



HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABUS

Under CBCS

(Applicable for Students admitted from Academic Year 2018-19)

B. Tech. Computer Science Engineering With Specialization in Cloud Computing and Virtualization (In Collaboration with IBM)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF COMPUTING SCIENCES

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

VISION AND MISSION

MOTTO

“To Make Every Man A Success And No Man A Failure”

VISION

To be an International Institute of Excellence, providing a conducive environment for education with a strong emphasis on innovation, quality, research and strategic partnership blended with values and commitment to society.

MISSION

- To create an ecosystem for learning and world class research.
- To nurture a sense of creativity and innovation.
- To instill highest ethical standards and values with a sense of professionalism.
- To take up activities for the development of Society.
- To develop national and international collaboration and strategic partnership with industry and institutes of excellence.
- To enable graduates to become future leaders and innovators.

VALUE STATEMENT

- Integrity, Innovation, Internationalization

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

VISION AND MISSION

VISION

To excel in Computer Science and Engineering education, research and project management by empowering the students with strong conceptual knowledge.

MISSION

- M1:** To educate the students with basic foundation blocks of core and allied disciplines of Computer Science and Engineering.
- M2:** To provide practical skills in the advancements of the Computer Science and Engineering field required for the growing dynamic IT and ITES industries.
- M3:** To sculpt strong personal, technical, research, entrepreneurial, and leadership skills.
- M4:** To inculcate knowledge in lifelong learning, professional ethics and contribution to the society.

B. Tech. Computer Science and Engineering

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The Program Educational Objectives (PEOs) of the **Computer Science and Engineering** are listed below:

The graduate after 3-5 years of programme completion will

- PEO1:** Excel in his/her professional career and/or pursue higher education including research by applying the knowledge of Computer Science and Engineering.
- PEO2:** Demonstrate the technical skills to analyze and design appropriate solutions for problems with social consciousness and ethical values.
- PEO3:** Adapt themselves to organizational needs by understanding the dynamically changing technologies.

PROGRAM OUTCOMES (ALIGNED WITH GRADUATE ATTRIBUTES) (PO)

(To be achieved by the student after every semester/year/and at the time of graduation)

At the end of this program, graduates will be able to

- PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

- PO6:** **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7:** **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8:** **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9:** **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10:** **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11:** **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12:** **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

On completion of the B.Tech. Computer Science & Engineering degree the graduates will be able to

- PSO1:** Apply mathematical, conceptual knowledge of computing and analytical skills to solve complex problems.
- PSO2:** Design and develop computer systems based on the domains of Cyber Physical Systems, Algorithm Design Techniques and Enterprise systems security.
- PSO3:** Do innovative system design with analytical knowledge by developing modern tools and techniques.



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**B.TECH. CSE WITH SPECIALIZATION IN CLOUD COMPUTING AND VIRTUALIZATION
(IN COLLABORATION WITH IBM)**

(177 CREDIT STRUCTURE)

SEMESTER – I

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	HS/ES	ELA4101/ MEA4101	Professional English and Soft Skills /Engineering Graphics and Computer Aided Design	1	1	2	3	1	4
2	BS	MAA4101	Matrices and Calculus	3	0	2	4	0	5
3	BS	PHA4102/C YA4101	Engineering Physics/Engineering Materials	3	0	0	3	1	3
4	PC	CSA4101	Problem Solving Using C	2	0	2	3	1	4
5	ES	EEB4101 /CSB4101	Introduction to Digital Systems / Engineering and Design	3	0	0	3	1	3
6	ES	GEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2
7	BS	PHA4131/C YA4131	Engineering Physics Lab/ Materials Chemistry Lab	0	0	2	1	0	2
Total				12	1	10	17.5	6	23

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SEMESTER – II

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4117	Analytical Mathematics	3	0	2	4	1	5
2	BS	PHA4102/C YA4101	Engineering Physics/ Engineering Materials	3	0	0	3	1	3

3	HS/ES	ELA4101/ MEA4101	Professional English and Soft Skills /Engineering Graphics and Computer Aided Design	1	1	2	3	1	4
4	ES	EEB4101 / CSB4101	Introduction to Digital Systems / Engineering and Design	2	0	2	3	1	4
5	ES	GEA4102	Sustainable Engineering Systems	2	0	0	2	1	3
6	PC	CSB4117	Data Structures using C	3	0	0	3	1	3
7	PC	CSB4118	Object Oriented Programming using C++	3	0	2	4	1	5
8	PC	CSB4146	Data Structures Lab	0	0	3	1	0	3
9	ES	GEA4131	Engineering Immersion Lab	0	0	2	0.5	2	2
10	BS	PHA4131/C YA4131	Engineering Physics Lab/ Materials Chemistry Lab	0	0	2	1	0	2
11	PC	IBC4101	Introduction to Open Source Software and Open Standards	2	0	0	2	0	2
Total				19	1	15	26.5	9	36

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SEMESTER – III

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4201	Partial Differential Equations and Transforms	3	0	2	4	0	5
2	PC	CSB4201	Design and Analysis of Algorithms	2	1	2	4	1	5
3	PC	CSB4202	Database Management Systems	3	0	0	3	1	3
4	PC	CSB4203	Java Programming	3	0	2	4	0	5
5	DE	IBC4201	IT Infrastructure Landscape	3	0	0	3	0	3
6	NE	CSD42**	Non-Department Elective- I	2	0	0	2	0	2
7	PC	CSB4231	Python Programming Lab	0	0	3	1	0	3
8	PC	CSB4232	Database Management Systems Lab	0	0	3	1	0	3
Total				16	1	12	22	2	29

