Transmission and Medium Access Control: Wireless Transmission, Telecommunication, Satellite and Broadcast Systems	15
	Total	45

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the basic features of Wireless Sensor networks
2. Understand and apply the features of different Wireless sensor Architectures for real world scenarios.
3. Understand and apply the protocols of MAC and Network layer for real world Wireless sensor networks
4. Sensor Network Programming approaches.
5. Design Wireless sensor network for Real time Applications

Course Outcome:

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

CO1: Compare MANET and WSN(Analyze)

CO2: Understand the fundamentals of wireless networks.(Understand)

CO3: Implement MAC and Network layer protocols for Sensor networks.(Apply)

CO4: Categorize wireless sensor networks.(Analyze)

CO5: Simulate Wireless sensor network to understand real life applications.(Apply)



Detailed Syllabus

Modules	Topics	No. of Lectures
1	Introduction: Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETWORKS (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC. Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts	15
2	Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study. Routing Protocols :Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks. Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols.	15
3	Introduction, Wireless Transmission and Medium Access Control: Applications, A short history of wireless communication. Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT- 2000. Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover	15

Textbook(s):

- 1) Protocols and Architectures for Wireless Sensor Network, HolgerKerl, Andreas Willig, John Wiley and Sons, 2005
- 2) Wireless Sensor Networks Technology, Protocols, and Applications ,KazemSohraby, Daniel Minoli and TaiebZnati, John Wiley & Sons, 2007
- 3) Mobile communications, Jochen Schiller,2nd Edition, Addison wisely , Pearson Education,2012

Additional Reference(s):

- 1) Fundamentals of Wireless Sensor Networks, Theory and Practice, WalteneusDargie, Christian Poellabauer , Wiley Series on wireless Communication and Mobile Computing, 2011
- 2) Networking Wireless Sensors, BhaskarKrishnamachari , Cambridge University Press, 2005


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Practical: (Skill Development & Employability)

Practical experiments require software tools like INET Framework for OMNeT++, NetSim, TOSSIM, Cisco packet tracer 6.0 and higher version.

1. Understanding the Sensor Node Hardware. (For Eg. Sensors, Nodes(Sensor mote), Base Station, Graphical User Interface.)
2. Exploring and understanding TinyOS computational concepts:- Events, Commands and Task.
 - nesC model
 - nesC Components
3. Understanding TOSSIM for
 - Mote-mote radio communication
 - Mote-PC serial communication
4. Create and simulate a simple adhoc network
5. Understanding, Reading and Analyzing Routing Table of a network.
6. Create a basic MANET implementation simulation for Packet animation and Packet Trace.
7. Implement a Wireless sensor network simulation.
8. Create MAC protocol simulation implementation for wireless sensor Network.
9. Simulate Mobile Adhoc Network with Directional Antenna
10. Create a mobile network using Cell Tower, Central Office Server, Web browser and Web Server. Simulate connection between them.



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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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ARCHITECTING OF IOT

at Semester VI
(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	IoT-An Architectural Overview, IoT Architecture-State of the Art	15
2	IoT Data Link Layer and Network Layer Protocols, Network Layer	15
3	Transport layer protocols, Session layer, Service layer protocols	15
	Total	45

Objective:

- To assess the vision and introduction of IoT.
- To Understand IoT Market perspective.
- To Implement Data and Knowledge Management and use of Devices in IoT Technology.
- To Understand State of the Art - IoT Architecture.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT

Outcome:

CO1: Describe the meaning and different components of Internet of Things, also the principles of Internet (Understand)

CO2: Explain and prototype an embedded product. (Understand)

CO3: Illustrate the physical design of the system and work with online components API for security, polling, etc. (Analyse and Apply)

CO4: Describe the the memory management of an embedded system and write the codes for embedded product (Understand)

CO5: To create a small model representing the automation in IoT. (Create)


