VALUE ADDITION COURCES (VAC)

Under

National Education Policy of India 2020 (NEP 2020)

for

Bachelor of Arts (Hons)/ Bachelor of Science (Hons)

(***w.e.f. Session 2022- 23***)

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF SCIENCE

GURUKULA KANGRI (DEEMED TO BE UNIVERSITY)
HARIDWAR

MAY 2022

VALUE ADDITION COURSE							
VAC	BCS-V301	IT Skill, Data Analysis	L	T	P	C	Time for ESE
			2	0	0	2	3 Hrs.

Pre- requisite: NIL

Course Objectives:

- To introduce IT in a simple language to undergraduate students, regardless of their specialization.
- To understand the important roles of information technology.
- To introduce the importance of Data Science.

Course Outcomes:

CO1	Understand basic concepts and terminology of information technology.
CO2	Have a basic understanding of personal computers and their operations.
CO3	Understand the relationship of the Statistics and Data Science.

Course Contents

UNIT	Contents	Lectures Required
1.	**Knowing Computers:** What is Computer? Basic Application of Computer: Component of Computer System; CPU, VDU, Keyboard & Mouse, Other Inputs/Outputs Devices, Computer Memory; Concept of hardware and software; Concept of Computing; Data and Information; Application of IECT; Connecting Keyboard, Mouse m Keyboard, Monitor and Printers to CPU and Checking; Power supply.	2
2.	**Operating Computer using GUI based Operating System:** What is an operating system? Basics of Popular Operating Systems; The User Interface, Using Mouse, using right button of the mouse, and moving icon on the screen, use of common icons, status bar, using Menu and Menu Selection, running an application, viewing of file, folder and directories, creating and renaming the files and folders, opening and closing of different windows, using Help, Creating shortcuts, Basic of O.S Setups and Common utilities.	3
3.	**Understanding Word Processing:** Word processing basics, opening and closing of documents, text creation and manipulation, Formatting of text, Table handing, Spell Check, language setting and treasures, printing of word document.	2
4.	**Using Spread Sheet:** Basics of Spreadsheet, Manipulation of Cell, Formula and functions, editing of spread sheet, printing of spread sheet.	3
5.	**Making Small Presentation:** Basic of Presentation Software; Creating Presentation: Preparation & Presentation of sliders; Slide Shows; Taking Printout of presentation/Handouts	3

6.	**Internet, WWW, and Web Browser:** Basic of computer network, Application of internet, connecting to Internet, Web Browser, Safe Browsing, Understanding URL. **Communication and Collaboration:** Basics of Electronic Mail; Getting an Email Account; Sending and Receiving Mails; Accessing Sent Mails; Online Storage.	3
7.	**Use of Statistics in Data Science:** Introduction; Subsets of data; Two-way frequency table; Interpreting two-way tables; Two-way relative frequency table; Mean; Median; Mean Absolute Deviation; Standard Deviation. **Distribution in Data Science:** Introduction, Different types of continuous distribution, different types of discrete distribution. **Identifying Patterns:** Identification of partiality, preference and prejudice towards a set of data; Probability for Statistics.	8
	Total Lectures	24

Suggested Text Book(s)

1.	Rajaraman V, Adabala N, Fundamentals of Computers, PHI.
2.	Rajaraman V, Introduction to Information Technology, PHI.
3.	ITL ESL, Introduction to Information Technology, Pearson.
4.	Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, Fundamentals of Data Science, Chapman and Hall/CRC.

VALUE ADDITION COURSE							
VAC	BCS-V302	Digital Literacy and Cyber Security	L	T	P	C	Time for ESE
			2	0	0	2	3 Hrs.

Pre- requisite: NIL

Course Objectives:

- To introduce IT in a simple language to undergraduate students, regardless of their specialization.
- To understand the important roles of information technology.
- To understand the basic issues of cyber security.

Course Outcomes:

CO1	Understand basic concepts and terminology of information technology.
CO2	Have a basic understanding of personal computers and their operations.
CO3	Be able to identify issues related to cyber security.

Course Contents

UNIT	Contents	Lectures Required
1.	**Basics of Computers:** Computer, Mobile/ Tablet and their applications; Components of a Computer System: Central Processing Unit, Common Input & Output devices, USB ports and Pen Drive, Connecting Power cord, Keyboard, Mouse, Monitor and Printer to CPU.	2
2.	**Operating Computer using GUI based Operating System:** Operating System and its usage; Basic Operations: Mouse (click, click and drag, double click, right click (for the context menu)), Keyboard (some of the more common letters, enter, Delete, backspace, shift, tab and arrows); Starting and Shutting Down a Computer; User Interface for Desktop and Laptop: Task Bar, Icons & Shortcuts, Running an Application, Scroll Bars, Using Help; File and Folder Management, Types of File Extensions.	2
3.	**Understanding Word Processing:** Word Processing Basics: Opening Word Processing Package, Title Bar, Menu Bar, Toolbars & Sidebar, Creating a New Document; Opening and Closing Documents: Opening Documents, Save and Save As, Closing Document, Using The Help, Page Setup, Print Preview, Printing of Documents, PDF file and Saving a Document as PDF file; Document manipulation & Formatting: Text Selection, Cut, Copy and Paste, Font, Color, Style and Size selection, Alignment of Text, Undo & Redo, 6 Spelling & Grammar; Shortcut Keys.	5
4.	**Internet:** Concept of Internet & WWW, Website Address and URL, Applications of Internet, Modes of Connecting Internet (Hotspot, Wi-Fi, LAN Cable, Broadband, USB Tethering); Popular Web Browsers (Internet Explorer/Edge, Chrome, Mozilla Firefox); Exploring the Internet: Surfing the web, Popular Search Engines, Searching on Internet.	2