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SEMESTER – IV

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4219	Discrete Mathematics	3	1	0	4	0	4
2	PC	CSB4216	Computer Organization and Architecture	3	0	0	3	1	3
3	PC	CSB4217	Computer Networks	3	0	0	3	1	3
4	PC	CSB4218	Operating Systems	3	0	0	3	1	3
5	DE	IBC4216	Introduction to Virtualization and Cloud Computing	3	0	0	3	0	3
6	NE	CSD42**	Non-Department Elective–II	2	0	0	2	0	2
7	PC	CSB4241	Networking Lab	0	0	3	1	0	3
8	PC	CSB4242	Operating Systems Lab	0	0	3	1	0	3
9	PC	CSB4243	Design Project-I	0	0	2	1	0	2
10	-	-	Internship	0	0	0	1	0	0
11	DE	IBC4241	Virtualization Lab	0	0	2	1	0	3
Total				17	1	10	23	3	29

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(177 CREDIT STRUCTURE)

SEMESTER – V

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	BS	MAA4302	Probability and Statistics	3	0	2	4	0	5
2	PC	IBC4303	Web Programming through PHP & HTML	3	0	2	4	0	5
3	PC	CSB4302	Theory of Computation	3	1	0	4	1	4

4	PC	CSB4303	Artificial Intelligence	3	0	0	3	0	3
5	DE	IBC4301	Cloud Computing Architecture	3	0	0	3	0	3
6	DE	IBC4302	Business Intelligence	3	0	2	4	0	5
7	HS	GEA4216	Professional Ethics and Life Skills	2	0	0	2	1	2
8	NE	CSD43**	Non-Department Elective–III	2	0	0	2	0	2
9	PC	CSB4331	Skill Development in Programming	0	0	2	1	0	2
10	PC	CSB4332	Design Project with IoT	0	0	3	1	0	3
Total				22	1	11	28	2	34

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SEMESTER – VI

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CSB4316	Principles of Compiler Design	3	1	0	4	1	4
2	PC	CSB4318	Data Warehousing and Data Mining	3	0	0	3	1	3
3	PC	CSB4319	Modern Software Engineering	3	0	2	4	1	5
4	HS	GEA4304	Business Economics	2	0	0	2	1	2
5	DE	IBC4316	Cloud Deployment Model	3	0	0	3	0	3
6	DE	IBC4317	Backup & Disaster Recovery	3	0	0	3	0	3
7	DE	IBC4318	Business Process Management	2	0	2	3	0	4
8	PC	CSB4341	Compiler Design lab	0	0	3	1	0	3
9	PC	CSB4342	Design Project-II	0	0	2	1	0	2
11	-	-	Internship	0	0	0	1	0	0
Total				19	1	9	25	4	29

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SEMESTER – VII

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CSB4401	Software Project Management	3	0	0	3	1	3
2	PC	CSB4402	Big Data and Analytics	3	0	2	4	1	5
3	PC	CSB4403	Applied Cryptography and Network Security	3	1	0	4	1	4
4	PC	CSB4404	Programming Paradigms	3	0	0	3	1	3
5	DE	IBC4401	Cloud Performance Tuning	3	0	0	3	0	3
6	DE	IBC4402	Managing the Cloud	3	0	0	3	0	3
7	DE	IBC4403	Service Oriented Architecture	3	0	0	3	0	3
8	PC	CSB4431	Cloud Deployment Lab	2	0	2	3	0	4
9	PC	CSB4432	Design Project-III	0	0	2	1	0	2
Total				23	1	6	27	4	30

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SEMESTER – VIII

SL. NO	COURSE CATEGORY	COURSE CODE	NAME OF THE COURSE	L	T	P	C	S	TCH
1	PC	CSB4441	Project & Viva – voce	0	0	16	8	0	16
Total				0	0	16	8	0	16
Total							177		

SYLLABUS

SEMESTER II

IBC4101	INTRODUCTION TO OPEN SOURCE SOFTWARE AND OPEN STANDARDS	L	T	P	C
		2	0	0	2
Goal	To provide wide knowledge on Open source and its standards				
OBJECTIVES			OUTCOMES		
The course should enable the students to <ol style="list-style-type: none"> 1. Understand the Open Source Software and Open Standards 2. Learn the adoption of open source standards. 3. Realize the role of open source community. 4. Learn the Adoption of open source. 5. Learn the fundamentals of Linux 			The student should be able to <ol style="list-style-type: none"> 1. Have Gained knowledge of Open Source Software and Open Standards. 2. Learn the Open Source Evolution along with case studies. 3. Have understood the significance of open source. 4. Work with Linux. 5. Contribute to open source community. 		

UNIT I INTRODUCTION TO STANDARDS AND EVOLUTION

9

Introduction to Standards; Types of Standards; Open Standard, Closed Standard; Summary and examples. Evolution of Standards; Life Cycle; Importance of Standards and Benefits of Open Standards

Standard Organizations, De Jure standard setters - International Organization for Standardization, International Electro Technical Commission, International Telecommunication Union, ASEAN, Bureau of Indian Standards, De Facto Standard Setters - Bluetooth Special Interest group, USB Implementers forum; Testing and certification, Summary. Introduction, Drivers for adoption - Network effects, Lower costs, Impending benefits; Adoption methods and Process - Degree of association, Methods, process; Examples of Open Standards adoption in the world - SCOSTA, Web Standards; Adoption barriers, Early adopters.

UNIT II ADOPTION OF OPEN STANDARDS&CASE STUDIES

9

Introduction; Drivers of Adoption; Adoption Methods and Process; examples of Open Standard Adoptions in the World; Adoption Barriers; Early adopters

Open Standards Case Study 1 - Transfer Account Procedure (TAP), Open Standards Case Study 2 - Open Document Format (ODF) Major Principles of Open Standards - Openness, Consensus, Due Process, Open IPR, Open World, Open Access, Open meetings, Ongoing support, Open interfaces, Open use.

