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B.Tech. (CSE in Big Data Analytics in association with IBM)
Choice Based Credit System (CBCS) 2017-18

SEMESTER-VI

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS501	-	Theory of Computation	60	20	20	-	-	3	1	-	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES
The student will have ability to:
1. To introduce concepts in automata theory and theory of computation.
2. To identify different formal language classes and their relationships.
3. To design grammars and recognizers for different formal languages.

COURSE OUTCOMES
Upon completion of the subject, students will be able to:
1. Ability to relate practical problems to languages, automata, and computability.
2. Ability to demonstrate an increased level of mathematical sophistication.
3. Ability to apply mathematical and formal techniques for solving problems.

SYLLABUS

UNIT–I
Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT–II
Regular Expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of

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Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT–III

Context Free Grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT–IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT–V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 3rd edition, 2014

REFERENCES:

1. Martin J. C., "Introduction to Languages and Theory of Computations", TMH, 4th edition, 2010.
2. Peter Linz, "An Introduction to Formal Language and Automata", NarosaPub.House, 2011.
3. Papadimitriou, C. and Lewis, C. L., "Elements of the Theory of Computation", PHI, 1997.
4. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS701	-	Cloud Computing	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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COURSE OBJECTIVES
The student will have ability to:
1. Analyze the SAAS, PAAS IAAS services of Cloud Computing to represent how engineering agility inan organization can be created.
2. Assess the exploitation of web services from cloud computing.
3. Configure essential infrastructural components used contained by the cloud.
4. Critically analyze dissimilar techniques for implementing Cloud.
5. Significantly study case studies to derive the most excellent practice model to be appropriate ewhen deploying cloud based applications.

COURSE OUTCOMES
Upon completion of the subject, students will be able to:
1. Investigate the trade-offs among deploying applications in the cloud and overthe local infrastructure.
2. Compute the real-world problems using cloud computing through groupcollaboration.
3. Development and Deployment applications over commercial cloud computing infrastructures.
4. Analyze and investigation of application & hardware performance, scalability, and availability of the underlying cloudtechnologies and software.
5. Classify security and privacy issues in cloud computing.

SYLLABUS

UNIT–I: Overview of Cloud Computing
Advantages, History, and Characteristics of Cloud Computing, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

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UNIT–II : Dynamic Interactions and Computing Architectures
Overview , Service, Deployment, Scope, and Control ,SaaS Interaction Dynamics and Software Stack Control ,SaaS Benefits, Issues and Concerns, Suitability, and Recommendations ,PaaS Dynamics and Software Stack Control ,PaaS Benefits, Issues and Concerns, Suitability, and Recommendations , IaaS Abstract Interaction Dynamics and Software Stack Control Hardware and Infrastructure- Clients, Security, Network, Services. Software as a Service (SaaS)-Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a(PaaS)-IT Evolution Leading to the Cloud, Benefits of PaaS Solutions, Disadvantages ofPaaS Solutions. Infrastructure as a Service (IaaS)-Understanding IaaS, Improving Performancethrough Load Balancing, System and Storage Redundancy.

UNIT–III: Economics of Cloud Computing and Securing the Cloud
Overview, Review of Service Models, SWOT Analysis and Value Proposition, General Cloud Computing Risks. Service Level Agreements and Monitoring- Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling Software Dependencies.

UNIT–IV: Developing Applications and Migrating to the Cloud
Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantagesand disadvantages ,Analyzing the Services- Establishing a Baseline and Metrics- Tools, Best Practices- Finding the Right vendor- Phased-in Vs Flash-cut Approaches- Bringing in Creativity, How Cloud computing might evolve- Researcher Predictions- Responding to Changes- Getting ready.

UNIT–V: Designing Cloud Based Solutions and Coding Cloud Based Applications
System Requirements, Design Is a Give-and-Take Process. Creating a Simple Yahoo Pipe,Amazon Web Services, Using Google App Engine and creating Windows Azure Applications.

TEXT BOOKS:

1. Cloud Computing: A Practical Approach by Anthony T. Velte Toby J. Velte, RobertElsenpeter, 2010 by The McGraw-Hill.
2. Cloud Computing Theory And Practice Danc.Marinercus, Elsevier, 2013.
3. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wile, 2011.
4. Buyya, Selvi ," Mastering Cloud Computing ",TMH Pub.
5. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.