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Detailed Syllabus

Module	Topics	No. of Lectures
1	IoT-An Architectural Overview: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. IoT Architecture-State of the Art : Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	15
2	IoT Data Link Layer and Network Layer Protocols: PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy DASH7 Network Layer:IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP	15
3	Transport layer protocols : Transport Layer (TCP, MPTCP, UDP, DCC, SCTP)-(TLS, DTLS) Session layer: Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT Service layer protocols: Service Layer -oneM2M, ETSI M2M, OMA, BBF	15

Textbook(s):

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,1st Edition, Academic Press, 2014.
2. Learning Internet of Things, Peter Waher, PACKT publishing, BIRMINGHAM – MUMBAI,2015

Additional References(s):

1. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley Publications,2013
2. Internet of Things (A Hands-onApproach), Vijay Madiseti and ArshdeepBahga,1st Edition, VPT, 2014.
3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html



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Practical: (Skill Development & Employability)

1. a) Edit text files with nano and cat editor, Learn sudo privileges and Unix shell commands such as cd , ls , cat, etc
- b) Learn to set dynamic and static IP. Connect to and Ethernet and WiFi network. Learn to vnc and ssh into a raspberry pi using vnc and putty from a different computer on the network.
- c) Write a basic bash script to open programs in kiosk mode. Learn how to autostart programs on boot.
2. Run the node red editor and run simple programs and trigger gpios. Use basic nodes such as inject, debug, gpio
3. Open the python idle editor and run simple Python scripts such as to print Fibonacci numbers, string functions. Learn how to install modules using Pip and write functions
4. Setup a physical button switch and trigger an led in node red and python w debounce
5. Write simple JavaScript functions in Node-Red simple HTTP server page using node red
6. Setup a TCP server and client on a raspberry pi using Python modules to send messages and execute shell commands from within python such as starting another application
7. Trigger a set of led Gpios on the pi via a Python Flask web server
8. Interface the raspberry pi with a 16x2 LCD display and print values.
9. Setup a Mosquitto MQTT server and client and write a Python script to communicate data between Pi's.
10. Interface with an Accelerometer Gyro Mpu6050 on the i2c bus and send sensor values over the internet via mqtt.


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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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CLOUD COMPUTING

*at Semester VI
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Cloud Computing, Computing. Cloud Computing Architecture, Types of clouds.	15
2	Characteristics of Virtualized Environments	15
3	Introduction to OpenStack	15
	Total	45

Objective:

- The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Outcome:

On completion of the course learner will be able to:

- CO1: Understand the key dimensions of the challenge of Cloud Computing(Understand)
- CO2: Perform assessment of the economics , financial, and technological implications for selecting cloud computing for own organization (Apply)
- CO3: Assess the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.(Evaluate)
- CO4: Perform assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas. (Apply)



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Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Cloud Computing Architecture, The cloud reference model, Infrastructure as a service, Platform as a service, Software as a service, Types of clouds.	15
2	Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment, Open challenges of Cloud Computing	15
3	Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat	15

Textbook(s):

- 1) Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw Hill Education Private Limited, 2013
- 2) OpenStack in Action, V. K. CODY BUMGARDNER, Manning Publications Co, 2016

Additional Reference(s):

- 1) OpenStack Essentials, Dan Radez, PACKT Publishing, 2015
- 2) OpenStack Operations Guide, Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, O'Reilly Media, Inc., 2014
- 3) <https://www.openstack.org>

Practical: (Skill Development & Employability)

1. Study and implementation of Infrastructure as a Service.
2. Installation and Configuration of virtualization using KVM.
3. Study and implementation of Infrastructure as a Service
4. Study and implementation of Storage as a Service
5. Study and implementation of identity management
6. Study Cloud Security management
7. Write a program for web feed.
8. Study and implementation of Single-Sign-On.
9. User Management in Cloud.
10. Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform


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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

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CYBER FORENSICS

*at Semester VI
(Implemented during Academic Year 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Computer Forensics, Network Forensic, Cell Phone and Mobile Device Forensics	15
2	Internet Forensic, E-mail Forensics, Messenger Forensics, Social Media Forensics, Browser Forensics	15
3	Investigation, Evidence presentation and Legal aspects of Digital Forensics, Introduction to Legal aspects of Digital Forensics	15
Total		45

Course Objectives:

- To provide an understanding Computer forensics fundamentals
- To analyze various computer forensics technologies
- To provide computer forensics systems
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.