UNIT III INTRODUCTION TO OPEN SOURCE & HISTORY

9

Introduction to Open Source Software - History of Open Source Software, Initiation of Open Source project start; Open Source Software examples: The Origins, The GNU projects, The Operating System GNU/Linux, The Graphical User Interface KDE/GNOME, Apache Web Server, Application Software; Strengths and Advantages of Open Source Software - Network effects, Lower cost, Availability, Maintainability. Drivers for Adoption - Lower cost of ownership, Quality, Innovation reuse, Technical competence; Open Source Software Assessment, Examples of Open Source Adoption in the World, Open Source Challenges.

History, evolution and benefits of Open Source. History of Open Source - Evolution of UNIX, GNU General Public License - Genesis of GNU, Copyleft- All Rights reserved; Benefits of Open Source.

UNIT IV OPEN SOURCE COMMUNITIES AND DEVELOPMENT PROCESS

9

Open Source Initiative (OSI); Open Source definition; Free Software foundation; Open source development process – Call for Contributions, MythBuster, Brook’s law; Open Source Community; Apache Web Server; Apache Software Foundation (ASF); How to contribute to Open source projects.

Introduction; Drivers for Open Source adoption; Adoption Methods and Process; examples of Open Standard Adoptions in the World; Open Source Challenges.

UNIT V CASE STUDIES ON OPEN STANDARDS - INTRODUCTION TO LINUX

9

Introduction; Open Standards Case Study 1 - Mozilla, Open Standards Case Study 2 - Linux The Operating System – an Overview, Linux Basics, Various Linux distributions available, Working with the System, Shells and Utilities, An Introduction to Linux, Booting – Building the Linux kernel image, Overview, booting BIOS POST, Bootsector and setup, Using LILO as a boot loader, High level initialization, SMP bootup on x86, freeing initialization data and code, Processing kernel command line, Run levels, Changing RUNLEVELS, Init scripts, Creating your own init scripts, Stopping the System- Shutdown(reboot, halt), Preparing for Installation – Installation Checklist, Hardware Requirements, Partitioning, Installation problems.

TOTAL: 45

TEXT BOOK

1. Introduction to Open Source Software & Open Standards by IBM ICE Publications.

SEMESTER III

IBC4201	INTRODUCTION TO IT INFRASTRUCTURE LANDSCAPE	L	T	P	C
		3	0	0	3
Goal	To provide wide knowledge on IT infrastructure landscape.				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. Understand the Database and storage concepts 2. Learn server technologies. 3. Learn directory services. 4. Understand the concepts of network and its security. 5. Learn middleware concepts.			The student should be able to 1. Have gained good knowledge of Database. 2. Have learnt Server Technologies. 3. Design Directory services for the server. 4. Have understood network security concepts. 5. Have learnt some middle ware technologies used.		

UNIT I DATABASE & STORAGE OVERVIEW

9

Understanding Database types, SQL, JDBC, Indexing, Database clustering replication. Storage Networking Technology, Types of storage system, FC- AL, FABRIC, Storage Area Networks, Zones, Storage virtualization

UNIT II SYSTEMS OVERVIEW

9

Server Technology (Rack, Blades, Enterprise, HPC), Operating systems, Virtualization (Hypervisors, Partitioning, VMs, I/O Virtualization), Server Deployment (Physical and Virtual), Server Management console, Server Availability concepts and techniques. Server workloads.

UNIT III DIRECTORY SERVICES OVERVIEW

9

Directory Server concepts, LDAP protocol, LDAP replication topologies, LDIF data exchange

UNIT IV NETWORK & SECURITY OVERVIEW

9

Networking overview - Topologies, Switching and Routing concepts, Firewalls and security zones, VLANs. Security basics, Cryptography & PKI basics, Identity & Access Management, Data security, Storage Security, Network Security (Firewalls, IDS/IPS), Server security - Configuration control & patch management, Firewalls, Physical Security, Security Operations Center concepts, Virtualization Security.

UNIT V APPLICATION AND MIDDLEWARE OVERVIEW

9

Introduction to common Messaging Systems (MQSeries), Web tiered deployment, Application Servers & Clustered deployment, E-mail (Lotus Notes / exchange).

Understanding Data warehouse concepts, Data Warehouse Architectures, Logical Design, Physical Design.

TOTAL: 45

TEXT BOOK

1. Introduction to IT infrastructure Landscape by IBM ICE Publications

SEMESTER IV

IBC4216	INTRODUCTION TO VIRTUALIZATION AND CLOUD COMPUTING	L	T	P	C
		3	0	0	3
Goal	To provide knowledge on virtualization concepts and its application in cloud computing.				
OBJECTIVES			OUTCOMES		
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the basic concepts of virtualization. 2. Learn the network and application virtualization. 3. Learn the basics of cloud computing concepts. 4. Learn the cloud implementation procedures 5. Do case study 			<p>The students should be able to:</p> <ol style="list-style-type: none"> 1. Have gained introductory knowledge of Cloud computing along with Virtualization concepts and implementation. 2. Do virtualization. 3. Implement a cloud. 4. Analyze cloud services. 		

UNIT I INTRODUCTION TO VIRTUALIZATION 9

Traditional IT Infrastructure, Benefits of Virtualization, Types of Virtualization, History of Virtualization.

UNIT II NETWORK AND APPLICATION VIRTUALIZATION 9

Types of Server Virtualization, Hypervisors, Anatomy of Server Virtualization, Benefits of Storage Virtualization, Types of Storage Virtualization, VPN, VLAN, Benefits of Application Virtualization.

UNIT III INTRODUCTION TO CLOUD COMPUTING 9

History, Importance of Virtualization in Cloud, Anatomy of Cloud, Cloud deployment models, Cloud delivery models, Stepping stones for the development of cloud, Grid Computing, Cloud Computing.