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REFERENCES:

1. Kumar Saurabh, "Cloud Computing" , Wiley Pub,2012.
2. Krutz , Vines, "Cloud Security " , Wiley Pub,2013.
3. Sosinsky, " Cloud Computing" , Wiley Pub,2012.
4. Murray Woodside ; John Chinneck ; Marin Litiou on "Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness"IEEEXplore, Year: 2017, Page(s):277 – 290.
5. ImanSadooghi ;Jesús Hernández Martin ; Tonglin Li on "Understanding the Performance and Potential of Cloud Computing for Scientific Applications" IEEE Xplore, **ISSN:** 2168-7161Page(s): 358 – 371.

LIST OF EXPERIMENTS:

1. Service deployment & Usage over cloud using Virtual Box.
2. Performance evaluation of services over cloud using VMware tool.
3. Management of cloud resources using VMware tool.
4. Working on Aneka for Cloud application.
5. Working of Goggle Drive to make spreadsheet.
6. Working and installation of Google App Engine.
7. Working and installation of Microsoft Azure.
8. Java Application deployment with Azure.
9. Installation and configuration of IBM Smart Cloud.
10. Installation and configuration of Hadoop.
11. Installation and configuration of Euceliptus.
12. Working & usage of Amazon Web Services.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTIT603	-	Cyber and Network Security	60	20	20	0	0	3	-	-	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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COURSE OBJECTIVES

The student will have ability to:
1.To gain a fundamental knowledge of what Cyber Security is and how it applies to your daily work
2. To gain an understanding of terms commonly used in Cyber Security such as vulnerability
3.To gain a fundamental understanding of what an attack is, and how to identify and prevent them from occurring
4. To provide the fundamental skills and understanding needed to identify Cyber Security threats.

COURSE OUTCOMES (04-05)

Upon completion of the subject, students will be able to:
1.Identify physical points of vulnerability in simple networks .
2.Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to
3.attack, and explain the characteristics of hybrid systems.
4.Evaluate the computer network and information security needs of an organization.
5.Formulate, update and communicate short- and long-term organizational cyber-security strategies and policies.
6.Troubleshoot, maintain and update an enterprise-level information security system.

SYLLABUS

UNIT–I

Introduction to Network Security, Computer Security and Cyber Security.Security Terminologies and Principle, Security Threats, Types of attacks (Operating System, application level, Shrink Wrap-code,

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Misconfiguration attacks etc.).Introduction to Intrusion, Terminologies, Intrusion Detection System (IDS), Types of Intrusion Detection Systems, System Integrity Verifiers (SIVS).Indication of Intrusion: System Indications, File System IndicationsIntrusion Detection Tools ,Post attack IDS Measures Evading IDS Systems. Penetration Testing, Categories of securityassessments,Types of Penetration Testing. Risk Management.

UNIT–II

Cryptography, Classical Cryptographic Techniques, Encryption, Decryption, Code Breaking: Methodologies, Cryptanalysis, Cryptography Attacks, Brute-Force Attack, Use of Cryptography. Public key cryptography, Principles of Public key Cryptosystems, Cryptographic Algorithms RSA, Data Encryption Standard (DES), RC4, RC5, RC6, Blowfish, Key Management, Diffie-Hellman key exchange, elliptic curve cryptography.

UNIT–III

Hash Functions, One-way Hash Functions, SHA (Secure Hash Algorithm), Authentication Requirements, Authentication Functions, Kerberos. Message Authentication codes ,Message Digest Functions, MD5, SSL (Secure Sockets Layer), SSH (Secure Shell), Algorithms and Security, Disk Encryption, Government Access to Keys (GAK)Digital Signature: Analysis, Components, Method, Applications, Standard, Algorithm: Signature Generation/Verification, ECDSA, EIgamal Signature Scheme, Digital Certificates.

UNIT–IV.

Cyber security fundamentals, Cyber security Architecture, principles ,Enterprise level Security System, Networks, Applications, Data. The Security Environment Threats, vulnerabilities, and Consequences ,Advanced persistent threats, The state of security today, Why security matters to DoD , Cyber security Management Concepts, Security governance, Management models, roles, and functions, Enterprise Roles and Structures, Information security roles and positions.