Learning Outcome:

Upon successful completion of the programme, learner will be familiar with cyber security landscapes and able to

CO1: Understand the definition of computer forensics fundamentals. (Level: Understand)

CO2: Describe the types of computer forensics technology. (Level: Analyze)

CO3: Analyze and evaluate the cyber security needs of an organization. (Level: Analyze)

CO4: Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation. (Level: Apply)

CO5: Measure the performance and troubleshoot cyber security systems. (Level: Apply)


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Detailed Syllabus:

Modules	Topics	No of Lectures
1	<p>Computer Forensics : Introduction to Computer Forensics and standard procedure, Incident Verification and System Identification ,Recovery of Erased and damaged data, Disk Imaging and Preservation, Data Encryption and Compression, Automated Search Techniques, Forensics Software</p> <p>Network Forensic : Introduction to Network Forensics and tracking network traffic, Reviewing Network Logs, Network Forensics Tools, Performing Live Acquisitions, Order of Volatility, Standard Procedure</p> <p>Cell Phone and Mobile Device Forensics: Overview, Acquisition Procedures for Cell Phones and Mobile Devices</p>	15
2	<p>Internet Forensic : Introduction to Internet Forensics, World Wide Web Threats, Hacking and Illegal access, Obscene and Incident transmission, Domain Name Ownership Investigation, Reconstructing past internet activities and events</p> <p>E-mail Forensics : e-mail analysis, e-mail headers and spoofing, Laws against e-mail Crime, Messenger Forensics: Yahoo Messenger</p> <p>Social Media Forensics: Social Media Investigations</p> <p>Browser Forensics: Cookie Storage and Analysis, Analyzing Cache and temporary internet files, Web browsing activity reconstruction</p>	15
3	<p>Investigation, Evidence presentation and Legal aspects of Digital Forensics: Authorization to collect the evidence , Acquisition of Evidence, Authentication of the evidence, Analysis of the evidence, Reporting on the findings, Testimony</p> <p>Introduction to Legal aspects of Digital Forensics: Laws & regulations, Information Technology Act, Giving Evidence in court, Case Study – Cyber Crime cases, Case Study – Cyber Crime cases</p>	15

Textbook(s): Guide to computer forensics and investigations, Bill Nelson, Amelia Philips and Christopher Steuart, course technology,5th Edition,2015

Additional Reference(s): Incident Response and computer forensics, Kevin Mandia, Chris Proise, Tata McGrawHill,2nd Edition,2003


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Practical: (Skill Development & Employability)

1. Creating a Forensic Image using FTK Imager/Encase Imager :

- Creating Forensic Image
- Check Integrity of Data
- Analyze Forensic Image

2. Data Acquisition:

- Perform data acquisition using:
- USB Write Blocker + Encase Imager
- SATA Write Blocker + Encase Imager
- Falcon Imaging Device

3. Forensics Case Study:

- Solve the Case study (image file) provide in lab using Encase Investigator or Autopsy

4. Capturing and analyzing network packets using Wireshark (Fundamentals) :

- Identification the live network
- Capture Packets
- Analyze the captured packets

5. Analyze the packets provided in lab and solve the questions using Wireshark :

- What web server software is used by www.snopes.com?
- About what cell phone problem is the client concerned?
- According to Zillow, what instrument will Ryan learn to play?
- How many web servers are running Apache?
- What hosts (IP addresses) think that jokes are more entertaining when they are explained?

