Prof. Neelam Srivastava
Dean- Training & Placement
Prof.- Electronics & Comm.
Institute of Engg. & Tech. (IET) Lucknow

Dr. A.P.J. Abdul Kalam Technical University
Lucknow, Uttar Pradesh
Sector-11,Jankipuram Extension, Lucknow
E-mail: dean.tp@aktu.ac.in

14 May, 2024

Ref: AKTU/CTPC/2024/938

To,

The Directors/Principals
Colleges affiliated/associated to Dr. APJ Abdul Kalam Technical University
Lucknow, Uttar Pradesh

Subject :- Regarding the Free courses offered by IBM (Self paced courses) Free of cost under MoU signed with AKTU on 14 March, 2024 to B.Tech(CSE/IT) & related courses of 2024/2025 batch students

Dear Sir/Ma'am.
This is in continuation to the MoU signed between AKTU and IBM on 14 March, 2024, herein, IBM is offering the under-mentioned self-paced courses in different technology domains digitally through IBM's portal (free of cost) to our students of B.Tech(CSE/IT) and related branches of 2024/2025 batch. Kindly circulate this among the eligible students to fill their details through the below-given Google form Link by 25 May, 2024.

https://forms.gle/cKUg7bgcz1RXmvtL9

- **Artificial Intelligence**:
    - Artificial Intelligence Fundamentals
    - Fundamentals of Sustainability and Technology
    - Introduction to Generative AI in Action
    -
- Technology Domain: **Data Science:**
    - Data Fundamentals
    - OpenDS4All
    -
- Technology Domain: **Cloud Computing**:
    - Cloud Computing Fundamentals

For any query please write on tnp@aktu.ac.in

Best wishes

(Prof. Neelam Srivastava)
14/05/24

Copy to:
(1) Registrar, AKTU, Lucknow
(2) Finance Officer, AKTU, Lucknow
(3) Satff Officer to Hon' Vice Chancellor for kind information

(Prof. Neelam Srivastava)

Artificial Intelligence Fundamentals

(Classroom)

Artificial Intelligence Fundamentals Module:

In this program, we will delve into the realm of artificial intelligence (AI), exploring its foundational concepts, techniques, and applications. Throughout this course, you will gain a deep understanding of what artificial intelligence is, its historical evolution, and its various subfields.

Learning Objectives:

After completing the course, the students should be able to:
- Explain the fundamental concepts of artificial intelligence.
- Write functions and pass arguments in Python.
- Apply various machine learning algorithms.
- Evaluate the performance of machine learning models.
- Preprocess raw data by handling missing values.
- Apply natural language processing techniques.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

The following chapter and exercise durations are estimated and might not reflect every class experience. The estimates do not include the duration of additional exercises or sections. Students in this course to have setup the software requirement as stated. The course contains test your knowledge after each chapter.

COURSE AGENDA

Unit 1. Introduction to Artificial Intelligence:

Duration: 8 Hrs.

Overview	This unit serves as the foundational cornerstone of our course, offering a structured introduction to the multifaceted domain of artificial intelligence (AI). Throughout this segment, participants will delve into the essence of AI, elucidating its definition, significance, and historical evolution.
Learning Objectives	After completing this unit: • Definition and Significance of Artificial Intelligence • Evolution of AI: Past to Future • Introduction to Machine Learning • Structured vs. Unstructured Data

Unit 2. Natural Language Processing and Computer Vision:

Duration: 6 Hrs.

Overview	In this Unit, we delve into the realms of Natural Language Processing (NLP) and Computer Vision.
Learning Objectives	After completing this unit, you should be able to: • Introduction to Natural Language Processing (NLP) • Understanding Chatbots • Introduction to Computer Vision • Image Classification • Generative Adversarial Networks (GANs)

Unit 3. Machine Learning and Deep Learning:

Duration: 7 Hrs.

Overview	In this Unit, we delve into the intricate realms of machine learning (ML) and deep learning (DL), crucial components of artificial intelligence (AI) that underpin numerous applications across various domains.
Learning Objectives	After completing this unit, you should be able to: • Definitions and Distinctions of AI, ML, and DL • Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning • Classical Machine Learning Algorithms • Neural Networks, Deep Learning, and Its Ecosystem

Unit 4. Run AI Models with IBM Watson Studio:

Duration: 7 Hrs.

