SEMESTER VI

SUBJECT CODE	Category	SUBJECT 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	**DCC**	**Theory of Computation**	60	20	20	0	0	3	1	0	4

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

Course Educational Objectives (CEOs):

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 (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The 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 **10HRS**

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 **9HRS**

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 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.

SEMESTER VI

SUBJECT CODE	Category	SUBJECT 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	**DCC**	**Theory of Computation**	60	20	20	0	0	3	1	0	4

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

Unit-III **8HRS**

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 properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

Unit-IV **7HRS**

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 **8HRS**

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 TM, NP hard and NP complete problem, 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
2. Peter Linz, "An Introduction to Formal Language and Automata", NarosaPub.House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,"Theory of Computer Science", PHI Learning, 3rd edition, 2006

SEMESTER VI

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS501	**DCC**	**Theory of Computation**	60	20	20	0	0	3	1	0	4

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

References:

1. Martin J. C., "Introduction to Languages and Theory of Computations", TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., "Elements of the Theory of Computation", PHI, 1997.
3. Michael Sipser,"Introduction to Theory of Computation", Cengage Learning, 3rd edition, 2013.

SEMESTER VI

SUBJECT CODE	Category	SUBJECT 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*				
BTIT713	**DCC**	**Distributed Systems**	60	20	20	30	20	3	0	2	4

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

Course Educational Objectives (CEOs):

The student will have ability:

1. Understand foundations of Distributed Systems.
2. Introduce the idea of peer to peer services and file system.
3. Understand in detail the system level and support required for distributed system.
4. Understand the issues involved in studying process and resource management.

Course Outcomes (COs):

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

1. Discuss trends in Distributed Systems.
2. Apply network virtualization.
4. Apply remote method invocation and objects.
5. Design process and resource management systems.

SYLLABUS

Unit I **10HRS**

INTRODUCTION Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

Unit II **9HRS**

COMMUNICATION IN DISTRIBUTED SYSTEM

System Model, Interprocess Communication, API for internet protocols, External data representation and Multicast communication, Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation and Objects: Remote Invocation, Introduction request-reply protocols, Remote procedure call, Remote method invocation, Case study: Java RMI – Group communication, Publish-

SEMESTER VI

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BTIT713	**DCC**	**Distributed Systems**	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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subscribe systems, Message queue, shared memory approaches Distributed objects, Case study: Enterprise Java Beans -from objects to components.

Unit-III **8HRS**

PEER TO PEER SERVICES AND FILE SYSTEM Peer-to-peer Systems Introduction, Napster and its legacy, Peer-to-peer Middleware, Routing overlays. Overlay case studies: Pastry, Tapestry, Distributed File Systems, File service architecture, Andrew File system. File System: Features-File model -File accessing models, File sharing semantics Naming: Identifiers, Addresses, Name Resolution, Name Space Implementation, Name Caches LDAP.

Unit-IV **7HRS**

SYNCHRONIZATION AND REPLICATION Introduction Clocks, events and process states ,Synchronizing physical clocks, Logical time and logical clocks , Global states , Coordination and Agreement, Distributed mutual exclusion, Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control – Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

Unit-V **8HRS**

PROCESS & RESOURCE MANAGEMENT Process Management: Process Migration: Features, Mechanism, Threads: Models, Issues, Implementation. Resource Management: Introduction-Features of Scheduling Algorithms, Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

Text Books:

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

SEMESTER VI

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BTIT713	**DCC**	**Distributed Systems**	60	20	20	30	20	3	0	2	4

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

References:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
3. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.

LIST OF EXPERIMENTS:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write the Programs for Remote Procedure call.
3. Write the Programs for Remote Method Invocation.
2. Write the Programs for Thread Programming in JAVA.
3. Implement CORBA file.
4. Write a Program to Increment a Counter in Shared Memory.
5. Implement Network File System (NFS).
6. Creation of a BPEL (Business Process Execution Language) Module and a Composite Application.
7. Study of Web Service Programming.
8. Study of Grid Services using various Tools.
9. Simulate election algorithms.
10. Simulate clock synchronization algorithm.
11. Simulate Distributed Deadlock Detection algorithm.