UNIT IV CLOUD IMPLEMENTATION**9**

Decision Factors for Cloud Implementations, Public, Private and Hybrid Cloud, Overview, Infrastructure as a Service (IaaS) Cloud Delivery Model, Platform as a Service (PaaS) Cloud Delivery Model, Software as a Service (SaaS) Cloud Delivery Model

UNIT V CASE STUDY**9**

Customer IT Landscape, Triggers of Virtualization, Preparation for Virtualization, Transition Tools for Virtualization, Cost savings, Cloud workload Overview, Workloads most suitable for Cloud, Workloads not suitable for Cloud

TOTAL: 45**TEXT BOOK**

Introduction to Virtualization and Cloud Computing by IBM ICE Publications.

IBC4241	VIRTUALIZATION LAB	L	T	P	C
		0	0	2	1
Goal	To perform virtualization using VMware and Hypervisor				
OBJECTIVES			OUTCOMES		
The course should enable the students to <ul style="list-style-type: none"> Learn virtualization 			The student should be able to <ul style="list-style-type: none"> Do virtualization using a hypervisor 		

LIST OF EXPERIMENTS

1. Virtual Machine Using VMware
2. Virtual Machine Using QEMU
3. KVM on Ubuntu 12.10
4. KVM and guest operating system on CentOS6.3
5. Installation Of VMware ESX Server

SEMESTER V

IBC4301	CLOUD COMPUTING ARCHITECTURE	L	T	P	C
		3	0	0	3
Goal	The subject describes the architecture of cloud computing.				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. Learn the overview of cloud computing concepts. 2. Learn IaaS cloud computing delivery model. 3. Learn PaaS cloud computing delivery model. 4. Learn SaaS cloud computing delivery model. 5. Learn Cloud computing reference architecture.			The student should be able to 1. Have gained knowledge on the concepts of cloud computing. 2. Implement IaaS Cloud delivery model. 3. Implement PaaS Cloud delivery model. 4. Implement SaaS Cloud delivery model. 5. Understand briefly Cloud Computing Reference Architecture.		

UNIT I OVERVIEW OF DELIVERY MODELS IN CLOUD COMPUTING 9

Introduction; Overview of Cloud Computing; Cloud Service models and Cloud Deployment Models; Cloud History – Internet technologies (SOA, Web Services, Web 2.0, mashups), Distributed computing – Utility and Grid Computing, Hardware – VMWare ESXi, Xen, KVM; Virtual Appliances and the open Virtualization format; System Management; Anatomy of Cloud; Benefits of Cloud; Cloud Transformation roadmap; cloud delivery models and their advantages; Cloud computing architecture.

UNIT II INFRASTRUCTURE AS A SERVICE (IAAS) 9

Introduction to Infrastructure as a Service delivery model, characteristics of IaaS, Architecture, examples of IaaS, Applicability of IaaS in the industry, Comparing ISPs and IaaS, Motivations for renting the infrastructure; IaaS Case studies; IaaS enabling Technology; Trusted cloud.

UNIT III PLATFORM AS A SERVICE (PAAS) 9

Introduction to Platform as a Service delivery model, characteristics of PaaS, patterns, architecture and examples of PaaS, Applicability of PaaS in the industry; Integrated Lifecycle Platform; Anchored Lifecycle platform; Enabling Technologies as a Platform; PaaS – best option or not;

UNIT IV SOFTWARE AS A SERVICE (SAAS) 9

Introduction to Software as a Service delivery model, characteristics of SaaS, SaaS Origin; Evolution of SaaS – Salesforce.com's approach; SaaS Economics and Ecosystem; Types of

SaaS Platforms; Architecture, SaaS – Providers; Collaboration as a Service; Enabling and Management tools as a Service; Applicability of SaaS in the industry.

UNIT V CLOUD COMPUTING REFERENCE ARCHITECTURE (CCRA) 9

Introduction to Cloud computing reference architecture (CCRA), benefits of CCRA, Architecture overview – The conceptual Reference Model; Cloud Consumer; Cloud provider; Cloud Auditor; Cloud carrier; Scope of control between Provider and Consumer; CCRA: Architectural Components – Service deployment, Service Orchestration, Cloud Service Management, Security; Cloud Taxonomy; IBM’s Cloud Computing Reference Architecture (CCRA 2.0)

– Introduction, roles, Architectural elements; CCRA evolution; Examples of Cloud Services; versions and application of CCRA for developing clouds.

TOTAL: 45

TEXT BOOK

1. Cloud Computing Architecture by IBM ICE Publications

IBC4302	BUSINESS INTELLIGENCE	L T P C 3 0 2 4
Goal	The course describes the business intelligence concepts and the development of BI using necessary tools	
OBJECTIVES		OUTCOMES
The course should enable the students to <ol style="list-style-type: none"> 1. Learn the basics of Business Intelligence. 2. Learn dashboards design by utilizing key performance indicators that managers can use to improve day-to-day business operations. 3. To learn how to plan and implement BI development projects. 4. To know the administrative and deployment scenarios & issues in BI space. 		The student should be able to <ol style="list-style-type: none"> 1. Understand & appreciate the use of analytical skills and business principles in operational and strategic decision-making by means of BI. 2. Design and develop dashboards. 3. Learn the best practices to work on BI projects. 4. Use IBM Cognos BI tool to develop, implement and administrate wide range of BI artifacts.

UNIT I BI BASICS 9

BI concepts, components & architecture, Previewing the future of BI, End User Assumptions, Setting Up Data for BI, The Functional Area of BI Tools, Query Tools and Reporting , OLAP and Advanced Analytics, Supporting the requirements of senior executives, including performance management

UNIT II ELEMENTS OF BUSINESS INTELLIGENCE SOLUTIONS 9

Reports & ad hoc queries; Analyze OLAP data; Dashboards & Scorecards development, Metadata Models; Automated tasks & events; Mobile & disconnected BI; Collaboration capabilities; Real time monitoring capabilities; Software development kit; Consume BI through portals, web applications, Desktop applications.