Overview	In this Unit we will delve into the practical implementation of AI models using IBM Watson Studio. This unit focuses on the application of machine learning algorithms and models within the IBM Watson Studio environment.
Learning Objectives	After completing this unit, you should be able to: • Machine Learning Algorithms and Models • Introduction to IBM Watson Studio • Key Features and Benefits of IBM Watson Studio • Setting up a Machine Learning Project • Building AI Models with AutoAI

Unit 5. Run AI Models with IBM Watson Studio:

Duration: 4 Hrs.

Overview	In this Unit, we delve into the critical domain of AI ethics, where we examine the ethical considerations and challenges associated with the development, deployment, and use of artificial intelligence systems.
Learning Objectives	After completing this unit, you should be able to: • Five Pillars of AI Ethics • Fairness in AI • Robustness and Adversarial Robustness in AI • Adversarial Attacks and Influence on AI Systems • Differential Privacy and Data Minimization • Transparency and Governance in AI Systems

Text References:

- "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
- "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
- "Pattern Recognition and Machine Learning" by Christopher M. Bishop

Further suggested Readings:

- "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper - This book provides a practical introduction to natural language processing using the Python programming language. It covers topics such as tokenization, part-of-speech tagging, named entity recognition, and sentiment analysis, with hands-on examples and exercises.

Fundamentals of Sustainability and Technology

(Classroom)

Fundamentals of Sustainability and Technology

Welcome to the Fundamentals of Sustainability and Technology course! In this formal curriculum, we embark on a comprehensive exploration of sustainability principles and their integration with cutting-edge technological advancements. Sustainability, a cornerstone of modern society, lies at the intersection of environmental stewardship, social responsibility, and economic prosperity. Throughout this course, participants will delve into the multifaceted dimensions of sustainability, examining its significance across diverse disciplines and industries.

Learning Objectives:

- Define sustainability and distinguish it from conservation.
- Identify the environmental, social, and governance (ESG) pillars guiding sustainability initiatives.
- Explain how data analytics aids in identifying and measuring sustainability issues for organizational solutions.
- Describe key sustainability applications of artificial intelligence and hybrid cloud technologies.
- Discuss emerging technologies impacting sustainability and their implications.
- Make informed decisions in the role of a sustainability scientist.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

The following chapter and exercise durations are estimated and might not reflect every class experience. The estimates do not include the duration of additional exercises or sections. Students in this course to have setup the software requirement as stated. The course contains test your knowledge after each chapter

COURSE AGENDA

Unit 1. Beyond Conservation to Sustainability:

Duration: 8 Hrs.

Overview	In this Unit, students transition from traditional conservation practices to the broader and more holistic concept of sustainability. Through a formal lens, this unit explores the distinctions between conservation and sustainability, highlighting the environmental, social, and governance (ESG) issues inherent in sustainability initiatives.
Learning Objectives	After completing this unit: • Differences Between Conservation and Sustainability • Environmental, Social, and Governance (ESG) Issues in Sustainability • Business Initiatives for Sustainability • Role of Advanced Technologies in Promoting Sustainability

Unit 2. Make an Impact with Data Analytics:

Duration: 7 Hrs.

Overview	In this Unit, students delve into the realm of data analytics, exploring its pivotal role in driving sustainable business practices and addressing climate risks. Through a formal lens, participants analyze real-world data, examining how artificial intelligence facilitates the attainment of business sustainability objectives.
Learning Objectives	After completing this unit, you should be able to: • Analysis of real-world data • AI's Role in Addressing Business Sustainability Goals and Climate Risks • Application of AI to Sustainability Problems

Unit 3. Make an Impact with AI:

Duration: 7 Hrs.

Overview	This Unit delves into the transformative potential of Artificial Intelligence (AI) in advancing sustainability goals. Through a formal exploration of AI principles and applications.
Learning Objectives	After completing this unit, you should be able to: • Definition of AI and Overview of Types • Sustainability Applications of AI • AI's Ability to See and Analyze the Unseen • Experience with AI Sustainability • AI in daily life

Unit 4. Make an Impact with Hybrid Cloud:

Duration: 6 Hrs.