SEMESTER VI

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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*				
BTCS612	**DCC**	**Simulation and Modeling**	60	20	20	30	20	2	1	2	4

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

Course Educational Objectives (CEOs):

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 (COs):

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

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SUBJECT CODE	Category	SUBJECT 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*				
BTCS612	**DCC**	**Simulation and Modeling**	60	20	20	30	20	2	1	2	4

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

Unit I **10HRS**

INTRODUCTION

Introduction to simulation & modeling, advantages anddisadvantages of simulation, application areas in communication, computer and softwaredesign, systems and systems environment, components of a 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 **9HRS**

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 **8HRS**

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 **7HRS**

VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

SEMESTER VI

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			THEORY			PRACTICAL		Th	T	P	CREDITS
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BTCS612	**DCC**	**Simulation and Modeling**	60	20	20	30	20	2	1	2	4

Legends: **L -** Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P** – Practical; **C -** Credit;
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Unit-V **8HRS**

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 Edition

Banks 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 using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

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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*				
BTCS613	**DCC**	**Software Testing and Quality Assurance**	60	20	20	30	20	2	1	2	4

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

Course Educational Objectives (CEOs):

The student will have ability to:

1. Develop a skill in developing good quality in the software product.
2. Develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time
3. Learn systematic approach to the operation, maintenance, and retirement of software.
4. Learn how to use available resources to develop software, reduce cost of software and how to maintain quality of software
5. Methods and tools of testing and maintenance of software

Course Outcomes (COs):

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

1. Apply approach of Software Testing & QA concepts.
2. Apply modern software testing processes in relation to software development and project management.
3. Create test strategies and plans, design test cases prioritize and execute them.
4. Manage defects within a project.
5. Contribute to efficient delivery of software solutions and implement improvements in the software development processes.

SYLLABUS

Unit I **10HRS**

BASIC CONCEPTS: Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The “V” Concept of Testing.

SEMESTER VI

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS613	**DCC**	**Software Testing and Quality Assurance**	60	20	20	30	20	2	1	2	4

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

Unit II **9HRS**

WHITE BOX TESTING: White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

Unit-III **8HRS**

BLACK BOX TESTING: Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

Unit-IV **7HRS**

SYSTEM TESTING - Functional testing-non-Functional testing-acceptancetesting-performance testing –Factors and Methodology for Performance testing, Regression testing-Methodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

Unit-V **8HRS**

ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING): Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

SEMESTER VI

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS613	**DCC**	**Software Testing and Quality Assurance**	60	20	20	30	20	2	1	2	4

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

TEXT BOOKS:

1. KshirasagarNaik&PriyadarshiTripathy, “Software Testing & Quality Assurance”, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,”Software Engineering: A Practitioner's Approach”, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,”Software Enginerring”, TMH
4. Sommerville,”Software Enginerring”,Pearson Education.
5. 5.“IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle)”, IBM Careeer Education

REFERENCES:

1. KshirasagarNaik&PriyadarshiTripathy, “Software Testing & Quality Assurance”, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,”Software Engineering: A Practitioner's Approach”, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,”Software Enginerring”, TMH
4. Sommerville,”Software Enginerring”,Pearson Education.
5. http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/
6. https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf
7. http://www.tutorialspoint.com/uml/

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
8. Manual Testing for PAN card verification.

SEMESTER VI

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS613	**DCC**	**Software Testing and Quality Assurance**	60	20	20	30	20	2	1	2	4

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

9. Generate test case for ATM machine.
10. Overview of Testing process using Rational Robot.
11. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
12. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

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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*				
BTCS617	**DCC**	**Robotics**	60	20	20	30	20	2	1	2	4

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

Course Educational Objectives (CEOs):

The objective of this course is to impart knowledge about industrial robots for their control and design.

Course Outcomes (COs):

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

1. Perform kinematic and dynamic analyses with simulation.
2. Design control laws for a robot.
3. Integrate mechanical and electrical hardware for a real prototype of robotic device.
4. Select a robotic system for given application.

