



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
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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 from Academic Year- 2018-2019)


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**NAGINDAS KHANDWALA COLLEGE OF COMMERCE
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(AUTONOMOUS)
MALAD (W), MUMBAI - 400 084**

Course Code	Course	Hrs. of Instruction / week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1711UCSSS	Part 1: Soft Skills Development	3	2 ½ hrs	25	75	100	2

Objectives:

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:

On successful completion of the course, learner 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. (Analyse)

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

CO4: Effectively use communication technology.(Apply)

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



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Sr. No.	Modules / Units
1	UNIT 1
	<p>Personality Development: Knowing Yourself, Positive Thinking, Johari's Window, verbal Communication, Non-verbal Communication, Body Language: grooming</p> <p>Emotional Intelligence: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence</p> <p>Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette</p> <p>Communication Today: Significance of Communication, GSC's 3M Model of Communication, Vitality of the Communication Process, Fundamentals of Good Listening, Need for Intercultural Communication, Communicating Digital World</p>
2	UNIT 2



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Academic Skills (Skill Development)

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



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3	UNIT 3
	<p>Creativity at Workplace: Current Workplaces, Nurturing Hobbies at Work, The Six Thinking Hat Method</p> <p>Ethical Values: Ethics and Society, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics</p> <p>Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and</p> <p>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</p> <p>Stress and Time Management: Stress, Sources of Stress, Ways to Cope with Stress, time management, prioritising and procrastination</p>

Reference Books
Soft Skills Development
<p>Text book:</p> <ol style="list-style-type: none"> 1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India <p>Additional References:</p> <ol style="list-style-type: none"> 1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press 2. Business Communication, Shalini Kalia, Shailja Agrawal, Wiley India 3. Soft Skills - Enhancing Employability, M. S. Rao, I. K. International 4. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

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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 from Academic Year- 2018-2019)

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MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1737UCSWP	Skill Enhancement: Web programming	3	2 ½ hrs	25	75	100	2

Course Objective:

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

1. To Learn basics of web page design
2. To create web application with CSS
3. To learn ajax and jQuery for partial refreshes
4. Build dynamic web pages using JavaScript
5. To develop web applications with php and mysql.

Course outcome:

After completing this course learners will be able to:

CO1: Apply the different tags in HTML for website creation.(Apply)

CO2: Describe the use of CSS with HTML. (Understand)

CO3: Develop a dynamic webpage by the use of java script (Create)

CO4: Recognize the web page creation and working with different tags with implementation of ajax and jQuery. (Remember)


CO5: Analyze and study the working of php with MySql (Analyze)

Sr. No.	Modules / Units
1	UNIT 1 (Skill Development) HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML,


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	<p>Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an element</p>
2	UNIT 2
	<p>JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions with Timer, JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model, Form Validation using JavaScript XML: Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML Entity References, DTD, XSLT: XSLT Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set, xsl:value-of</p>
3	UNIT 3
	<p>AJAX: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX PHP: Variables and Operators, Program Flow, Arrays, Working with Files and Directories, Working with Databases, Working with Cookies, Sessions and Headers Introduction to jQuery: Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects</p>


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Reference Books

Web Programming

Text Book(s):

- 1) HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Pvt 2016
- 2) Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India, 2017.
- 3) PHP: A Beginners Guide, Vikram Vaswani, TMH, 2008

Additional Reference(s):

- 1) HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY, 2010
- 2) Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd.
- 3) Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly, 2017
- 4) PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley, 2013

Practical (1737UCSPR) (Skill Development)

1. Design a webpage that makes use of:

- a. Document Structure Tags b. Various Text Formatting Tags c. List Tags d. Image and Image Maps

2. Design a webpage that makes use of:

- a. Table tags b. Form Tags (forms with various form elements)
c. Navigation across multiple pages d. Embedded Multimedia elements

3. Design a webpage that make use of Cascading Style Sheets with:

- a. CSS properties to change the background of a Page b. CSS properties to change Fonts and Text Styles
c. CSS properties for positioning an element

Case study:

Develop a web application on topic of your choice(College website) to demonstrate various HTML tags, text formatting tags. Design it using CSS properties.

