Academic Council: -/--/--
Item No. :

College of Arts, Science & Commerce
SIES
RISE WITH EDUCATION
Sion (West), Mumbai – 400022.
(Autonomous)

Faculty: Science
Program: B.Sc.
Subject: Data Science
Academic year: 2024-2025

Syllabus for Semester- III and Semester – IV

Choice Based Credit System Syllabi (as per NEP) approved by Board of Studies in Data Science to be brought into effect from June 2024.

PREAMBLE

Data has become the most important factor in this era of digital transformation. The technological advancements are seen in all walks of life and therefore we are flooded with enormous data. Every business relies on data to deliver better products as well as services. All data are stored in cloud, and so accessed and processed easily. Data analytics has helped in better decision making with sufficient data insights.

Predictive Analysis has played a crucial role in making businesses smarter with improvised strategies. Machine Learning and Artificial Intelligence are used together to optimize business operations and data management. Augmented analytics uses machine learning and natural language processing to automate the process of data analysis. Global data is predicted to grow due to data generated by the Internet of Things(IoT) and cloud computing advancements. These developments have given rise to a new area of study, called Data Science.

Data Science as an area has evolved out of the applications of various tools and techniques in the field of Computer Science, Mathematics and Statistics. There is an increasing demand to capture, analyse the enormous data present in a number of application domains. The data in these applications then needs to be converted into actionable strategies for effective decision making. So, the study of data science has become essential to cater to the growing need of data scientists and data analysts.

This course focuses on educating the students about the essentials of computer science, applied mathematics and applied statistics with respect to the data science applications.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOME

NO.	Details
PO1.	**Solving Complex Problems**:- Apply the knowledge gained in breaking down complex problems into simple components; and to design processes required for problem solving.
PO2.	**Critical Thinking: -** Ability to apply the acquired knowledge to identify assumptions and evaluate their accuracy and validity.
PO3.	**Reasoning ability and Rational thinking: -** Ability to analyse, interpret data and draw logical conclusions; to evaluate ideas rationally.
PO4.	**Research Aptitude: -** Ability to ask relevant questions to identify and define the problem, applying research tools for analysis and interpretation of data. Understand and comply with research ethics.
PO5.	**Effective Communication skill: -** Demonstrate the ability to listen and to clearly express ideas verbally. Equip to write reports, make presentations effectively.
PO6.	**Information and Digital Literacy: -** Equip to use appropriate tools and techniques inclusive of internet and electronic media for acquiring, assessing and analysing data from diverse resources.
PO7.	**Social Interactive Skills and team work: -** Exhibit networking and social interactive skills; function effectively as an individual and as a member in diverse groups; demonstrate leadership quality useful for employability
PO8.	**Self-directed and Lifelong Learning:** Ability to explore and gain knowledge in independent and self-reliant ways. Demonstrate ability to adapt and upgrade with the global , social and technological changes.
PSO1.	**Sound Knowledge:** Demonstrate the knowledge of core data science concepts and apply them to develop a user- friendly, scalable, and robust applications
PSO2.	**Critical and Rational Thinking:** Exhibit higher order skills to adapt to the everchanging technological environment
PSO3.	**Logic Building and Programming Skills:** The ability to apply logic to problem solving and acquire proficiency in various programming languages.
PSO4.	**Data Analysis :** Apply quantitative modelling and data analysis techniques to solve real world business problems, Learn tools and techniques for transformation of data and statistical data analysis
PSO5.	**Pursue Higher Education:** Make students competent to take up advanced degree courses like MSc(Data Science),MCA, MSc(CS), MSc(IT) and MBA etc.

S.Y.B.Sc.(DS) VSC Syllabus under NEP - Semester III

Course Code	Course Type	Course Title	Credits
SIUDSVS211	Vocational Skill Course (VSC)	Introduction to Kafka	**1**
SIUDSVS211	Vocational Skill Course Practical (VSC)	Introduction to Kafka – Practical	**1**

SIUDSVS211: Introduction to Kafka

B.Sc. (Data Science)	**Semester – III**
Course Name: Introduction to Kafka	**Course Code: SIUDSVS211**
Credits	**1**

Course Objective:

- Kafa Introduction.
- A Deep Dive into Kafka Architecture.
- Understanding Brokers.
- Understanding Producers.
- Understanding Consumers.

Course Outcomes:

After completion of this course, student will be able to:

- **CO1:** To understand Kafka Architecture.
- **CO2:** To Understanding Brokers.
- **CO3:** To Understanding Producers.
- **CO4:** To Understanding Consumers.
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Unit	Contents	No. of Lectures
I	**Introduction:** Kafka origin , Benefits, Use Cases, Messaging System. Fundaments of Kafka: Topics and Partitions, Producers and Consumers, Brokers and Clusters. **Kafka CLI :** Creating Kafka Topics, Sending data to Kafka , Kafka Console Consumer, Kafka Consumer Group , Kafka Brokers, Topic Replication, and Controller **Apache Kafka With Zookeeper:** Start ZooKeeper, Single Node-Single Broker Configuration, Start Producer to Send Messages, Start	15

	Consumer to Receive Messages, Single Node-Multiple Brokers Configuration **Creating a Topic:** Start Producer to Send Messages, Start Consumer to Receive Messages **Kafka Real Time Example:** Creating Twitter Producer, Application Kafka monitoring, Kafka Connect	

