MAHARAJA SURAJMAL BRIJ UNIVERSITY BHARATPUR

NATIONAL EDUCATION POLICY-2020

STRUCTURE OF UG-BACHELOR OF COMPUTER APPLICATIONS (BCA)

Syllabus for V & VI Semester

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BCA Part - III (V & VI Semester)

Semester-wise Titles of the Papers in Bachelor of Computer Application

Bachelor of Computer Application

Semester	Course Code	Course Title	Course Type	Theory/ Practical	Teaching Hours/ Week	Credits
V	BCA-40-T-501	Artificial Intelligence & Machine Learning	CC(Major)	Theory	4	4
	BCA-40-P-502	Machine Learning Lab	CC(Major)	Practical	4	2
	BCA-40-T-503	Python Programming	CC(Major)	Theory	4	4
	BCA-40-P-504	Python Lab	CC(Major)	Practical	4	2
	BCA-40-T-505	Data Communication & Computer Networks	DSE(Major /Minor)	Theory	6	6
	MDC-	MDC-III	MDC	Theory	4	4
			Total		26	22
VI	BCA-40-T-601	.NET Framework with C#	CC(Major)	Theory	4	4
	BCA-40-P-602	.NET with C# Lab	CC(Major)	Practical	4	2
	BCA 40-T-603	Introduction to Data Science	CC(Major)	Theory	4	4
	BCA-40-P-604	Data Science Lab	CC(Major)	Practical	4	2
	BCA-40-T-605	Cloud Computing	DSE(Major /Minor)	Theory	6	6
	SEC	SEC/VAC	SEC/VAC	Theory/ Practical	2	2
			Total		24	20

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Course Content for BCA Semester V and VI

Semester: V

Course Code: BCA-40-T-501	Course Title: **Artificial Intelligence & Machine Learning**
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:

- Understand and explain the definition, components, and application areas of Artificial Intelligence
- Understand the concepts of Logical Reasoning and their use in knowledge representation and knowledge processing
- Describe the architecture and working of knowledge-based systems (Expert systems)
- To **Understand Machine Learning Fundamentals**, principles, and types of machine learning, including supervised, unsupervised, and reinforcement learning.
- To **Implement Machine Learning Algorithms** such as linear regression, logistic regression, decision trees, support vector machines, k-nearest neighbors, and neural networks.
- **To u**nderstand and apply data preprocessing techniques, including data cleaning, normalization, and feature engineering, to prepare data for machine learning models.
- To **Evaluate Model Performance** and interpret the performance of machine learning models using appropriate metrics, such as accuracy, precision, recall, F1-score, and ROC-AUC.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the fundamental concepts and techniques of artificial intelligence.
- Apply AI algorithms and methodologies to solve real-world problems.
- Design and develop AI systems using appropriate tools and frameworks.
- Evaluate and optimize AI models for performance and accuracy.
- Differentiate between supervised and unsupervised learning tasks.
- Differentiate between linear and non-linear classifiers. 3

- Describe theoretical basis of SVM

Artificial Intelligence & Machine Learning

UNIT – I

General Issues and overview of AI : Concept of Intelligence, AI intelligent agents, Characteristics of AI, Comparison of AI, Machine Learning and Deep Learning. Defining problem as a State Space Search, Search and Control Strategies, Production systems, Problems – Water Jug problem, Block words Problem, Monkey & Banana problem, Applications of AI. Ethical considerations in AI development & deployment and MYCIN.

Unit-II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Informed search strategies (Heuristic search) Generate-and-test, Hill climbing, Best First Search , Constraint Satisfaction ,A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search.

Knowledge Representation : Definition of Knowledge, Types of knowledge (Procedural and Declarative knowledge),Approaches to Knowledge Representation, Knowledge representation using Propositional and Predicate logic , Conversion to clause form, Resolution in Propositional logic, Resolution in Predicate logic.