Overview	In this Unit, students delve into the realm of hybrid cloud computing, a pivotal technology with profound implications for sustainability. Through a formal exploration, participants examine the concepts of private, public, and hybrid cloud computing, elucidating their role in promoting green computing practices.
Learning Objectives	After completing this unit, you should be able to: • Private, Public, and Hybrid Cloud Computing • Promotion of Green Computing Through Hybrid Cloud • Steps of Green IT Implementation • Sustainability Applications of Hybrid Cloud

Unit 5. Make an Impact with Future Technology:

Duration: 4 Hrs.

Overview	In this Unit, students delve into the transformative potential of emerging technologies in shaping the future of sustainability. Through a formal lens, this unit explores future trends, technological innovations, and their implications for addressing sustainability challenges.
Learning Objectives	After completing this unit, you should be able to: • Future Trends in Sustainability • Impact of Emerging Technologies on Sustainability • Selection of Technologies for Sustainability Challenges

Text References

- "Introduction to Sustainability" by Robert Brinkmann and Sandra Garren
- "Sustainability: A Comprehensive Foundation" edited by Tom Theis and Jonathan Tomkin

Further suggested Reading

"Sustainable Development" by Susan Baker and Vicky Ingham - This textbook provides a comprehensive overview of sustainable development principles and practices, covering topics such as resource management, urban planning, and corporate sustainability strategies.

Introduction of Generative Ai in Action

(Classroom)

Introduction of Generative Ai in Action

Welcome to the course on Generative AI in Action! Throughout this formal curriculum, participants will embark on a journey into the fascinating realm of generative artificial intelligence (AI). Generative AI techniques enable the creation of new data instances that resemble existing data, offering vast potential for innovation and creativity across various domains.

Learning Objectives:

- Apply generative AI techniques to real-world scenarios effectively.
- Demonstrate a clear understanding of generative AI concepts and methodologies.
- Identify various types of generative models and their applications, including autoencoders.
- Gain practical experience through hands-on exercises and projects, fostering creative problem-solving skills.
- Develop a strong portfolio of generative AI projects showcasing practical applications and innovative solutions.
- Analyze the ethical and social implications of generative AI technologies, contributing to responsible AI development.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

The following chapter and exercise durations are estimated and might not reflect every class experience. The estimates do not include the duration of additional exercises or sections. Students in this course to have setup the software requirement as stated. The course contains test your knowledge after each chapter

COURSE AGENDA

Unit 1. Overview of Generative AI:

Duration: 8 Hrs.

Overview	In Unit I, participants embark on a foundational exploration of Generative AI, delving into its core concepts and significance in contemporary artificial intelligence. Through a formal lens, this unit elucidates the fundamental principles that underpin generative AI techniques, distinguishing them from other branches of AI.
Learning Objectives	After completing this unit: • Definition and significance of generative artificial intelligence (AI) • Differentiation from other branches of AI • Data generation, feature extraction, and output generation

Unit 2. Introduction to Large Language Models (LLMs):

Duration: 7 Hrs

Overview	In Unit II, participants delve into the realm of Large Language Models (LLMs), exploring their intricate architecture and diverse applications. This unit provides a formal introduction to key concepts and techniques essential for understanding and harnessing the power of LLMs in various domains.
Learning Objectives	After completing this unit, you should be able to: • Tokenization, embedding, and transformers • Encoders and decoders • Risk and ethical concerns

Unit 3. Introduction to Watsonx AI:

Duration: 7 Hrs.

Overview	Unit III introduces participants to the powerful capabilities of Watsonx AI, a cutting-edge platform for artificial intelligence applications.
Learning Objectives	After completing this unit, you should be able to: • Foundation models using Watsonx AI • Insight extraction of AI forecasting • Synthetic data generation

Unit 4. Crafting Precision Prompts with GenAI:

Duration: 6 Hrs.

Overview	Unit IV delves into the art of crafting precision prompts with GenAI, a pivotal aspect of generative artificial intelligence (AI). Through a formal lens, participants explore the intricacies of prompt engineering and its role in shaping the output of generative AI models.
Learning Objectives	After completing this unit, you should be able to: • Prompt engineering and basics • Sentiment analysis • OpenAI and prompting techniques

Unit 5. Coding Simplified with GenAI:

Duration: 4 Hrs.