UNIT III BUILDING THE BI PROJECT 9

Planning the BI project, Project Resources; Project Tasks, Risk Management and Mitigation, Cost-justifying BI solutions and measuring success, Collecting User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development, Best Practices for BI Design; Post-Implementation Evaluations, Maintaining Your BI Environment.

UNIT IV REPORT AUTHORIZING 9

Building reports with relational vs Multidimensional data models; Types of Reports - List, Crosstabs, Statistics, Chart, map, financial etc; Data Grouping & Sorting, Filtering Reports, Adding Calculations to Reports, Conditional formatting, Adding Summary Lines to Reports. Drill-up, drill-down, drill-through capabilities. Run or schedule report, different output forms – PDF, excel, csv, xml etc.

UNIT V BI DEPLOYMENT, ADMINISTRATION & SECURITY 9

Centralized Versus Decentralized Architecture, BI Architecture Alternatives, phased & incremental BI roadmap, System Sizing, Measurements, and Dependencies, System Sizing, Measurements, and Dependencies. Setting Early Expectations and Measuring the Results. End-User Provisos. OLAP Implementations. Expanding BI, Authentication, Authorization, Access Permissions, Groups and Roles, Single-sign on, Server Administration, Manage Status & Monitoring, Audit, Mail server & Portal integration, Back Up and Restore.

TOTAL: 45

TEXT BOOK

1. Business Intelligence by IBM ICE Publications

IBC4303	WEB PROGRAMMING THROUGH PHP &HTML	L	T	P	C
		3	0	2	4
Goal	The course emphasizes on the basics of web programming through PHP and html.				
OBJECTIVES			OUTCOMES		

<p>The course should enable the student to</p> <ol style="list-style-type: none"> 1. Understand PHP Basics. 2. Learn operators, structures and functions in PHP. 3. Learn arrays and PHP file handling 4. Object Oriented programming features of PHP. 5. Learn advanced PHP 	<p>The students should be able to</p> <ol style="list-style-type: none"> 1. Do PHP programming 2. Embed PHP in HTML 3. Have learnt Javascript 4. Have understood advanced concepts in PHP programming.
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UNIT I PHP BASICS

9

Introduction to PHP, Support for Database, PHP Installation, Working with PHP, Why PHP?, Basic Syntax of PHP, PHP statement terminator and case insensitivity, Embedding PHP in HTML, Comments, Variables, Assigning value to a variable, Constants, Managing Variables.

UNIT II OPERATORS, CONTROLS STRUCTURES AND FUNCTIONS IN PHP

9

Arithmetic Operators, Bit-wise Operators, Comparison Operators, Logical Operators, Concatenation Operator, Incrementing/Decrementing Operator, Ternary Operator, Operator Precedence, String Manipulation: strtoupper(), strtolower(), ucfirst(), ucwords(), strcmp(), strlen(), substr(), trim(), Conditional Control Structures: If statement, If- else statement, If- else if statement, Nested If, Switch statement, Looping Control Structures: For loop, While loop, Do- While loop, For-each, Loop control: Break and Continue. Functions, User-Defined function, Function Definition, Function Call, Function with arguments, Function with return value, Call by value and call by references, Understanding variable scope, Global Variables, Static Variables, Include and Require, Built-in functions in PHP.

UNIT III ARRAYS AND PHP FILE HANDLING

9

Introduction to Array, Array in PHP, Creating an Array, Accessing Elements of an Array, Modifying Elements of an Array, Finding the Size of an Array, Printing an Array in the readable Way, Iterating Array Elements, Modifying Array while iteration, Iterating Array with Numeric index, Removing Element from an Array, Converting an Array to String, Converting String to an Array, Array Sorting, Multidimensional Array, Accessing elements of a Multidimensional Array, Iterating Multidimensional Array. Introduction, File Open, File Creation, Writing to files, Reading from File, Searching a record from a file, Closing a File, Using PHP With HTML Forms.

UNIT IV CLASS, OBJECT AND EXCEPTION HANDLING, JAVA SCRIPT

6

Introduction, Object, Class, Defining Class in PHP, Object in PHP, Usage of \$this variable, Constructor, Constructor with Parameters. Introduction to Exception, Exception Handling mechanisms, Creating Custom Exceptions, Multiple Catch Blocks, Exception Propagation, Error Handling in PHP. Java Introduction, JavaScript Basics.

UNIT V INTRODUCTION TO ADVANCE PHP, SET UP PHP DEVELOPMENT ON ECLIPSE CREATING AND DEBUGGING PHP PROJECTS **12**

Advanced functions in PHP, Serializing data for persistence, Pattern matching with PHP, Object-oriented Programming and PHP, PHP frameworks - CakePHP, Symfony, & Zend Framework, Manage PEAR modules, Install prebuilt PHP applications, Eclipse installation – All in one, PDT runtime, installation via Update Manager Eclipse, Installing a debugger, Running the code inside the web server.