Unit-III

Concepts : Machine Learning, Machine Learning Foundations-Overview, Applications, Types of Machine Learning, Basic Concepts in Machine Learning – Examples of Machine Learning.

Supervised Learning : Introduction, Linear Models of Classification – Decision Trees, NaïveBayes Classification, Linear Regression – Logistic Regression – Bayesian Logistic Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization .

Unit-IV

Unsupervised Learning : Clustering, Association rule mining, K-Means Clustering, EM (Expectation Maximization), Mixtures of Gaussians, EM algorithm in General, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis, Principal Component Analysis.

Probabilistic Graphical Models : Directed Graphical Models, Bayesian Networks, Exploiting Independence Properties, From Distributions to Graphs, Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models.

Recommended Books:

1. ElaineRich and KevinKnight, "Artificial Intelligence", Tata McGraw Hill, 3rd edition, 2012.

2. DanW.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 2012

3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3rd edition, 2014

4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1st Edition, 2016
5. StuartRussell, PeterNorving, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd edition, 2010.
6. MitchellT.M., Machine Learning, McGraw Hill
7. Bishop C., Pattern Recognition and Machine Learning, Springer-Verlag
8. JoelGrus, "Data Science from Scratch-First Principles with Python", O'Reilly, 2015
9. M. Gopal, "Applied MACHINE LEARNING", McGraw-Hill, 2018
10. Dr. Mahaveer Kumar Sain, "Introduction to Machine Learning", Akinik Publications-New Delhi, 2021.

Course Code: BCA-40-P-502	Course Title: **Machine Learning Lab**
Course Credit : **02**	Hours/Week: **04**

Content: Suggested Experiments :

1. Install and set up Python and essential libraries like NumPy and pandas.
2. Introduce scikit-learn as a machine learning library. 3
3. Install and set up scikit-learn and other necessary tools.
4. Write a program to Load and explore the dataset of .CVS and excel files using pandas.
5. Write a program to Visualize the dataset to gain insights using Matplotlib or Seaborn by plotting scatter plots, bar charts.
6. Write a program to Handle missing data, encode categorical variables, and perform feature scaling.
7. Write a program to implement a k-Nearest Neighbours (k-NN) classifier using scikit- learn and Train the classifier on the dataset and evaluate its performance.
8. Write a program to implement a linear regression model for regression tasks and Train the model on a dataset with continuous target variables.
9. Write a program to implement a decision tree classifier using scikit-learn and visualize the decision tree and understand its splits.
10. Write a program to Implement K-Means clustering and Visualize clusters.

Course Code: BCA-40-T-503	Course Title: **Python Programming**
Course Credit : **04**	Hours/Week: **04**

Course Objectives (COs):

By the end of this course, students will be able to:

- To gain a solid foundation in the basics of Python programming, including syntax, data types, control structures, and functions.

- To enhance problem-solving abilities by applying Python programming techniques to solve a variety of computational problems.
- Learn to efficiently use and implement built-in data structures such as lists, tuples, dictionaries, and sets.
- To Utilize Python for data analysis and scientific computing using libraries such as NumPy, Pandas, and Matplotlib.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the basics of programming language
- Develop, document, and debug modular Python programs.
- Apply suitable programming constructs and built-in data structures to solve a problem.
- Use and apply various data objects in Python.
- Use classes and objects in application programs and handle files.

Python Programming

UNIT-I

Python Concepts: Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Standard Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Sequences: Strings, Sequences, String-Operators & functions, Special Features of Strings, Memory Management, programs & examples.

Conditionals and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement

Unit-II

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, Python libraries(Strings, Data structures & algorithms).

Lists and Sets: Built-in Functions, List type built in Methods, Tuples, Tuple Operators, Special Features of Tuples, **Set**: Introduction, Accessing, Built-in Methods (Add, Update, Clear, Copy, Discard, Remove), Operations (Union, Intersection, Difference).

Unit-III

Dictionaries : Introduction to Dictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Sorting and Looping, Nested Dictionaries.