Overview	Unit V delves into the practical applications of generative artificial intelligence (AI) in coding and scripting tasks. Through a formal lens, participants explore the streamlined approaches facilitated by GenAI for simplifying coding processes.
Learning Objectives	After completing this unit, you should be able to: • Traditional programming vs. scripting • Scripting and code generation using GenAI • Analyzing and deployment

Text References

• "GPT-3: The Complete Guide" by Sudhanshu Mishra

• "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper

Further suggested Reading

Research Papers and Academic Journals: Exploring research papers and academic journals in artificial intelligence, natural language processing, and machine learning can provide valuable insights into the latest advancements in AI models and text generation techniques.

Data Fundamentals

(Classroom)

Data Fundamentals Module

Welcome to the Data Fundamentals course, where we embark on a structured exploration of the foundational principles, methodologies, and applications of data science. In this formal curriculum, participants will delve into the intricate world of data, gaining a comprehensive understanding of its significance in contemporary contexts across various industries and societal domains.

Understand the foundational concepts of data and its significance in modern contexts.

Explore the practical applications of data science across various industries and societal domains. Gain proficiency in utilizing essential data tools and programming languages for data analysis and manipulation. Develop skills in cleaning, refining, and visualizing data using IBM Watson Studio. Reflect on potential career pathways and opportunities within the data science field, and chart a personalized course for future growth and development.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

PREREQUISITES SKILLS

Basic understanding of statistics and familiarity with programming concepts. Basic understanding of computer usage and file management. Familiarity with fundamental mathematical concepts such as arithmetic, algebra, and statistics. Proficiency in using a personal computer and navigating software applications. Basic knowledge of programming concepts (recommended but not mandatory). Eagerness to learn and engage in practical exercises and assignments.

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

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COURSE AGENDA

Unit 1. Introduction to Data Concepts:

Duration: 4 Hrs.

Overview	In this Unit, students will embark on an introductory journey into the fundamental concepts underlying the vast realm of data. The unit commences with an exploration of data types and structures, elucidating the diverse forms and arrangements through which data manifests.
Learning Objectives	After completing this unit: • Understanding the Significance of Data • Data Types and Structures • Introduction to Databases • Quantitative vs. Qualitative Data • The Five V's of Big Data • Types of Data Analytics • Data Analysis Process • Purpose of Data Visualization • Choosing the Right Visualization

Unit 2. Data Science in Our World:

Duration: 6 Hrs.

Overview	In this Unit of the Data Fundamentals course, students will delve into the expansive domain of data science as it manifests in our contemporary world.
Learning Objectives	After completing this unit, you should be able to: • Definition of Data Science • Importance of Curiosity in Problem-Solving • Distinction Between Data Analytics and Data Science • Data Science Methodologies • Exploring Data Project Scenarios • Industries and Applications of Data Science • Comparison of Data Roles

Unit 3. Overview of Data Tools and Languages:

Duration: 8 Hrs.

Overview	In this Unit, students will be introduced to a comprehensive overview of data tools and programming languages essential for data analysis and manipulation.
Learning Objectives	After completing this unit, you should be able to: • Value of Collaboration and Open Source • Purpose of GitHub • Common Data Analysis and Visualization Tools • Factors for Business Tool Selection • Factors for Individual Tool Selection

Unit 4. Clean, Refine, and Visualize Data with IBM Watson Studio:

Duration: 8 Hrs.

Overview	In this Unit, students will emerge with a formal understanding of how to clean, refine, and visualize data using IBM Watson Studio, equipped with the formal skills and knowledge needed to leverage this powerful platform for data-driven decision-making.
Learning Objectives	After completing this unit, you should be able to: • Purpose and Key Features of IBM Watson Studio • Setting up a New Project • Importing & Cleaning with Data Refinery Tool • Data Refinement with Data Refinery Tool • Creating Data Visualizations • Drawing Insights from Data Visualizations

Unit 5. Your Future in Data:

Duration: 6 Hrs.

Overview	In this Unit, we examine the landscape of opportunities and prospects within the realm of data science. With a focus on formal discourse, participants delve into a comprehensive analysis of the global demand for data analysts and data scientists, gaining insights into emerging trends and industry trajectories.
Learning Objectives	After completing this unit, you should be able to: • Global Demand for Data Analysts and Data Scientists • Industries Employing Data Professionals • Primary Responsibilities of Data Analysts and Data Scientists • Essential Skills for Data Professionals • Tools for Beginners in Data Science,Learning Resources and Continuous Education

Text References:

- R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems," Addison-Wesley 2020.
- D. J. DeWitt and J. Gray, "Database Systems: Concepts and Design," McGraw-Hill. 2011.
- J. Han, M. Kamber, and J. Pei, "Data Mining: Concepts and Techniques," Morgan Kaufmann. 2011.
- P. Dalgaard, "Introductory Statistics with R," Springer. 2008.