Install the local Web Server, Install the PHP engine. Create and Run PHP Project, Understanding Debug View, The PHP debug perspective – the Variables view, the breakpoints view, the editor view, the console view, the debug output view, the browser output view; Installing and Configuring the debuggers – Install the Zend debugger, Install XDebug, Configure the debuggers, Setting up PDT (PHP Development Tools) – Set up PHP servers, Set up PHP executables, Debug Web Application, Inserting other languages e.g. SQL, HTML, Java Script in PHP Code. SQL – PHP SQL Script Installing PHP Projects on Web Server

TOTAL: 45

TEXT BOOK

1. Web Programming Thru PHP (IBM ICE Publications)
2. PHP Bible - Tim Converse

REFERENCE BOOKS

1. PHP A beginner's guide - Bill McCarthy
2. PHP and MySQL Web Development - Luke Welling
3. Learning PHP - O'Reilly Press
4. <http://in.php.net/quickref.php>
5. <http://www.w3schools.com/php/default.asp>
6. <http://www.tizag.com/php/>

Practical Component:

LIST OF EXPERIMENTS

Basics Programming:

1. Branching Statements using number Exercise
2. Looping Statement
3. String Functions
4. String Manipulation
5. Calculator

Practicals using Functions

1. Generate Employee ID

2. Calculate Tax
3. Reverse a string
4. Call by value and Call by reference
5. Find Grade

Practicals using Arrays

1. Sorting
2. Find grade
3. Sort Array
4. Multidimensional Array
5. Population Details

File Handling programs

1. Writing into an existing file
2. Read from a file
3. Filter the contents from the file
4. File Copy

PHP programming thru HTML

- 1.PHP with HTML

Programs related with PHP Classes and Objects

1. Student Registration
2. Online Examination System
3. Online Feedback System

Exception Handling in PHP

1. User Defined Exception
2. Exception Propagation
3. Error Handling in PHP

Java Scripting

1. Arithmetic Operation
2. Html and java script

SEMESTER VI

IBC4316	CLOUD DEPLOYMENT MODEL	<table border="1"> <tr> <td>L</td> <td>T</td> <td>P</td> <td>C</td> </tr> <tr> <td>3</td> <td>0</td> <td>0</td> <td>3</td> </tr> </table>	L	T	P	C	3	0	0	3
L	T	P	C							
3	0	0	3							
Goal	To provide knowledge about cloud deployment model									
OBJECTIVES		OUTCOMES								
The course should enable the students to 1. Understand the basic concepts of cloud computing. 2. Learn Public cloud deployment model. 3. Learn Private cloud deployment model. 4. Learn Hybrid cloud deployment model. 5. Understand cloud adoption considerations.		The student should be able to 1. Have understood the cloud computing platform. 2. Deploy private cloud. 3. Deploy public cloud. 4. Deploy Hybrid cloud. 5. Have learnt cloud adoption considerations.								

UNIT I CLOUD COMPUTING PLATFORM OVERVIEW

9

Why Cloud Computing; Evolution of Cloud Computing; What is Cloud Computing; Types of Cloud; Cloud Computing Advantages; Illustration of the benefits of Cloud Computing; Cloud Computing Challenges; Cloud Computing Service Models; Cloud Computing deployment models; Cloud adoption considerations; Cloud adoption – Summary

UNIT II PRIVATE CLOUD DEPLOYMENT MODEL

9

Overview of Private cloud deployment model, Illustration of Private Cloud; Advantages and Limitations of private cloud deployment model, Service Management; Journey into private cloud –Planning and Strategy, standardization, Virtualization, Automation. Case Study – Vmware vcloud, IBM Smart cloud entry

UNIT III PUBLIC CLOUD DEPLOYMENT MODEL

9

Introduction; What is Public Cloud; Illustration of Public Cloud; Why Public Cloud; Advantages of Public Cloud; Limitations of Public Cloud – Low degree of security and control, Lack of control on infrastructure configuration, Network latency and accessibility concerns, highest long term cost; Public Vs Private; Journey into Public Cloud – revisit the idea of adopting public cloud, cloud vendor selection, Migration to cloud; Cloud Vendor Selection – SLA, Credits/Compensation terms, Credit process, disaster recovery plan, exclusions, Security and Privacy, Periodic upgrade and Maintenance, data location and jurisdiction, Pricing and Measurability, Interoperability and lock-in, Exit process / termination policies, proven track record; Public Cloud Vendors

UNIT IV HYBRID CLOUD DEPLOYMENT MODEL**9**

Introduction; What is a hybrid Cloud; Why hybrid cloud; Illustration of Hybrid cloud; Advantages of Hybrid cloud; Challenges of Hybrid cloud; Develop and manage hybrid workloads – developing applications for hybrid workloads; Develop applications using PaaS – managing hybrid workloads; Journey into hybrid cloud – Assess current IT Infrastructure and business, Explore cloud computing, Create Cloud deployment strategy plan, Hybrid Cloud implementation.

UNIT V CLOUD ADOPTION CONSIDERATIONS**9**

Other deployment models available – Virtual private clouds, vertical & special purpose clouds, migration paths for cloud adoption, selection criteria for cloud deployment types.

TOTAL: 45**TEXT BOOK**

1. Cloud Deployment Model by IBM ICE Publications

IBC4317	BACKUP AND DISASTER RECOVERY	L	T	P	C
		3	0	0	3
Goal	To provide knowledge about back up and disaster recovery in cloud				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. Learn the fundamentals of data backup. 2. Understand the requirements of backup. 3. Learn the techniques of disaster recovery. 4. Know about the software used for disaster recovery. 5. Know about the media technologies used for disaster recovery.			The student should be able to 1. Gain knowledge of the basics of Data backup and storage. 2. Define requirements of data backup and storage. 3. Design the techniques for data backup. 4. Use appropriate software for taking data backup. 5. Have learnt new media technologies for Data backup and recovery.		

UNIT I FUNDAMENTALS OF DATA BACKUP**9**

Fundamentals of Data storage and backup –Understanding Availability requirements - Recovery Point Objective (RPO), Recovery Time Objective (RTO), Backup mechanisms in virtualized and non-virtualized environment

UNIT II HIGH AVAILABILITY**9**

Overview of High Availability, Definition, Levels of High Availability (Hardware [RAID levels, Clustering, Mirroring], Hypervisor, OS, Application), Cost versus value analysis while deciding the availability requirements.