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Regular Expression: Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.

Unit-IV

Excetiptons: Concepts of Exceptions, Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

Database Interaction : SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, **Python Multithreading**: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.

Recommended Books:

1. R. NageswaraRao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020
3. MartinC.Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2021.
4. AshokNamdevKamthane; "Programming and Problem Solving with Python";2nd Edn, MGH,2020
5. AllenB.Downey, "Think Python", O'Reilly Media, 2016
6. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro,Ingram, "Advanced Python Programming", short title, 2019
7. DavidM.Beazley, "Python Essential Reference", Amazon Books, 2010.
8. M. Lutz, "Programming Python, 4th Edition", O'Reilly Media, 2010
9. DeepakThomas,Wrox Press

Course Code: BCA – 40 – P – 504	Course Title: **Python Lab**
Course Credit : **02**	Hours/Week: **04**

Content: Suggested Experiments

1. Program to Find the biggest number among three numbers
2. Program to print all the prime numbers with in the given range
3. Python script to display the grade of student using obtained marks.
4. Write a Python script to find the minimum and maximum elements without using built-in operations in the lists
5. Write a Python script to create a list with different data types
6. Write a Python script to find the repeated items of a tuple.
7. Write a Python script to perform Union, Intersection, difference and symmetric difference of given two sets.
8. Write a Python script to concatenate following dictionaries to create a new one.
9. Write a Python script to sort (ascending and descending) a dictionary by value
10. Write a Python script to handle simple errors by using exception handling mechanism
11. Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it

12. Implement python script that takes a list of words and returns the length of the longest one.
13. Write a python script that read a text file and return those lines which start with a specific letter or specific word.
14. Write a Python script to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).
15. Write a Python script to handle simple errors by using exception handling mechanism
16. Write a Python script to implement multithreading.
17. Write a Python script to implement database connectivity along with basic operations of database.

Course Code: BCA-40-T-505	Course Title: **Data Communication & Computer Networks**
Course Credit : 06	Hours/Week: 06

Course Objectives (COs):

By the end of this course, students will be able to:

- Understand the basic concepts, types of networks, OSI, ans TCP/IP models with working of all the layers in detail

- Learn and understand the working of different hardware components used in networking and various communication protocols

- Learn and understand various issues involved in network security, and methods used to implement network security.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the fundamentals of data communication and networking concepts.

- Analyze and design network architectures and topologies.

- Configure and troubleshoot network devices and protocols.

- Apply network security measures to protect data transmission.

- Understand emerging trends and technologies in data communication and networks.

Data Communication & Computer Networks

UNIT-I

Introduction: Network definition, Network topologies, Types of Network, Layered network architecture, Categories of Network, protocol, Standards and interface.

Network Models :client-server, peer-to-peer, OSI reference model, Architecture and functions of layers. TCP/IP protocol suite.

UNIT-II

Data Communication Fundamentals: Analog and digital signal, Data-rate limits, Digital to digital & Digital to analog modulation. Guided and Unguided Transmission media

Data Link Layer and Network Devices Data link layer: framing, error detection and Corrections, flow control, Network devices: switches, routers, bridges, etc., MAC addressing and Ethernet standards.

UNIT-III

Networks Layer Functions and Protocols: Routing, Routing algorithms, Network layer protocol of Internet- IP protocol.

Transport Layer Functions and Protocols: Transport services, Berkeley socket interface overview, Transport layer protocol of Internet- UDP and TCP. Overview of Application layer protocol, DNS protocol, WWW &HTTP protocols.

UNIT-IV

Circuit Switching : Simple Circuit Switching, Circuit Switching Networks, Space Division switching, Time Division Multiplexing, Routing in Switching Networks, Control Signals & Channels. Packet Switching concepts and principles.

Network Security and Wireless Networks Network security concepts: encryption, firewalls, VPN, Wireless networks and technologies.