SYLLABUS

Unit I **10HRS**

Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop and open-loop control systems.Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

Unit II **9HRS**

Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics
Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

Unit-III **8HRS**

Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS617	**DCC**	**Robotics**	60	20	20	30	20	2	1	2	4

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

Unit-IV **7HRS**

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

Unit-IV **8HRS**

Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.
Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.
3. Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.
5. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.
6. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, "Robot Modelling and Control", John Wiley and Sons Inc, 2005
8. Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phathak P.M. and Bouamama B. Ould, "Intelligent Mechatronic System: Modeling, Control and Diagnosis", Springer.

SEMESTER VI

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS617	**DCC**	**Robotics**	60	20	20	30	20	2	1	2	4

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

LIST OF PRACTICALS:

1. Study components of a real robot and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

SEMESTER VI

SUBJECT CODE	Category	SUBJECT 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*				
BTIBM 401	**DCC**	**Micro services and System Designing**	60	20	20	30	20	3	0	2	4

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

Course Educational Objectives (CEOs):

Students will acquire knowledge on:

1. Understand the importance of Microservices and describe its need as an Architecture Implementation.
2. Understand strengthen the understanding of basic concepts of Docker and Kubernetes.
3. Understand the Html and its Tags
4. Understand CSS and how we implement in html
5. Be able to Deploy application on docker and Access the Kubernetes

Course Outcomes (COs):

At the end of the mobility period, students will be able to:

1. Run docker commands.
2. Deploy container and pods on Kubernetes.

Syllabus:

UNIT–I CSS and JavaScript: 10HRS

Understand CSS, JavaScript, and DOM and BOM, Understand Client-side and Server-side Application

UNIT–II Introduction to Micro services: 9HRS

Motivation for Microservices, What is monolithic application? Domain Driven Design, Edge Service, SOA and Microservices, Microservices characteristic, Microservices Security, API management and gateways, the future of Microservices, Microservices Governance, Cloud Application Component Architecture.

UNIT–III Docker: 8HRS

A shipping container for code, Benefits of using containers, Docker basic concepts, Docker architecture, Docker shared and layered file systems technology.

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BTIBM 405	**DCC**	**Micro services and System Designing**	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Deployment of container, learn how to run Docker command, Container ecosystem and orchestration.

UNIT–IV Kubernetes: 7HRS

Kubernetes architecture, Master Node Components, Worker Node Components, Kubernetes Building Blocks, Images, Pods, Labels & Selectors, Namespace, Services, Replication Controller, Replica Sets, Deployments, Autoscaling, Config Maps & Secrets, Deploying Applications on Kubernetes, Kubectl Commands

UNIT–V Case Study: 7HRS

The Journey from Monolith Architecture to Micro services; Refactoring A Monolith application Into A Cloud-Native App.

TEXT BOOKS:

1. Sam Newman ,"Building Microservices", O'Reilly Media
2. Ajay Sharma, "Microservices Architecture", Kindle Edition
3. IBM Career education Microservices Architecture and Implementation

REFERENCES:

R1:*Eberhard Wolff* ,"Microservices — A Practical Guide", Korean translation
R2:Martin Kleppmann ,"Designing Data-Intensive Applications", O'Reilly Media

Video Lectures

https://www.youtube.com/watch?v=lktzQrHQcYU
https://youtu.be/KrPFRhKsXw8

LIST OF EXPERIMENTS:

1. Write a program to define variable, control structure in JavaScript.
2. Study and perform basic Docker commands.

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3. Write docker commands to perform following operations-
   a) PULL & RUN MYSQL Image.
   b) Access running MYSQL container.
   c) Create one database name demo_db.
   d) Inside demo_db create one table named student(id, name, email, age)
   e) Commit edited mysql container.
   f) Push it into docker hub.
4. Write docker commands to perform following operations-
   a) Pull and run httpd server image on windows machine/linux machine.
   b) Access browser and check whether the httpd server is running?
   c) Access running httpd server & change the message(that is displaying on browser)
   d) Commit changes.
   e) Push customized image of httpd server to a repository(Docker Hub).
5. Write Dockerfile that perform following operations
   a) Base image should be alpine.
   b) Add vim and curl in it.
6. Write Dockerfile for NGINX server that perform following instructions-
   a. Base image should be Ubuntu.
   b. Maintainer information should be provided.
   c. Install nginx.
   d. Specify port No. to run nginx server.
   e. Start nginx container.