UNIT–V

Alternative enterprise structures and interfaces, Strategy and Strategic PlanningStrategy, security strategy, The information security lifecycle, Architecting the enterprise, Security Plans and Policies ,Levels of planning, Planning misalignment, The System Security Plan (SSP),Policy development and implementation, Laws and Regulatory Requirements, Timeline of U.S. laws related to information

security, The Federal Information Security Management Act (FISMA) Security Standards and Controls, Security standards and controls,Certification and accreditation (C&A),Risk Management, Principles of risk, Types of risk, Risk strategies, The Risk Management Framework (RMF)

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice",7th Edition Pearson,2017
2. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, " Network

Security -Private communication in a public world" ,2nd Edition,TMH,2002
3. Fourozon, "Cryptography & Network Security" 4thEdition ,TMH,2005
4.Salvatore J. Stolfo(Editor), Steven M. Bellovin, Insider "Attack and Cyber Security: Beyond the Hacker",1st edition, Springer,2008
5.MayankBhushan "Fundamentals of Cyber Security",1st Edition ,BPB Publication,2017
6. GauravGupta,Sarika Gupta "Information Security and Cyber Laws",1stEdition,Khanna Book Publishing,2011

REFERENCES:

1.CarlEndorf, Eugene Schultz, Jim Mellander**"**INTRUSION DETECTION & PREVENSION**"**,1st Edition,TMH,2007
2.Neal, Krawetz, Introduction to Network Security,1st Edition ,Cengage Learning,2006
3. Joseph MiggaKizza, Computer Network Security,4thedition , Springer International,2017
4. AtulKahate,"Cryptography and Network Security",McGraw Hill,,2009
5.SunitBelapure Nina Godbole"Cyber Security",1st edition, Wiley Publication, 2011

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
BTCS708	-	Advanced RDBMS	60	20	20	0	50	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTIT611	-	Information Storage And Management	60	20	20	30	20	3	1	2	5

Legends: L-Lecture; T-Tutorial/Teacher Guided Student Activity; P–Practical; C-Credit; Q/A–Quiz/Assignment/Attendance, MST Mid Semester Test.

*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

1. An ability to understand various storage architecture & technologies.
2. An ability to understand various technologies used to provide backup & recovery.
3. An ability to understand various techniques used to provide security.
4. Ability to identified information storage system requirements.
5. An ability to develop policy for information storage system.
6. An ability to develop policy for backup& recovery.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Describe & apply storage technologies.
2. Identified storage technologies that provide cost effective IT solution for medium to large scale businesses& data centers.
3. Manage Virtual Server & Storage between Remote locations.
4. Design analysis and manage clusters of resources.

SYLLABUS

Unit-I:

Introduction: Digital data and its types, Information storage, Key characteristics of data center,Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

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Unit-II:

Storage System Architecture: Intelligent disk subsystems overview, Contrast of integrands modulararray, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III:

Introduction to network storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison,Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV:

Hybrid storage solutions and virtualization: memory, network, server, storage & appliances. Datacentre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V:

Information storage on clouds: concept of cloud, cloud computing, storage on cloud, Cloud benefits,Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

1. G. Somasundaram&AlokShrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India

REFERENCES:

1. Saurabh; Cloud Computing : Insight into New era Infrastructure; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.
3. Sosinsky, Cloud Computing Bible, Wiley India.

LIST OF EXPERIMENTS:

1. Install The VNXE Simulator
2. Discover The Infrastructure
3. Navigate The Storage System
4. Create A Block Device
5. Create A File Device
6. Fc San Configuration
7. Fc San Trace
8. IP San Configuration
9. ISCSI San Trace

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCC505	-	**Mobile Ad-hoc Networks**	60	20	20	30	20	3	1	2	5

10. MultipathArray-Based Protection
11. Configuring LUN Protection Monitoring and Reporting.

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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COURSE OBJECTIVES

The student will have ability to:

1. Understand the division of Ad-hoc network functionalities into layers.
2. Be familiar with the components required to build different types of networks
3. Be exposed to the required functionality at each layer
4. Learn the flow control, routing and congestion control algorithms.

COURSE OUTCOMES

Upon completion of the subject, students will be able to:

1. Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
2. Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
3. To understand the routing algorithm used mobile adhoc network
4. To understand the Transport protocol of mobile adhoc network
5. To understand the security mechanism used in mobile adhoc network

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SYLLABUS

UNIT–I
Introduction
Introduction to adhoc networks – definition, characteristics features, applications. Charectristics of Wireless channel, Adhoc Mobility Models:- Indoor and outdoor models.