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Kafka : The Definitive Guide	Neha Narkhede, Gwen Shapira , Todd Palino	O'Reilly	1st	2015
2	Kafka Streams in Action: Real-time apps and microservices with the Kafka Streams API	Bill Bejeck	Manning	1st	2018
3	Building Data Streaming Applications with Apache Kafka: Design, develop and streamline applications using Apache Kafka, Storm, Heron and Spark	Manish Kumar , Chanchal Singh	Packt	1st	2017

SIUDSVS211 : Introduction to Kafka - Practical

B.Sc. (Data Science)	**Semester – III**
Course Name: Introduction to Kafka - Practical	**Course Code: SIUDSVS211**
Credits	**1**

List of Practical:

1.	Installation of Kafka.
2.	Start the Zookeeper. Perform Single Node- Single Broker Configuration.
3.	Demonstrate Start Consumer to Receive Messages.
4.	Demonstrate Single Node- Multiple Broker Configuration.
5.	A Practical to creating a topic in zookeeper.
6.	Demonstrate Real time application(Twitter).

S.Y.B.Sc.(DS) SEC Syllabus under NEP - Semester IV

Course Code	Course Type	Course Title	Credits
SIUDSSE221	Skill Enhancement Course (SEC)	Web Technology – I	**1**
SIUDSSE221	Skill Enhancement Course (SEC)	Web Technology – I – Practical	**1**

SIUDSSE221: Web Technology-I

B.Sc. (Data Science)	**Semester – IV**
Course Name: Web Technology-I	**Course Code: SIUDSSE221**
Credits	**1**

Course Objective:

- Introducing the basic concepts of Internet and web design to learners
- Providing brief knowledge about HTML5 concepts
- Giving insight of the Page layout and navigation with HTML5
- Making students aware about use of Tables, Forms and Media with HTML5
- Teaching data validation using Java Script. Giving knowledge about transmission of data

Course Outcomes:

After completion of this course, student will be able to:

- **CO1**: Understand the meaning of the basic terminologies of web technology and explore, use The HTML5 concepts, Understand the basic requirement of web design. Understand and use the Page layout, Navigation, Tables, Forms and Media features of HTML5.
- **CO2:** Understand and use Cascading Style sheet for beatifying the webpages.
- **CO3:** Understand and use the Java Script for validation of user forms in web pages

Unit	Contents	No. of Lectures
I	**HTML5:** Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. **HTML5 Page layout and navigation:** Creating navigational aid, creating image map, redirecting to another URL, HTML5 semantic tags **HTML5 Tables, Forms and Media:** Creating tables and formatting tables, creating user forms, Incorporating sound and video. **CSS:**	**15**

	Style sheets, CSS, formatting text using style sheets, formatting paragraphs using style sheets. **Java Script:** Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp **Document and its associated objects:** document, document object methods, Link, Area, Anchor, Image, Layer **Events and Event Handlers** : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload	

Books and References

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Web Design The Complete Reference	Thomas Powell	Tata McGraw Hill	Fifth Edition	2009
2	HTML5 Step by Step	Faithe Wempen	Microsoft Press	Twelfth Edition	2011
3	JavaScript 2.0: The Complete Reference	Thomas Powell and Fritz Schneider	Tata McGraw Hill	Second Edition	2004

SIUDSSE221 : Web Technology-I Practical

B.Sc. (Data Science)	Semester – IV
Course Name: Web Technology-I Practical	**Course Code: SIUDSSE221**
Credits	**1**

List of Practical:

1	**Use of Basic Tags:**
a.	Design a web page using different text formatting tags.
b.	Demonstrate use of Font tag with its attributes and HTML various color options in web page.
c.	Design a web page with links to different pages and allow navigation between web pages.
2.	**Navigation, list and paragraph:**
a.	Design a web page to demonstrate text-based navigation bar.
b.	Demonstrate use of lists and backgrounds in web page.
c.	Demonstrate use of paragraph and its associated tags in web page.
3.	**Lists, images and semantics:**
a.	Demonstrate use of multiple image tag in web page.
b.	Design a web page with Imagemaps.
c.	Design a web page demonstrating use of various semantics tags
4.	**Multimedia and User controls:**
a.	Design a web page with a form that uses all types of user controls.
b.	Design a web page embedding with multimedia features.
c.	Design a 3 page static website with appropriate tags and attributes.
5.	**CSS with list, links and table:**
a.	Create and use different style rules with available types of lists.
b.	Create and use different style rules with hyperlinks.
c.	Create and use different style rules with tables.
6.	**CSS with font, paragraph and types:**
a	Create and use different style rules with font elements.
b.	Demonstrate the use of inline, internal and external CSS in one web page.
7.	**Demonstrate the use of Document object methods**
a.	Using java script, demonstrate validating Text Input Fields, Drop-down Lists and Checkboxes.
b.	Using java script, demonstrate validating Radio buttons and Validating Multi-Select Boxes.
8.	**Java Script : Handling the events**
a.	Using java script, demonstrate the use of onAbort, onBlur, onChange, onClick, onDblClick events.

b	Using java script, demonstrate the use of o onError, onFocus events.
c	Using java script, demonstrate the use of onKeyDown, onKeyPress, onKeyUp, onLoad, onReset, onResize, onSelect, onSubmit, onUnload events.
9.	**Demonstrate complete validation of User Registration form using appropriate fields of html and events of java script.**