4. Write JavaScript code for:

- a. Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number
b. Validating the various Form Elements

5. Write JavaScript code for:

- a. Demonstrating different JavaScript Objects such as String, RegExp, Math, Date
b. Demonstrating different JavaScript Objects such as Window, Navigator, History


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Location, Document,

c. Storing and Retrieving Cookies

Case study:

From the above case study, create a form and perform various validations on it.

6. Create a XML file with Internal / External DTD and display it using:

a. CSS b. XSL

Case study:

Create an XML file to store details of books which include the ISBN, Book name, Title, Author.

Display the details in a format using CSS/XSL.

7. Design a webpage to handle asynchronous requests using AJAX on:

a. Mouseover b. button click

8. Write PHP scripts for:

a. Retrieving data from HTML forms

b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number

c. Working with Arrays d. Working with Files (Reading / Writing)

9. Write PHP scripts for:

a. Working with Databases (Storing Records / Retrieving Records and Display them)

b. Storing and Retrieving Cookies

c. Storing and Retrieving Sessions

Case study:

Develop a form which take the details of Students in a class. On click of Submit button the details should be stored into the database and also retrieve from database.

10. Design a webpage with some jQuery animation effects.



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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

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Course Code:	Course	Hrs. of Instruction/week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1747UCSAD	Core Subject: Android Developer Fundamentals	3	2 ½ hrs	25	75	100	2

Course Objective:

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

1. Understand the fundamentals of Android programming using the Android SDK.
2. Implement fundamental concepts in Android programming -activities and intents, designing user interface using views, data persistence, contentproviders, messaging and networking, location-based services.
3. Create and develop apps with android services.

Course outcome:

After completing this course learners will be able to:

- CO1: Explore the differences between mobile based application and conventional application (Understand)
- CO2: Design UI in the context of mobile application (Create)
- CO3: Develop mobile applications for Android (Create)
- CO4: Write Android application involving integration of sensors, connectivity to database, etc. (Create)
- CO5: Demonstrate their skills of using Android software development tools (Apply and Analyse)


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Sr. No.	Modules / Units
1	<p>UNIT 1</p> <p>(Skill Development)</p> <p>What is Android? Obtaining the required tools, creating first android app, understanding the components of screen, adapting display orientation, action bar, Activities and Intents, Activity Lifecycle and Saving State, Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View</p>
2	<p>UNIT 2</p> <p>User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently</p>
3	<p>UNIT 3</p> <p>Data - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite primer, store data using SQLite database, ContentProviders, loaders to load and display data, Permissions, performance and security, Firebase and AdMob, Publish your app</p>



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Reference Books
Android Developer Fundamentals
Textbook(s): 1) "Beginning Android 4 Application Development", Wei-Meng Lee, WROX, 2012.
Additional Reference(s): 1) https://developers.google.com/training/courses/android-fundamentals 2) https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-practicals/details



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Practical (1747UCSPR) (Skill Development)

1. Design an application for a Simple Calculator
2. Understanding the different layouts and design a Food application with radio buttons.
3. Implement an app similar to a online booking website- BookMyshow
 - a) concept of styles and themes and to create own custom style
 - b) AutotextComplete
 - c) Webview, Access
 - d) use of intents invoke a Built-in application of calling a Phone number
4. Implement the concept of managing a Lifecycle of an Activity
5. Using Fragments, link one activity to the next activity of any application – Accessing from a list of books
6. Design a Menu for any application- Context Menu , Options and Pop up Menu- Music Store
7. Implement:
 - a) Using Android AlarmManager to schedule the application to run for a specific time in the future.
 - b) The TimePicker and DatePicker tool
8. For any online brand store (Apparel / shoe) - design and implement using
 - a) Spinner create an Image changer application
 - b) concept of Action Bar , Scroll Bar
 - c) With the help of Rating Bar , implement a PUSH notification
9. Design a simple to-do list application using SQLite to Insert , Update and delete the tasks of the list.
10. Using SQLite, Insert a student record of a class and search for the record
11. Using SQLite, Internal Storage of data using FileInputStream and FileOutputStream
12. Develop an application for working with location service