Open DS4 All
(Classroom)

Foundations of Data Science

Welcome to OpenDS4ALL, your gateway to the world of data science! In this course, we embark on a journey to explore the foundational concepts, methodologies, and practical applications of data science in contemporary society. OpenDS4ALL is designed to provide participants with a comprehensive understanding of data science and its pivotal role in driving innovation, decision-making, and problem-solving across various industries and domains. Throughout the course, participants will delve into key topics such as data acquisition, preparation, exploratory data analysis, machine learning fundamentals, and advanced data science techniques.

Learning Objectives:

- Demonstrate a deep understanding of the foundational concepts of data science and its significance in contemporary contexts.
- Apply critical thinking skills to analyze and interpret data from various sources, drawing meaningful insights and conclusions.
- Utilize a range of data tools and programming languages proficiently to manipulate, clean, and visualize data effectively.
- Develop practical skills in data analysis and interpretation, demonstrating the ability to solve real-world problems using data-driven approaches.
- Evaluate potential career pathways and opportunities within the field of data science and develop a personalized plan for professional development and growth.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

The following chapter and exercise durations are estimated and might not reflect every class experience. The estimates do not include the duration of additional exercises or sections. Students in this course to have setup the software requirement as stated. The course contains test   your   knowledge   after   each   chapter

COURSE AGENDA

Unit 1. Foundations of Data Science:

Duration: 4 Hrs.

Overview	Unit I serve as the bedrock for our exploration into the world of data science. Participants will embark on a journey to grasp the fundamental concepts that underpin this dynamic field. Through formal instruction and engaging discussions, we will delve into the essence of data science, explore its methodologies, and ponder the ethical considerations that guide its practice.
Learning Objectives	After completing this unit: • Introduction to Data Science • Overview of Data Science Methodologies • Ethical Considerations in Data Science • Data Science Lifecycle • Career Opportunities in Data Science

Unit 2. Data Acquisition and Preparation:

Duration: 6 Hrs.

Overview	Unit II focuses on the crucial steps of data acquisition and preparation, laying the foundation for effective data analysis and interpretation. Through a formal lens, participants delve into best practices for acquiring data, cleaning techniques, integration methods, quality assessment, and preprocessing.
Learning Objectives	After completing this unit, you should be able to: • Best Practices for Data Acquisition • Data Cleaning Techniques • Data Integration Methods • Data Quality Assessment • Data Transformation and Preprocessing

Unit 3. Exploratory Data Analysis:

Duration: 8 Hrs.

Overview	Unit III of OpenDS4ALL focuses on Exploratory Data Analysis (EDA), a crucial phase in the data science lifecycle. Participants delve into descriptive statistics, data visualization techniques, and exploratory data analysis tools to gain insights into their datasets.

Learning Objectives	After completing this unit, you should be able to: • Descriptive Statistics • Data Visualization Techniques • Exploratory Data Analysis Tools • Data Distribution Analysis • Correlation and Association Analysis

Unit 4. Machine Learning Fundamentals:

Duration: 8 Hrs.

Overview	Unit IV delves into the foundational principles of machine learning, a core component of data science. Participants will explore various machine learning algorithms, including supervised and unsupervised learning techniques, and gain insights into model evaluation and optimization.
Learning Objectives	After completing this unit, you should be able to: • Introduction to Machine Learning • Supervised Learning Algorithms • Unsupervised Learning Algorithms • Model Evaluation and Selection • Hyperparameter Tuning and Optimization

Unit 5. Advanced Topics in Data Science:

Duration: 6 Hrs.