6. Using Sysinternals tools for Network Tracking and Process Monitoring :

- Check Sysinternals tools
- Monitor Live Processes
- Capture RAM
- Capture TCP/UDP packets
- Monitor Hard Disk
- Monitor Virtual Memory
- Monitor Cache Memory

7. Recovering and Inspecting deleted files

- Check for Deleted Files
- Recover the Deleted Files
- Analyzing and Inspecting the recovered files

Perform this using recovery option in ENCASE and also Perform manually through command line

8. Acquisition of Cell phones and Mobile devices

9. Email Forensics

- Mail Service Providers
- Email protocols
- Recovering emails
- Analyzing email header

10. Web Browser Forensics

- Web Browser working
- Forensics activities on browser
- Cache / Cookies analysis
- Last Internet activity



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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

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DATA SCIENCE

at Semester VI

(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction to Data Science, Data Management	15
2	Data Curation	15
3	Statistical Modelling and Machine Learning, Data transformations, Supervised Learning	15
Total		45

Course Objectives:

1. The main goal of this course is to help students learn, understand, and practice different techniques used in data science.
2. Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics.
3. Practice problem analysis and decision-making.
4. Gain practical, hands-on experience with statistics programming languages and big data tools through coursework and applied research experiences.

Learning Outcome:

After successful completion of course, Learner will be able to understand and apply diverse data representations, visualization and analysis tools.

CO1: Apply principles of Data Science to the analysis of business problems. (Level: Apply)

CO2: Use data mining software to solve real-world problems. (Level: Apply)

CO3: Employ cutting edge tools and technologies to analyze Big Data. (Level: Apply)

CO4: Apply algorithms to build machine intelligence. (Level: Apply)

CO5: Demonstrate use of team work, leadership skills, decision making and organization theory. (Level: Apply)



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Detailed Syllabus:

Module	Topics	No of Lectures
1	Introduction to Data Science: What is Data? Different kinds of data, Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources, Data Management: Data Collection, Data cleaning/extraction, Data analysis & Modeling	15
2	Data Curation: Query languages and Operations to specify and transform data, Structured/schema based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS)	15
3	Statistical Modelling and Machine Learning: Introduction to model selection: Regularization, bias/variance tradeoff e.g. parsimony, AIC, BIC, Cross validation, Ridge regressions and penalized regression e.g. LASSO Data transformations: Dimension reduction, Feature extraction, Smoothing and aggregating Supervised Learning: Regression, linear models, Regression trees, Time-series Analysis, Forecasting, Classification: classification trees, Logistic regression, separating hyperplanes, k-NN Unsupervised Learning: Principal Components Analysis (PCA), k-means clustering, Hierarchical clustering, Ensemble methods	15

Textbook(s):

- 1) Doing Data Science, Rachel Schutt and Cathy O'Neil, O'Reilly, 2013
- 2) Mastering Machine Learning with R, Cory Lesmeister, PACKT Publication, 2015

Additional Reference(s):

- 1) Hands-On Programming with R, Garrett Golemund, 1st Edition, 2014
- 2) An Introduction to Statistical Learning, James, G., Witten, D., Hastie, T., Tibshirani, R., Springer, 2015



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Practical: (Skill Development & Employability)

Practical shall be performed using R

1. Practical of Data collection, Data curation and management for Unstructured data (NoSQL)
2. Practical of Data collection, Data curation and mgmt for Large-scale Data system (such as MongoDB)
3. Practical of Principal Component Analysis
4. Practical of Clustering
5. Practical of Time-series forecasting
6. Practical of Simple/Multiple Linear Regression
7. Practical of Logistics Regression
8. Practical of Hypothesis testing
9. Practical of Analysis of Variance
10. Practical of Decision Tree



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Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)

PRINCIPAL

NAGINDAS KHANDWALA COLLEGE OF COMMERCE
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DIGITAL IMAGE PROCESSING

at Semester VI

(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Image-processing System, 2D Signals and Systems, Convolution and Correlation, Image Transforms	15
2	Image Enhancement, Binary Image processing, Colour Image processing	15
3	Image Segmentation, Image Compression	15
	Total	45

Objective:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study the image segmentation techniques
4. To study image restoration procedures.
5. To study the image compression procedures.

