

**SIES College of Arts, Science and Commerce,
Sion (W)
Autonomous College**



**Syllabus for
Program: First Year Bachelor of Science
(NEP) Course: Computer Science
Semester: I & II**

With effect from
Academic Year 2023 -24

Preamble

Information and Communication Technology (ICT) has today become an integral part of all industry domains as well as fields of academics and research. The industry requirements and technologies have been steadily and rapidly advancing. Organizations are increasingly opting for open source systems. The students too these days are thinking beyond careers in the industry and aiming for research opportunities.

The B.Sc. Computer Science course structure therefore needed a fresh outlook and complete overhaul. A real genuine attempt has been made while designing the new syllabus for this 3 year graduate course. Not only does it prepare the students for a career in the Software industry, it also motivates them towards further studies and research opportunities.

The core philosophy of overall syllabus is to -

- a. Form strong foundation of Computer science,
- b. Introduce emerging trends to the students in gradual way,
- c. Groom the students for the challenges of ICT industry

In the first year i.e. for semester I & II, the basic foundation of important skills required for software development is laid. The syllabus proposes to have 2 core subjects of Computer science and 2 core courses of Mathematics-Statistics. In Semester II the students would also be given industrial exposure via field projects/industrial visit. All core subjects are proposed to have theory as well as practical tracks. While the Computer Science courses will form fundamental skills for solving computational problems, the Mathematics & Statistics course will inculcate research oriented acumen.

The syllabus design for further semesters encompasses more advanced and specialized courses of Computer Science.

We sincerely believe that any student taking this course will get a very strong foundation and exposure to basics, advanced and emerging trends of the subject. We hope that the students' community and teachers' fraternity will appreciate the treatment given to the courses in the syllabus.

We wholeheartedly thank all experts who shared their valuable feedback and suggestions in order to improvise the contents, we have sincerely attempted to incorporate each of them. We further thank the Chairperson and members of the Board of Studies for their confidence in us. Special thanks to the Department of Computer Science and colleagues from various colleges, who volunteered or have indirectly helped design certain specialized courses and the syllabus as a whole.

Program Outcomes and Program Specific Outcomes

B.Sc. Computer Science

SR.NO	Details
PO 1	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline. Interpret scientific ideas and relate its interconnectedness to various fields in science.
PO 2	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans and execute them, organize data and draw inferences.
PO 3	Explore and evaluate digital information and use it for knowledge upgradation. Apply relevant information so gathered for analysis and communication using appropriate digital tools.
PO 4	Ask relevant questions, understand scientific relevance, hypothesize a scientific problem, construct and execute a project plan and analyze results.
PO 5	Take complex challenges; work responsibly and independently, as well as in cohesion with a team for completion of a task. Communicate effectively, convincingly and in an articulate manner.
PO 6	Apply scientific information with sensitivity to values of different cultural groups. Disseminate scientific knowledge effectively for upliftment of the society.
PO 7	Follow ethical practices at the workplace and be unbiased and critical in interpretation of scientific data. Understand the environmental issues and explore sustainable solutions for it.
PO 8	Keep abreast with current scientific developments in the specific discipline and adapt to technological advancements for better application of scientific knowledge as a lifelong learner.

SR.NO	Details
PSO 1	Apply knowledge of computational mathematics, statistics and programming acquired in the field of Computer Science.
PSO 2	Identify, analyze complex problems in the real world and formulate innovative solutions to those problems.
PSO 3	Compare and apply hardware and software technologies for implementing reliable optimized solutions catering to need and available resources.
PSO 4	Apply software development, managerial, Professional, and soft skills in industry
PSO 5	Understand the global needs and prepare themselves for the changing needs worldwide adapting an ability to engage in life-long learning.
PSO 6	Become a responsible, ethical citizen and explore environmental issues to develop sustainable solutions for it.