Overview	Unit V delves into the practical applications of generative artificial intelligence (AI) in coding and scripting tasks. Through a formal lens, participants explore the streamlined approaches facilitated by GenAI for simplifying coding processes.
Learning Objectives	After completing this unit, you should be able to: • Advanced Data Modeling Techniques • Deep Learning and Neural Networks • Generative Adversarial Networks (GANs) • Reinforcement Learning • Applications of Data Science in Emerging Technologies

Text References

- "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett
- "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney
- "An Introduction to Statistical Learning: with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- "Big Data: A Revolution That Will Transform How We Live, Work, and Think" by Viktor Mayer-Schönberger and Kenneth Cukier

Cloud Computing Fundamentals

(Classroom)

Cloud Computing Fundamentals Module:

Cloud computing is the delivery of computing services, including servers, storage, databases, networking, software, analytics, and intelligence, over the internet. By learning cloud computing, professionals in various industries can acquire the skills needed to leverage these benefits, optimize their IT operations, and drive digital transformation within their organizations.

Learning Objectives:

On successful completion of the course, the students will be able to:
- Understand the vision of Cloud Computing from a global context.
- Develop and understand various compute options on IBM Cloud by the market perspective of Cloud Computing.
- Analyze architecture and implementation of APIs with services of IBM Cloud in Cloud Computing.
- Build and create state-of-the-art architecture in Kubernetes cluster and Cloudant.

DELIVERY METHOD

- 25% Self-Paced Learning
- 75% Instructor Led Training

PREREQUISITES SKILLS

Basic knowledge about cloud computing

DURATION

32 Hours

SKILL LEVEL

Basic – Intermediate

The following chapter and exercise durations are estimated and might not reflect every class experience. The estimates do not include the duration of additional exercises or sections. Students in this course to have setup the software requirement as stated. The course contains test your knowledge after each chapter.

COURSE AGENDA

Chapter 1. Introduction to Cloud Computing:

Duration: 8 Hrs.

Overview	Chapter serves as a foundational introduction to the dynamic field of cloud computing, offering participants a comprehensive overview of its fundamental concepts, characteristics.
Learning Objectives	After completing this unit: • Defining cloud computing and its characteristics • Describing the factors that lead to the adoption of cloud computing • Describing the choices that developers have when creating cloud applications • Explain how technology advances impact the cloud • Identify the problems that cloud computing solves. • Understanding Cloud Deployment Models: • Identify considerations and situations for deploying public, private, and hybrid clouds • Explain the advantages of public, private, and hybrid cloud.

Chapter 2. Understanding Cloud Computing Services:

Duration: 8 Hrs.

Overview	Chapter delves deeper into the realm of cloud computing services, offering participants a comprehensive understanding of the various service models and deployment options available in the cloud ecosystem.
Learning Objectives	After completing this unit, you should be able to: • Describe the characteristics of cloud service models including Infrastructure as a service (IaaS), Platform as a service (PaaS), and Software as a service (SaaS) • Differentiate between proprietary and open-source approaches for developing cloud solutions • Identify the services and differentiates between the major cloud providers • Identify scenarios where different cloud service models are appropriate to use and recognize the value that businesses can expect from them.

Chapter 3. Developing and Deploying Software in the Cloud:

Duration: 8 Hrs.

Overview	Chapter delves into the practical aspects of developing and deploying software in the cloud, exploring essential concepts and techniques that enable efficient cloud application development.
Learning Objectives	After completing this unit, you should be able to: • Explain the purpose and benefits of virtual resources • Describe the purpose and function of using containers in the cloud • Describe the purpose and function of using microservices in the cloud • Identify key features of application programming interfaces (APIs) • Build a Docker container and deploy it to the cloud • Kubernetes

Chapter 4. Introduction to Data Management and Security in the Cloud:

Duration: 8 Hrs.

Overview	Chapter delves into the critical aspects of data management and security within the cloud computing paradigm. In an era where data is hailed as the new currency, understanding how to effectively manage and secure data assets in cloud environments is paramount.
Learning Objectives	After completing this unit, you should be able to: • Why cloud data security is important • Identify ways to mitigate different types of vulnerabilities in cloud data security • Describe the features of identity and access management (IAM) • Explain database as a service (DBaaS) and the benefits that it provides • Identify ways cloud databases support data governance and data compliance • Create an IBM Cloudant database and review its security settings.

Text References:

- Cloud Computing, A Practical Approach - Anthony T. Velte, CISSP, CISA
- Cloud Application Development - Anubhav Hanjura
- OpenStack Cloud Application Development - Scott Adkins, John Belamaric, Vincent
- Cloud Computing Paperback- Temitayo Fagbola