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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 from Academic Year- 2018-2019)

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ARTIFICIAL INTELLIGENCE

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

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 Of

Bachelor of Science Computer Science (BSC CS) Programme

Third Year

Semester V

Under Academic Autonomy and Credit, Grading and Semester System

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

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>	10



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	<p>Unity Engine: Multi-platform publishing, VR + AR: Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing. Scripting: Scripting Overview, Scripting Tools and Event Overview 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:

7. <https://unity3d.com/learn/tutorials/s/interactive-tutorials>
8. <https://unity3d.com/learn/tutorials/s/2d-ufo-tutorial>
9. <https://unity3d.com/learn/tutorials/s/space-shooter-tutorial>
10. <https://unity3d.com/learn/tutorials/topics/vr/introduction?playlist=22946>



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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 from Academic Year- 2018-2019)


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B. INFORMATION AND NETWORK SECURITY

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

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)

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


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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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Bachelor of Science Information Technology (BSC IT) Programme

(Department Of IT)

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Under Autonomy

(To be implemented from Academic Year- 2018-2019)

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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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Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter 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]: Focusses 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.
- Perform normalization for the unnormalized tables for RDBMS related projects



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- 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.
- Get good exposure and command in one or more application areas and on the software



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- 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
 - 7.1.2 Limitations of the System
- 7.2 Future Scope of the Project

REFERENCES

GLOSSARY



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SOFTWARE TESTING AND QUALITY ASSURANCE

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

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, KshirsagarNaik, PriyadarshiTripathy , 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 2018-19)*

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 simple Web 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, Jobinesh Purushothaman, PACKT Publishing, 2nd Edition, 2015
- 3) Developing Service-Oriented Applications with WCF, Microsoft, 2017
<https://docs.microsoft.com/en-us/dotnet/framework/wcf/index>

Additional Reference(s):

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


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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 from Academic Year- 2018-2019)

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WIRELESS SENSOR NETWORKS AND MOBILE COMMUNICATIONS

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

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)



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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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ARCHITECTING OF IOT

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

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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CLOUD COMPUTING

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

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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CYBER FORENSICS

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

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 Stuart, course technology,5th Edition,2015

Additional Reference(s): Incident Response and computer forensics, Kevin Mandia, Chris Prorise, 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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DATA SCIENCE

at Semester VI

(Implemented during Academic Year 2018-19)

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

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DIGITAL IMAGE PROCESSING

at Semester VI

(Implemented during Academic Year 2018-19)

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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ETHICAL HACKING

at Semester VI
(Implemented during Academic Year 2018-19)

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</p> <p>Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle</p> <p>Types of malware : Worms, viruses, Trojans, Spyware, Rootkits</p> <p>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</p> <p>Types of attacks and their common prevention mechanisms :</p> <p>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</p> <p>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)</p> <p>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.</p> <p>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</p> <p>Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing,</p> <p>Phases: Reconnaissance/foot-printing/Enumeration, Phases: Scanning, Sniffing</p>	10
3	<p>Ethical Hacking :Enterprise Security</p> <p>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 : SMTP/Email-based attacks, VOIP</p>	10



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	<p>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</p> <p>Phases : Covering your tracks : Steganography, Event Logs alteration Additional Security Mechanisms : IDS/IPS, Honey pots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines)</p>	
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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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INFORMATION RETRIEVAL
at Semester VI
(Implemented during Academic Year 2018-19)

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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