UNIT III DISASTER RECOVERY 9

Overview of Disaster Recovery, Definition, technologies and constrains, Various types of Disaster recoveries – Local & Remote

UNIT IV BACKUP SOFTWARE 9

Symantec NetBackup - NetBackup Master Servers, Media Servers, Clients, Data Flow within the NetBackup Environments

UNIT V VIRTUAL BACKUP & NEW MEDIA TECHNOLOGIES 9

Virtual Tape Libraries - VTL Types, Virtual Tape Allocation Models, Why VTL? Other Virtualized Media and a Look Ahead, Deduplication, Fixed-Block Deduplication, Variable-Block Deduplication, Data Type Limitations: Media, Mystery, and Mother Nature, Deduplication Types and Terms, Continuous Data Protection/Remote Replication

TOTAL: 45

TEXT BOOK

1. Backup and DR by IBM ICE Publications.

IBC4318	BUSINESS PROCESS MANAGEMENT	L	T	P	C
		2	0	2	3
Goal	To provide in depth knowledge on business process management.				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. Understand the basic concepts of BPM. 2. Learn BPM architecture 3. Learn business process modelling and analysis. 4. Learn the process of architecting complex BP. 5. Realize BPM as enabler of SOA.			The student should be able to 1. Model processes for subsequent implementation in Business Process Management Systems. 2. Understand the difference between Business Processes and Business Rules, and be able to select an appropriate information system. 3. Have known the different phases of the process management lifecycle, supporting technologies, and how to transition between the phases of the lifecycle		

UNIT I UNDERSTANDING BPM CONCEPTS AND ARCHITECTURE 9

BPM Concepts - A Brief History of Process; The Process Perspective; Process Management; Process Modeling; Process Analysis; Business Process Management Framework; Business Process Management Systems (BPMS); BPM vs BPMS; When to choose a BPMS; Aligning IT and Business; Components and structure of a BPMS; Enterprise Process Management Planning; Key Skills, Roles and Responsibilities; BPM Value Proposition.

UNIT II BPM ARCHITECTURE – I 9

The BPM Community; Why automating BPM? Topology of a SOA reference architecture; Positioning of BPM tools BPM Architecture - BPM Design tools ; BPM Deployment tools ; BPM Monitoring and management ; The process engine ; Process definition repository ; Transaction manager ; Example Connector framework; ; EAI and B2B aspects; Topology and scalability. Core BPMS features and Interfaces - Repository support to Database support; The level of required customization; BPEL language compliance; Involvement of development languages; Human workflow solutions.

UNIT III BUSINESS PROCESS MODELING & ANALYSIS 9

Creating a process-driven culture; Change management tools; Process discovery and process diagram; Creating a Discovery Map; Process diagram; Capturing process details; Analyzing the process by using BPM methodology; Conducting a playback of the process diagram; Process value-add analysis; Analyzing the as-is process by value-add analysis; Using a priority matrix as a roadmap for process improvement; Key performance indicators (KPIs); Blueprinting the to-be process; Creating a to-be process; Fault Handling and Exception Management; Defining Events; Configuring Timeouts; Handling Faults; Catching Exceptions ; Compensation Management

UNITIV ARCHITECTING COMPLEX PROCESS APPLICATIONS 9

Data and system architecture, Advanced routing, Integrating with external systems, Building stylish, high- performing user interfaces; Managing complex task and process interactions; Visibility through dashboards and reports

UNIT V BPM AS ENABLER OF SOA 9

SOA Concepts; Benefits; Key components of SOA; Application frontends; Basic Services ; The value of an ESB; Using a Repository; Increased agility for the business

Practical Component:

List of experiments

Section A:

1. Create a Process Model for a Retail Banking Liability product.
2. Create a Process Model for a Retail Banking Loan.
3. Create a Process Model for opening a company current account.
4. Create a Process Model for a Corporate Lending.

Section B:

5. Create a Process Model for a Life Insurance Policy Issuance.
6. Create a Process Model for a Health Insurance Claim settlement to cash less scheme.
7. Create a Process Model for a Fire Insurance Claim settlement.
8. Create a Process Model for Fraud detection in Auto Claims.

TOTAL: 45

TEXT BOOK

1. Business Process Management by IBM ICE Publications.

SEMESTER VII

IBC4401	CLOUD PERFORMANCE TUNING	L	T	P	C
		3	0	0	3
Goal	To impart wide knowledge about cloud performance tuning.				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. Understand Performance Tuning concepts learn the methods to Enhance the performance			The student should be able to 1. Gain knowledge of Performance Tuning concept 2. Gain the knowledge to enhance the performance		

UNIT I PERFORMANCE TUNING CONCEPTS

9

Introduction, Elements of Cloud Infrastructure (Hardware, Operating Systems, Hypervisors, Networks, Power Management), Elements of Performance Tuning (Resource Allocation, Resource Monitoring, Resource Management), Performance Analysis, Performance Monitoring Tools.

UNIT II HARDWARE PERFORMANCE TUNING

9

Introduction, Basic Cloud Hardware Setup(CPU Implications, Memory Consideration, Storage Issues, Network, Power Setup and Management, Heat Dissipation linked

Performance), Zones & LPAR Concepts, Load Balancing, Key Performance Indicators and Metrics, CPU Analysis & Tuning, Clock Frequency, Actual vs Calculated Operations performed per instruction, Branching Penalties, Native vs Adapted Execution

UNIT III OPERATING SYSTEM PERFORMANCE TUNING 9

Overview of Operating Systems, Process Management Techniques, Threads, Multicore Programming, Multithreaded Models, Threading Issues, Implicit Threading, CPU Scheduling (Scheduling Criteria, Multiple Processor Scheduling, Real-Time Scheduling), Memory Management, Main Memory Management, Virtual Memory Management, Storage Management(File Systems, Bulk Storage Systems), I/O Sub-Systems (I/O Application Interface, Kernel I/O Sub-System, Converting I/O Request to HW Activity), Security, Self-Tuning.