Outcome:

After successful completion of the course, learners will be able to:

CO1: Review the fundamental concepts of a digital image processing system. (Understand)

CO2: Analyze images in the frequency domain using various transforms. (Analyse)

CO3: Evaluate the techniques for image enhancement and image restoration. (Evaluate)

CO4: Categorize various compression techniques. (Analyse and Apply)

CO5: Interpret Image compression standards. (Analyse)

CO6: Interpret image segmentation and representation techniques. (Analyse)

CO6: Interpret image segmentation and representation techniques.



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Detailed Syllabus

Modules	Topics	No. of Lectures
1	<p>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing</p> <p>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter</p> <p>Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2DCorrelation</p> <p>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform</p>	15
2	<p>Image Enhancement :Image Enhancement in spatial domain, Enhancement through Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic</p> <p>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing, Logical operations, Morphological operations, Dilation and Erosion, Distance Transform</p> <p>Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image</p>	15
3	<p>Image Segmentation: Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform</p> <p>Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard</p>	15

Textbook(s):

1) Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw-Hill Education Pvt. Ltd., 2009



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Additional Reference(s):

- 1) Digital Image Processing 3rd Edition, Rafael C Gonzalez, Richard E Woods, Pearson, 2008
- 2) Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016 (https://scilab.in/textbook_companion/generate_book/125)

Practical: (Skill Development & Employability)

1. 2D Linear Convolution, Circular Convolution between two 2D matrices
2. Circular Convolution expressed as linear convolution plus alias
3. Linear Cross correlation of a 2D matrix, Circular correlation between two signals and Linear auto correlation of a 2D matrix, Linear Cross correlation of a 2D matrix
4. DFT of 4x4 gray scale image
5. Compute discrete cosine transform, Program to perform KL transform for the given 2D matrix
6. Brightness enhancement of an image, Contrast Manipulation, image negative
7. Perform threshold operation, perform gray level slicing without background
8. Image Segmentation
9. Image Compression
10. Binary Image Processing and Colour Image processing



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Nagindas Khandwala College (Autonomous)



Syllabus Of Course Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester VI

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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ETHICAL HACKING

at Semester VI
(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Information Security : Attacks and Vulnerabilities	10
2	Ethical Hacking – I (Introduction and pre-attack)	10
3	Ethical Hacking :Enterprise Security	10
	Total	30

Course Objective:

By the end of the course, learners will be able to:

1. To understand the security of the system
2. To ethically try to find out the security issues in the system
3. To understand the security measures to be adopted in the organization
4. Ethical Hacking ethically penetrates into network systems using various tools to test the strength of a network.
5. Ethical Hacking course shows how to test, scan, hack and secure networks and systems.

Course Outcome:

After completing this course learners will be able to:

CO1: Understand the security of the system (Understand)

CO2: Ethically try to find out the security issues in the system. (Apply)

CO3: Propose the security measures to be adopted in the organization (Evaluate)

CO4: Describes various types of securities and vulnerabilities (Remember)

CO5: Summarizing the legal and professional responsibilities of ethical hacking (Understand)



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Detailed Syllabus:

Module	Modules / Units	No of Lectures
1	<p>(Skill Development & Employability)</p> <p>Information Security : Attacks and Vulnerabilities Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, AttackSurface, Malware, Security-Functionality-Ease of Use Triangle Types of malware : Worms, viruses, Trojans, Spyware, Rootkits Types of vulnerabilities : OWASP Top 10 : cross-site scripting (XSS), crosssite request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database Types of attacks and their common prevention mechanisms : Keystroke Logging, Denial of Service (DoS / DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs Case-studies : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit</p>	10
2	<p>Ethical Hacking – I (Introduction and pre-attack) Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing. Approach : Planning - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect /Qualys, Nessus, Proxies, Metasploit) VA and PT, How Web Inspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, Preparing report, Fixing security gaps following the report Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing, Phases: Reconnaissance/foot-printing/Enumeration, Phases: Scanning, Sniffing</p>	10
3	<p>Ethical Hacking :Enterprise Security Phases : Gaining and Maintaining Access : Systems hacking – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IP Spoofing, SYN Flooding, Smurf attack, Applications hacking :</p>	10