5.	**E-mail:** Structure of E-mail; Using E-mails: Opening Email account, Mailbox: Inbox and Outbox, Creating and Sending a new E-mail, Replying to an E-mail message, Forwarding an E-mail message, Access email with attachments, Delete an e-mail.	2
6.	**Digital Financial Tools:** Understanding OTP [One Time Password]and QR [Quick Response] Code, UPI [Unified Payment Interface], AEPS [Aadhaar Enabled Payment System], USSD[Unstructured Supplementary Service Data], Card [Credit / Debit], eWallet, PoS [Point of Sale]; **Internet Banking:** National Electronic Fund Transfer (NEFT), Real Time Gross Settlement (RTGS), Immediate Payment Service (IMPS); Online Bill Payment; Overview of e-Governance Services like Railway Reservation, Passport, eHospital [ORS]; Accessing e-Governance Services on Mobile Using "UMANG APP".	5
7.	**Cyber Security:** Basic concepts of threats, vulnerabilities, controls; risk; confidentiality, integrity, availability; security policies; security Mechanisms; **Data Security and protection:** concept, creating strong passwords; how to stay safe when surfing on internet: "In private Browsing", identifying secure website, clear cookies; Know how to identify a secure web site: https, lock symbol; Security Considerations: Know about security threats from web sites like: viruses, worms, Trojan horses, spyware. Understand the term malware; Netiquettes, DOS, DDOS; Netiquettes; Security Considerations: Be aware of the possibility of receiving fraudulent and unsolicited e-mail; phishing, Recognize attempted phishing; Basics of Software Licensing, Overview and understanding of IT Act 2000.	6
	Total Lectures	24

Suggested Text Book(s)

1.	Rajaraman V, Adabala N, Fundamentals of Computers, PHI.
2.	Rajaraman V, Introduction to Information Technology, PHI.
3.	ITL ESL, Introduction to Information Technology, Pearson.
4.	Bhushan, Rathore & Jamshed, Fundamentals of Cyber Security, BPB Publication.

VALUE ADDITION COURSE							
VAC	BCS-V501	Data Science & Applications	L	T	P	C	Time for ESE
			2	0	0	2	3 Hrs.

Pre- requisite: Basic mathematics.

Course Objectives:

- To lay the foundation for Data Science,
- Understanding how data is collected, analyzed and, how it can be used in solving problems and making decisions.

Course Outcomes:

CO1	Obtain, clean/process, and transform data
CO2	Analyze and interpret data using an ethically responsible approach
CO3	Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues
CO4	Apply computing theory, languages, and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses
CO5	Interpret data findings effectively to any audience, orally, visually, and in written formats

Course Contents

UNIT	Contents	Lectures Required
1.	**Introduction to Data Science:** What is data science? Basic terminology, Why data science? The data science Venn diagram. Domain knowledge, Lifecycle of data science. Importance, and basic applications. **Data Representation:** Data Objects and Attribute Types: Nominal, Binary, Ordinal, Numeric, Discrete and Continuous, Types of data: Record, Temporal, Spatial Temporal, Graph, Unstructured and Semi structured data, Basic Statistical Descriptions of Data. **Exploratory Data Analysis:** Introduction; Univariate Analysis; Multivariate Analysis, Data Cleaning.	4
2.	**Introduction to Statistics:** Basic Statistics, Measure of central tendency, Types of Distributions, Anova. F-Test, Central Limit Theorem & applications, Types of variables. Relationships between variables, Central Tendency. Measures of Central Tendency. Kurtosis. Skewness. Arithmetic Mean / Average, Merits & Demerits of Arithmetic Mean, Mode, Merits & Demerits of Mode, Median, Merits & Demerits of Median, Range, Concept of Quantiles, Quartiles, percentile, Standard Deviation, Variance, Calculate Variance, Covariance, Correlation.	6
3.	**Data Visualization Techniques:** Bubble Chart, Sparklines, Waterfall chart, Box Plot, Line Charts, Frequency Chart, Bimodal & Multimodal Histograms, Histograms, Scatter Plot, Pie Chart, Bar Graph, Line Graph.	2

4.	**Introduction to Machine Learning:** Overview & Terminologies, what is Machine Learning? Why Learn? When is Learning required? Data Mining, Application, Areas and Roles, Types of Machine Learning, Supervised Learning, Unsupervised Learning, Reinforcement learning.	4
5.	**Classification Algorithms I**: Introduction; Introduction to Decision Trees; Applications of Decision Trees; Creating a Decision Tree. **Classification Algorithms II:** Introduction; Introduction to K-Nearest Neighbours; Pros and Cons of using K-NN; Cross Validation.	4
6.	**Regression Algorithms I:** Introduction; Introduction to Linear Regression; Mean Absolute Error; Root Mean Square Deviation. **Regression Algorithms II:** Introduction; Multiple Linear Regression; Non-linear Regression.	4
	Total Lectures	24

Suggested Text Book(s)

1.	Joel Grus, Data Science from Scratch, O'Reilly Media.
2.	Peter Bruce, Andrew Bruce & Peter Gedeck , Practical Statistics for Data Scientists, O'Reilly.
3.	Davy Cielen et.al, Introducing Data Science, Manning Publications.
4.	D.P. Kroese, Z.I. Botev, T. Taimre, R. Vaisman, Data Science and Machine Learning: Mathematical and Statistical Methods, CRC Press.