Recommended Books :

1. BehrouzA.Forouzan, "Data Communication and Networking", 4th edition, Tata McGraw Hill.
2. A. S.Tanenbaum, "Computer Networks", Pearson Education Asia, 4th Ed..
3. WilliamStallings, "Data and computer communications", Pearson education Asia, 7th Ed.
4. "Computer Networking: A Top-Down Approach" by JamesF.Kurose and KeithW.Ross.

Semester: VI

Course Code: BCA-40-T-601	Course Title: .NET Framework with C#
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:

- To introduce the fundamentals of the .NET framework.
- To learn about ASP.NET for web application development.
- To explore web forms, MVC architecture, and web services in ASP.NET.
- To understand data access techniques using ADO.NET.
- To develop and deploy ASP.NET applications.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- To learn fundamentals of. net framework
- To enrich knowledge about Windows Forms, Controls and ASP.NET based applications.
- To acquire skills to create web-based applications and Reports using.net technologies.
- To enrich knowledge about ADO.NET Controls and Database based applications.

.NET Framework With C#

Unit-I

Introduction to .Net framework: Managed Code and the CLR Intermediate Language, Metadata and JIT Compilation Automatic Memory Management

The Framework Class Library: .Net objects- ASP .NET, NET web services, Windows Forms.

Elements : Variable and constants data types, declaration. Operators, types precedence, Expressions Program flow, Decision statements, if then if. Then.else.select.case, Loop statements while and while, do.loop. for next for each.next

Unit-II

Types: Value data types Structures, Enumerations, Reference data types, arrays.

Windows Programming: Creating windows forms windows controls, Button, Check box, Combo box, Label, List box Radio Button, Text box, Events, Click, close deactivate, Load, mousemove, mousedown, mouseup.

Menus and Dialog Boxes : Creating menus, menu items, context menu, Using dialog boxes, show dialog() method.

Unit – III

ADO.NET : Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

ASP.NET Features: Application of States and Structure; Change the Home Directory in IIS- Add a Virtual Directory in IIS- Set a Default Document for IIS – Change Log File Properties for IIS-Stop, Start, or Pause a Web Site.

Unit-IV

Creating Web Controls: Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page.

Creating Web Forms: Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

Web Services and WCF: Web Services protocol and standards – WSDL Documents-Visual Studio.NET Architecture of WCF, WCF Client

Recommended Books :

1. Mathew Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3rd Edition, A Pres.
2. BillEvjenScottHanselman, DevinRader: Professional ASP.NET4, 2010, Willey.
3. GeorgeShepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
4. ImarSpaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer) , 2010 Wiely Publishing.
5. StevenHolzner; ASP.NET 4.0 (Cover C# & VB) Black Book; Dreamtech Press.
6. StevenHolzner; .NET Programming Black Book; Dreamtech Press.

Course Code: BCA-40-P-602	Course Title: .NET with C# Lab
Course Credit : 02	Hours/Week: 04

Content: Suggested Experiments

1. Simple application of window programming
2. Use of control structures in array handling
3. Implementation of basic data structures
4. Functions overloading
5. Working with GUI controls
6. Handling of multiple classes using interfaces
7. Event handling with controls
8. Working with Data Controls

9. Dynamic data binding
10. Use of Validation controls
11. Creating Forms & Dialog boxes
12. Working with Web Controls
13. Creating & Implementation User controls
14. Create Web sites
15. Session Management
16. Exception handling using Ajax toolkit
17. Web Services and WCF.

Course Code: BCA-40-T-603	Course Title: **Introduction to Data Science**
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:
- To introduce the basics of data science and its applications.
- To learn about data manipulation, visualization, and analysis using R.
- To explore statistical modeling, machine learning, and data mining techniques.
- To implement data science projects using R programming language.
- To study real-world applications and case studies of data science.

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:
- Understand the fundamental concepts and principles of data science.
- Apply data manipulation techniques using appropriate tools and libraries.
- Analyse and visualize data to extract insights and make data-driven decisions.
- Apply statistical methods and machine learning algorithms to analyse data.
- Communicate data findings effectively through data visualization and storytelling.