UNIT IV HYPERVISOR PERFORMANCE TUNING 9

Hypervisor Basics, Understanding Virtualization, Understanding Virtual Machines, Hypervisor Architecture, Managing a Hypervisor Setup, Managing CPUs for a Virtual Machine, Managing Memory for a Virtual Machine, Managing Storage for a Virtual Machine, Managing Network for a Virtual Machine, Creating a Virtual Machine, Loading Windows in a Virtual Environment, Loading Linux in a Virtual Environment, Copying a Virtual Machine, Managing Additional Devices in a Virtual Machine, Applications in a Virtual Machine.

UNIT V DATABASE PERFORMANCE TUNING & APPLICATION PERFORMANCE TUNING 9

Introduction, RDBMS concepts, types of workload, DB2 Universal Database, Oracle databases, Fundamental Parameters, Sizing a Database system, Designing RDBMS servers, Monitoring an RDBMS system for performance, Tuning an RDBMS system, Code Optimization. Introduction, Code Analysis, Code Optimization, Caching Strategies, Bottleneck Analysis

TOTAL: 45

TEXT BOOK

1. Cloud Performance Tuning by IBM ICE Publications

IBC4402	MANAGING THE CLOUD	L	T	P	C
		3	0	0	3
Goal	To impart knowledge about the cloud management				
OBJECTIVES			OUTCOMES		

The course should enable the students to 1. Understand Service management in cloud, security management in cloud and cloud system administration	The student should be able to 1. Gain Knowledge of Service, security management in cloud and cloud system administration
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UNIT I SERVICE MANAGEMENT IN CLOUD 9

Concept of service management, Characteristics of cloud service management – Workflows, Provisioning, Monitoring the usage, Metering and billing based on resource usage.

UNIT II CLOUD SYSTEM ADMINISTRATION 9

Overview of System Administration, Tasks included in regular system administration (System health check, patching and updates, maintenance outages, sending notifications, maintaining the service catalog, system troubleshooting), configuration management, managing the reports

UNIT III CLOUD GROWTH PLANNING 9

Forecasting the requirements for cloud managed resources, Aligning the cloud service catalog with business requirements (Addition/deletion/modification of service offerings from catalog)

UNIT IV MANAGING SECURITY AND RESILIENCY 9

Understanding the security threats for the cloud, risks involved in the service exposure (depending on the type deployment model – Public/Private/Hybrid), Addressing the security breaches and monitoring the system for any possible threats – Event monitoring, Patching, Managing the Operating System Resources.

TOTAL: 45

TEXT BOOK

1. Managing the cloud by IBM ICE Publications

IBC4403	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3
Goal	To provide wide knowledge on Service Oriented Architecture				
OBJECTIVES			OUTCOMES		
The course should enable the students to 1. To learn SOA overview, SOA solutions, SOA in Enterprise Architecture			The student should be able to 1. Understands SOA solutions, SOA in Enterprise Architecture.		

UNIT I OVERVIEW OF SOA 9

What is a Service Oriented Architecture? Driving Factors for SOA, SOA Principles, SOA Journey, SOA Life Cycle Governance, Introducing the IBM SOA Foundation.

UNIT II SOA SOLUTIONS & BUSINESS PROCESS MANAGEMENT AND SERVICE ORIENTED ARCHITECTURE **9**

Architecting Systems, Design Approaches, Component Based Design, Service Oriented Design, Interface Based Design, Service Oriented Architecture, SOA Conceptual Model. What is Business Process Management? BPM Architecture – Three Phase Approach, Business Process Management Notations, BPM in association with Service Oriented Architecture.

UNIT III WEB SERVICE INTRODUCTION **9**

What is a Service?, Service Interaction, Current Distributed Technologies Overview, What is a Web Service?, Web Service Characteristics, Web Service Standards, Example: Calculator Web Service Written in Java, WSDL 1.1 Web Service Description Language, UDDI – Universal Description Discovery and Integration, UDDI in Detail, Web Service Introduction, Service Oriented Architecture, SOA Characteristics, SOA and Web Service, Why SOA and Web Service, SOA and Cloud Computing, Characteristics of Cloud Computing, Cloud Computing Services, Cloud Computing Model, Sample Code to Access Web Service Using Dynamic Proxy, Sample Scenario for Cloud Computing, Advantages of Cloud Computing, Disadvantages of Cloud Computing.

UNIT IV INTRODUCTION TO ENTERPRISE ARCHITECTURE (EA) **9**

What is an Enterprise?, What is an Architecture?, Who is an Enterprise Architecture?, Layers of Architecture, Need for Enterprise Architecture, Benefits of an Enterprise Architecture, TOGAF – The Open Group Architecture Framework, TOGAF – Enterprise Architecture Domains, Service Oriented Architecture Vs Enterprise Architecture (SOA Vs EA), Perspectives of SOA, Need for SOA in Enterprise Architecture, SOA – Enterprise Architecture Integration, Enterprise Architecture Development Methods, SOI Concerns, SOA Tools.

UNIT V SOA GOVERNANCE AND TECHNICAL STANDARDS **9**

SOA Governance, SOA Governance Framework, SOA Governance – Dimensions from View of People, Process, Technology, Key Factors of SOA Governance Policies, SOA Governance – Implementation, Introduction to Standards, SOA and Cloud Computing Standard, The SOA Reference Architecture (SOA RA) – Technical Standard, SOCCI Governance Model, OSIMM.

TOTAL: 45

TEXT BOOK

1. Service Oriented Architecture by IBM ICE Publications.