F.Y.B.Sc. Computer Science Open Elective Course Syllabus
Credit Based System and Grading System
Academic year 2023-2024

Semester – I						
Course Code	Course Type	Course Title	Credits	Lectures/Week		
				Theory	Practical (2 lectures)	Total
Generic/ Open Elective Courses (OE)						
SIUCSOE111	Open Elective	Basic Web Designing	2	2		2
SIUCSOE111	Open Elective Practical	Practical of SIUSCS15	2		2	2
Semester – II						
Course Code	Course Type	Course Title	Credits	Lectures/Week		
				Theory	Practical (2 lectures)	Total
Generic/ Open Elective Courses (OE)						
SIUCSOE121	Open Elective	Basics of R programming	2	2		2
SIUCSOE121	Open Elective Practical	Practical of SIUSCS25	2		2	2

F.Y.B.Sc. Computer Science Open Elective Syllabus
Credit Based System and Grading System
Academic year 2023-2024

Course:	Title	Lectures	Credits
SIUCSOE111	Basic Web Designing	2 per week (60 min per lec)	2
<p>Objectives: To provide insight into emerging technologies to design and develop state of - the art web applications using client-side scripting, server-side scripting, and database connectivity.</p> <p>Expected Learning Outcomes:</p> <ul style="list-style-type: none"> ● CO1: To design valid, well-formed, scalable, and meaningful pages using emerging technologies. ● CO2: Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites ● CO3: To develop and implement client-side and server-side scripting language programs. 			
Unit I	<p>HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, 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</p>	15L	
Unit II	<p>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> <p>Bootstrap: What is Bootstrap, containers-fixed container, fixed- width container, grid system, typography- display headings, Colors- text colors, background colours, tables,images, jumbotron, alerts, buttons.</p>	15L	
<p>Text book:</p> <ol style="list-style-type: none"> 1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press 2. Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India. 3) PHP: A Beginners Guide, Vikram Vaswani, TMH <p>Additional References:</p> <ol style="list-style-type: none"> 1. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY 2. Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd. 			

Course	Title	Lectures	Credits
SIUCSOE111	Practicals of Web Designing	4 per week (45 min per lec)	2
1	Design a web page which displays the map of India. Create a clickable region using an image map on the same image so that when we click on Maharashtra it opens another tab with information about Maharashtra. Create two more clickable regions for states of your choice.		
2	<p>A. Design a web page which contains three hyperlinks (audio, video, and gif image).</p> <p>I. When a user clicks on an audio link web page should open in the same tab with some audio content.</p> <p>II. When a user clicks on a video web page should open in the same tab with some video content.</p> <p>III. When a user clicks on a gif image web-page should open in the same tab with some gif content.</p>		
3	Design a webpage to display nested ordered and unordered lists.		
4	Design a webpage to display the time table of your class.		
5	Design a webpage to display student registration forms.		
6	Design a webpage that makes use of Cascading Style Sheets with (Background, fonts, Text styles).		
7	Create webpage to showcase bootstrap containers		
8	Create webpage to showcase bootstrap table with buttons and images		

Course	Title	Lectures	Credits
SIUCSOE121	Basics of R programming	2 per week (60 min per lec)	2

Objective:

The course covers data reading and its manipulation using R, which is widely used for data analysis internationally. The course also covers different control structures and design of user-defined functions. Loading, installing and building packages are covered.

Course Outcome:

- CO1: Develop an R script and execute it.
- CO2: Install, load and deploy the required packages, and build new packages for sharing and reusability.
- CO3: Extract data from different sources using API and use it for data analysis.
- CO4: Visualize and summarize the data.
- CO5: Design application with database connectivity for data analysis.