Introduction to Data Science

Unit-I

Introduction to Data Science : Concept of Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process : Overview of data science process, setting the research goal, Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis. Data Modeling, Presentation and automation

Data Analytics: Types of Analytics, Data Analytics Lifecycle: Overview - Discovery - Data Preparation - Model Planning - Model Building, Regression analysis, Classification techniques, Clustering, Association rules analysis.

Unit-III

Statistics : Basic terminologies, Population, Sample, Parameter, Estimate, Estimator, Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Central tendency , Measures of Spread, Probability, Normal Distribution, Binary Distribution, Hypothesis Testing ,Chi-Square Test.

Unit-IV

Data Science Tools and Algorithms : Basic Data Science languages- R, Python, Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms - Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

Recommended Books :

1. SamuelBurns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. DavyCielen, ArnoD.B.Meysman, MohamedAli, "Introducing Data Science", Manning Publications, 2016
3. CathyO'Neil and RachelSchutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

Course Code: BCA-40-P-604	Course Title: **Data Science Lab**
Course Credit : 02	Hours/Week: 04

Content: Suggested Experiments

R Programming: Fundamentals, Properties & Characteristics, Data Types,Operators,Control & Looping Structures, Array & String handling, Functions, Vector & Matrices processing, Factors, Data Frames, Packages, Data Reshaping, Data and File management, Charts and Graphs.

Data science with R/Python : Overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,

Regression Algorithms in R/Python : How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

Course Code: BCA-40-T-605	Course Title: **Cloud Computing**
Course Credit : 06	Hours/Week: 06

Course Objectives (COs):

By the end of this course, students will be able to:

- To understand the principles and paradigm of Cloud Computing
- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions
- Ability to understand role of Virtualization Technologies
- Design & develop backup strategies for cloud data based on features

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the key dimensions of the challenges and benefits of Cloud Computing.
- Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies
- Implement different types of Virtualization technologies and Service Oriented Architecture systems.
- Choose among various cloud technologies for implementing applications.
- Install and use current cloud technologies.

Cloud Computing

Unit-I

Introduction of Cloud Computing: Definition, Historical Developments, Enabling Technology, Vision, Essential Characteristics of Cloud Computing , Components of Cloud Computing. Challenges and Approaches of Migration into Cloud, Cloud Applications: – Health care, CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming. Benefits: For the Market, Enterprise, End user and Individuals.

Unit-II

Cloud Computing Architecture : Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance. Parallel and distributed Computing-MapReduce, High level Language for Cloud, Service Oriented Computing.

Unit-III

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Virtualization: of CPU, Memory, I/O Devices, Server , Desktop, Network, and data-center. Pros and Cons of Virtualization, Technology Examples-VMware and Microsoft Hyper-V,KVM, Xen.

Introduction of Cloud security services, Design Principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Cloud Security technologies to secure the data in Private and Public. Security Concerns. Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements.

Unit-IV

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life-Cycle, cost model..

Recommended Books:

1. Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A.Goscinski, Pub.-Wiley-2016
2. KumarSaurabh, "Cloud Computing" , Wiley Pub 2016
3. "Cloud Computing: Concepts, Technology & Architecture" by ThomasErl, RicardoPuttini, and ZaighamMahmood
4. "Cloud Computing: A Practical Approach" by AnthonyT.Velte, Toby J.Velte, and RobertElsenpeter
5. Mastering Cloud Computing by RajkumarBuyya, ChristianVecchiola, S.ThamaraiSelvi from TMH 2013.
6. Distributed and Cloud Computing, KaiHawang , GeofreyC.Fox, JackJ.DongarraPub: Elservier, 2013
7. Krutz , Vines, "Cloud Security " , Wiley Pub,2010
8. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
9. KatarinaStanoevska-Slabeva, ThomasWozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

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