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	SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, Malware analysis : Netcat Trojan, wrapping definition, reverse engineering Phases : Covering your tracks : Steganography, Event Logs alteration Additional Security Mechanisms : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines)	
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Textbook(s):

- 1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016
- 2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Additional Reference(s):

- 1) Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition, 2013
- 2) Certified Ethical Hacker: Matt Walker, TMH,2011
- 3) http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines
- 4) https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project
- 5) https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10
- 6) https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents
- 7) https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_Quick_Reference_Guide
- 8) <https://cve.mitre.org/>
- 9) <https://access.redhat.com/blogs/766093/posts/2914051>
- 10) <http://resources.infosecinstitute.com/applications-threat-modeling/#gref>
- 11) <http://www.vulnerabilityassessment.co.uk/Penetration%20Test.html>

Practical: (Skill Development & Employability)

1. Use Google and Whois for Reconnaissance
2. a) Use Cryptool to encrypt and decrypt passwords using RC4 algorithm
- b) Use Cain and Abel for cracking Windows account password using Dictionary attack and to decode wireless network passwords
3. a) Run and analyze the output of following commands in Linux – ifconfig, ping, netstat, traceroute
- b) Perform ARP Poisoning in Windows
4. Use NMap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL, XMAS
5. a) Use Wireshark (Sniffer) to capture network traffic and analyze
- b) Use Nemesy to launch DoS attack
6. Simulate persistent cross-site scripting attack
7. Session impersonation using Firefox and Tamper Data add-on
8. Perform SQL injection attack
9. Create a simple keylogger using python
10. Using Metasploit to exploit (Kali Linux)



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**Syllabus
Of Course
Of**

**Bachelor of Science Computer Science
(BSC CS) Programme**

Third Year

Semester V

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2020-2021)


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INFORMATION RETRIEVAL

at Semester VI

(Implemented during Academic Year 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Information Retrieval	15
2	Link Analysis and Specialized Search	15
3	Web Search Engine and XML retrieval	15
	Total	45

Objective:

- To understand how to retrieve information from the web
- Apply the knowledge in information processing

Outcome:

- CO1 : Understand how to retrieve information from the web (Understand)
CO2: Apply the knowledge in information processing (Apply)
CO3: Understand web search architectures.(Understand)



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Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction to Information Retrieval: Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval.	15
2	Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.	15
3	Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures. XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, 15L Text-centric versus data-centric XML retrieval.	15

Text book(s):

- 1) Introduction to Information Retrieval, C. Manning, P. Raghavan, and H. Schütze, Cambridge University Press, 2008
- 2) Modern Information Retrieval: The Concepts and Technology behind Search, Ricardo Baeza-Yates and Berthier Ribeiro – Neto, 2nd Edition, ACM Press Books 2011.
- 3) Search Engines: Information Retrieval in Practice, Bruce Croft, Donald Metzler and Trevor Strohman, 1st Edition, Pearson, 2009.

Additional Reference(s):

- 1) Information Retrieval Implementing and Evaluating Search Engines, Stefan Büttcher, Charles L. A. Clarke and Gordon V. Cormack, The MIT Press; Reprint edition (February 12, 2016)

Practical: (Skill Development & Employability)

1. Write a program to demonstrate bitwise operation.
2. Implement Page Rank Algorithm.
3. Implement Dynamic programming algorithm for computing the edit distance between strings s1 and s2. (Hint, Levenshtein Distance)
4. Write a program to Compute Similarity between two text documents.
5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
6. Implement a basic IR system using Lucene.
7. Write a program for Pre-processing of a Text Document: stop word removal.
8. Write a program for mining Twitter to identify tweets for a specific period and identify trends and named entities.
9. Write a program to implement simple web crawler.
10. Write a program to parse XML text, generate Web graph and compute topic specific page rank.



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