UNIT–II
Medium Access Protocols
MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT–III
Network Protocols
Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing, AODV.

UNIT–IV
End-End Delivery and Security
Transport layer: Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT–V
Cross Layer Design and Integration of Adhoc for 4G
Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, Ad hoc Networking, Low Price Edition, Pearson Education,Addison, 2008.
3. C.K.Toh, “Ad Hoc Mobile Wireless Networks”, 1st Edition, Pearson Education, 2007.

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4. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education, 2007.

REFERENCES:

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", 5th Edition, Pearson Education, 2010.
2. Nader. F. Mir, "Computer and Communication Networks", 2nd Edition,Pearson Prentice Hall Publishers, 2006.
3. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks",1st Edition, Morgan Kaufmann Publishers, 2004.
4. Carlos De MoraisCordeiro, Dharma PrakashAgrawal "Ad Hoc & Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publishing Company, 2011.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
BTIT505	-	Component Technology	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Understand Client-Server Component.
2. Design component-based software systems using well-structured design methods.
3. Describe, Compare, contrast and evaluate structured, Object Oriented, data Oriented and formal approaches to component modeling.
4. Knowledge of UML notation: ability to produce UML documentation.
5. Analyze a software component problem and be able to design and implement an effective program structures to solve it, including appropriate modularity, separation of abstraction and implementation concerns, use of standard design patterns to solve recurring design problems, and use of standard libraries.
6. Discuss component composition and integration

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Understood basic concepts of Client Server.
2. Acquire knowledge about component-based software systems.
3. Acquire knowledge about formal approaches to component modeling.
4. Shall have the basic knowledge UML notation: ability to produce UML documentation.
5. Shall be able to Solve Component Problem and will be able to design and implement Program Structure.
6. Acquire knowledge ofcomponent composition and integration.

SYLLABUS:

UNIT I - Client/server computing

Building blocks, types of servers, types of clients, types of middleware aspects of client/server systems, sizing, scalability, tiered architecture, client/server models, Requirements of client/server systems, Distributed objects, benefits-drawbacksfrom distributed objects to components

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UNIT II - Component technology
Components: definitions, properties, benefits, components and interfaces, direct and indirect interfaces, versions, interfaces as contracts, callbacks forms of design level reuse connection oriented programming, connectable objects, component architecture, component frameworks, composition, data driven, contextual, aspect oriented programming, subject oriented programming, XML components, component development, assembly.

UNIT III - The Microsoft way-component object model
COM, COM+, DCOM to .NET framework evolution, web services technologies - XML,WSDL,UDDI,SOAP-Common Language Runtime.NET framework class library-ADO.NET,ASP.NET

UNIT IV- The Sun Way-component variety
Applets, servlets, java beans, enterprise beans, EJB architecture, types of beans, characteristics, Building and deploying distributed applications using EJB

UNIT V - The OMG way-system object model
CORBA timeline-CORBA architecture-ORB-services facilities-business objects-IIOP-transport mechanisms- IDL- - CCM- CCM container

TEXT BOOKS:

1. Clemens szyperski,DominikGruntz and Stephan Murer ,Component Software beyond object oriented programming, third edition, Pearson education,2004.
2. Robert Orfali, Dan Harkey, Jeri Edwards, Client/ Server Survival Guide, Third edition, John wiley Inc,2003.

REFERENCES:

1. David Chappell, Understanding .NET, Pearson Education Inc, 2002.
2. Bill Burke, Richard Monson-Haefel, Enterprise JavaBeans, Fifth Edition, O'Reilly, 2001.
3. Dan Harkey, Robert Orfali, Client/Server programming with JAVA and CORBA, second edition, Wiley & sons Inc, 1999.