Unit I	<p>Introduction: R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.</p> <p>Installing, loading and using packages: Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centring, scaling and normalizing the data values, converting types of values, using string in-built functions.</p>	15L
Unit II	<p>Statistical analysis of data - for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot.</p>	15L

Textbook:

1. Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reilly Media Inc

Additional References:

1. Gardener, M.(2017). Beginning R: The statistical programming language, WILEY Lawrence, M., & Verzani, J. (2016).
2. Programming Graphical User Interfaces in R. CRC press. (ebook)

Course	Title	Lectures	Credits																								
SIUCSOE121	Practicals of Basics of R Programming	4 per week (45 min per lec)	2																								
1	Write a program to check whether a year (integer) entered by the user is a leap year or not?																										
2	Write an R program to find the sum of natural numbers without formula using the if-else statement and the while loop																										
3	<p>Write a program that prints the grades of the students according to the marks obtained. The grading of the marks should be as follows.</p> <table border="1"> <thead> <tr> <th>Marks</th> <th>Grades</th> </tr> </thead> <tbody> <tr> <td>800-1000</td> <td>A+</td> </tr> <tr> <td>700 – 800</td> <td>A</td> </tr> <tr> <td>500 – 700</td> <td>B+</td> </tr> <tr> <td>400-500</td> <td>B</td> </tr> <tr> <td>150 – 400</td> <td>C</td> </tr> <tr> <td>Less than 150</td> <td>D</td> </tr> </tbody> </table>			Marks	Grades	800-1000	A+	700 – 800	A	500 – 700	B+	400-500	B	150 – 400	C	Less than 150	D										
Marks	Grades																										
800-1000	A+																										
700 – 800	A																										
500 – 700	B+																										
400-500	B																										
150 – 400	C																										
Less than 150	D																										
4	<p>Write a set of instructions to create the following matrix using vectors and rbind() function. Rename the rows to Lang1,Lang2 & Lang3 respectively and use the function to access any one element using row names.</p> <table border="1"> <thead> <tr> <th rowspan="2">Rows</th> <th colspan="4">Columns</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>C#</td> <td>Java</td> <td>Cobol</td> <td>.Net</td> </tr> <tr> <td>2</td> <td>JavaScript</td> <td>NodeJs</td> <td>R</td> <td>Azure</td> </tr> <tr> <td>3</td> <td>Power BI</td> <td>ASP.Net</td> <td>Unity</td> <td>Block Chain</td> </tr> </tbody> </table>			Rows	Columns				1	2	3	4	1	C#	Java	Cobol	.Net	2	JavaScript	NodeJs	R	Azure	3	Power BI	ASP.Net	Unity	Block Chain
Rows	Columns																										
	1	2	3	4																							
1	C#	Java	Cobol	.Net																							
2	JavaScript	NodeJs	R	Azure																							
3	Power BI	ASP.Net	Unity	Block Chain																							
5	<p>Write an R script to do the following:</p> <ol style="list-style-type: none"> simulate a sample of 100 random data points from a normal distribution with mean 100 and standard deviation 5 and store the result in a vector. visualize the vector created above using different plots. 																										
6	<p>In the library MASS is a dataset UScereal which contains information about popular breakfast cereals. Attach the data set and use different kinds of plots to investigate the following relationships:</p> <ol style="list-style-type: none"> relationship between manufacturer and shelf relationship between fat and vitamins relationship between fat and shelf relationship between carbohydrates and sugars relationship between fibre and manufacturer relationship between sodium and sugars 																										
7	<p>Using the Algae data set from package DMwR to complete the following tasks.</p> <ol style="list-style-type: none"> create a graph that you find adequate to show the distribution of the values of algae a6. show the distribution of the values of size 3. 																										

	<ul style="list-style-type: none"> c) check visually if oPO4 follows a normal distribution. d) produce a graph that allows you to understand how the values of NO3 are distributed across the sizes of rivers. e) using a graph check if the distribution of algae a1 varies with the speed of the river. f) visualize the relationship between the frequencies of algae a1 and a6. Give the appropriate graph title, x-axis and y-axis title.
8	<p>Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Create a histogram by using appropriate arguments for the following statements.</p> <ul style="list-style-type: none"> a) Assigning names, using the air quality data set. b) Change colors of the Histogram c) Remove Axis and Add labels to Histogram d) Change Axis limits of a Histogram e) Create a Histogram with density and Add Density curve to the histogram