LIST OF EXPERIMENTS:

The students have to develop distributed applications for a given domain using the following technologies:

1. RMI using JDBC
2. CORBA
3. COM
4. DCOM
5. ASP.NET/C#. NET
6. SERVLETS ,EJB,MESSAGE BEANS
7. An interoperable application involving either language/ network protocol heterogeneity or involvingany two of the above technologies.
8. Application development using ASP, PHP, JSP 9.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
BTCS612	-	Simulation and Modeling	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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COURSE OBJECTIVES

The student will have ability to:
1.Introduce students to the simulation and modeling techniques.
2. Provide a way for students with opportunities to develop basic simulation and modeling
3. Introduce concepts of modeling layers of society's&industrialreal world problems.
4. Build tools to view and control simulations and their results.

COURSE OUTCOMES

On completion of the subject, students will be able to:
1. Characterize a given engineering system in terms of its essential elements, that is, purpose, parameters, constraints, performance requirements, subsystems, interconnections and environmental context.
2. Develop a modeling strategy for a real world engineering system, which considers prediction and evaluation against design criteria, and integrates any required sub-system models.
3. Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
4. Interpret the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project
5. Fundamentals and techniques for designing and using simulation, modeling, and optimization algorithms with applications in system performance modeling, business infrastructure modeling, and distributed and parallel computing. An introduction to advanced complex systems models.

SYLLABUS

UNIT–I
INTRODUCTION

Introduction to simulation & modeling, advantages anddisadvantages of simulation, application areas in communication, computer and softwaredesign, systems and systems environment, components of a

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system, discrete and continuoussystems, model of a system, types of models, discrete-event simulation, steps in a simulationstudy. Simulation Examples- Simulation of queueing systems, on-demand and inventorysystems, simulation for reliability analysis, Introduction to GPSS.

UNIT–II
COMPUTER BASED SYSTEM SIMULATION:
Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III
INTRODUCTION TO QUEUING THEORY
Characteristics of queuing system, Poisson's formula, birth-death system, equilibriumof queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT–IV
VERIFICATION AND VALIDATION
Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT–V
SIMULATION TOOLS
Simulation Tools – Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:
1 Gordon G., System simulation, PHI Learning
2.Singh V.P System Simulation and Modeling NEW AGE INTERNATIONAL, PUBLISHERS
3.Taha H, Operations Research; PHI.
4.Payer, T., Introduction to system simulation, McGraw Hill.
5.Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

REFERENCES:

1. J K Sharma, Operations Research Theory and Application, Pearson Education Pvt Ltd, 2 EditionBanks J; Hand book of Simulation; John Wiley.
2. Law AM and Kelton WD; Simulation Modeling and Analysis; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system
2. Simulate multiplexer using queuing system
3. Simulate Network congestion control algorithms.
4. Simulate disk scheduling algorithms.
5. Simulate a Manufacturing shop and write a program in GPSS.
6. Simulate Telephone system model and write a program in SIMSCRIPT.
7. Graphical Simulation and Modeling using MATLAB.

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B.Tech. (CSE in Big Data Analytics in association with IBM)
Choice Based Credit System (CBCS) 2017-18

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS608	-	Foundation in Business Analytics using IBM Cognos Insight				60	40	0	0	4	2

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks

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			THEORY			PRACTICAL		Th	T	P	CREDITS
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BTCS606	-	**Minor Project**				30	20	0	0	8	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks

Course Objectives:

This course is the masters by coursework Minor Project.

A Minor Project is a substantial work of supervised research or development, requiring the equivalent of about four to six months full-time work from start to finish. A Project involves identifying a task or problem, searching and reviewing relevant literature, a proposed, implemented, and critically analyzed solution to the task or problem, and a written report describing the problem, the relevant literature, the solution, and its relation to other work in the area.

Note: This course includes a work integrated learning experience in which your knowledge and skillswill be applied and assessed in a real or simulated workplace context and where feedback from industry and/ or community is integral to your experience.

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

- Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology

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- Recognize and use research principles and methods applicable to Information Technology.

- **Critical Analysis:**

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

- analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems
- Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- **Problem Solving:**

Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:**

You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:**

You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behavior in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

- **Research and Scholarship:**

You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

- To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

- To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes

Upon successful completion of this course you should be able to:

- Identify a task or problem relevant to /or IT
- Search and review of the relevant literature
- Propose a solution to the task or problem
- Develop a software and/or algorithmic solution to the task or problem
- Implement solutions to meet high quality requirements developed by the supervisor
- Carry out research under supervision
- Present the research in a written form like that used for published papers
- Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar.

In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

- Research project comprising an implemented and critically analyzed solution to the task or problem
- Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area
- Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.