7. Study and perform basic kubectl commands.
8. Write kubectl commands to launch a single node cluster. (https://www.katacoda.com/courses/kubernetes/launch-single-node-cluster)

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BTIBMC 601	**DCC**	**Artificial Intelligence and Applications**	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

The student will have ability to:

1. Understand the evolution and relevance of AI in the world today.
2. Explore opportunities brought by the intersection between human expertise and machine learning.
3. Understand AI technology building blocks, including: natural language processing, machine and deep learning, neural networks, virtual agents, autonomics and computer vision.
4. Develop a deeper understanding of machine learning techniques and the algorithms that power those systems.
5. Engage in role-playing challenge-based scenarios to propose real-world solutions to different industries using AI and design thinking.

Course Outcomes (COs):

1. Describe the field of AI and its subfields machine learning, NLP and computer vision
2. Describe how Watson technology is being applied to solve real world problems
3. List the Watson services available on the IBM Cloud
4. Describe the purpose of training the various Watson services to adapt them to a closed-domain
5. Describe how to build a chatbot by using the IBM Watson Conversation service

Syllabus:

UNIT–I: AI LANDSCAPE **10 HRS**

AI impact in the world today, History and Evolution of AI, AI Explained, AI Technologies, Applications of A.I. Summary & Resources

UNIT–II: AI INDUSTRY ADOPTION APPROACHES **9 HRS**

AI Industry Impact, Autonomous Vehicles, SmartRobotics, Future Workforce and AI, Applications of AI. Main focus of AI, Summary & Resources.

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UNIT–III: FUTURE TRENDS FOR AI **8 HRS**

Artificial Intelligence Trends, Limits of machine and human, AI predictions in the next 5 years Summary and Resources.

UNIT–IV: MACHINE LEARNING AND DEEP LEARNING **7 HRS**

Machine Learning Explained, Various Algorithms of Machine Learning, Deep Learning Explained, Deep learning ecosystem, Experiments, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications Summary& Resources.

UNIT–V: **8 HRS**

NATURAL LANGUAGE UNDERSTANDING AND COMPUTER VISION

NLP Overview, NLP Explained, Virtual Agents Overview, Virtual Agents for the Enterprise, Summary and Resources, Computer Vision Overview, AI Vision through Deep Learning, Computer Vision for the Enterprise, Experiments. Summary and Resources

COMPUTER VISION

Define computer vision, History of computer vision Tools and Service of completed vision, Use cases of computer vision. Describe cognitive system, Summary and Resources.

TEXT BOOKS:

1. IBM TEXT BOOK

REFERENCES:

1. A Modern Approach" by Norvig and Russell

LIST OF EXPERIMENTS:

1. SETTING UP YOUR CLOUD ACCOUNT

- Obtain an IBM cloud account
- Apply promotion code
- Uses the various services of IBM Cloud

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2. CREATING A MODEL USING MACHINE LEARNING

- Apply Algorithmes
- Train the model
- Test The Model

3. CREATING AN AI VIRTUAL ASSISTANT

- Create a dialog skill
- Create a virtual assistant
- Load virtual assistant with various dialog skills
- Integrate your assistant

4. CREATE A CHATBOT USING PYTHON

- Use python Library
- Train the ChatBot
- Test The ChatBot

5. CREATE AN APPLICATIN USING OPEN CV

- Understand the Open CV Library
- Train The images and test

6.EDGE DETECTION CONCEPT

- Canny Algorithme
- How to detect the edges

7.BASIC UNDERSTANDING OF Tkinter,CREATE A GUI USING PYTHON

- Create an interface for the project
- Use the buttons and drop down

8. BASIC UNDERSTANDING OF NLTK

- Concept of Tokenization
- Concept of Lematization

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BTIT608	**DCC**	**IT Workshop-SciLab/MATLAB**	0	0	0	60	40	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:

1. Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB.
2. Learn application of MATLAB and/or SCILAB for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes (COs):

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

1. Understand the need for simulation/implementation for the verification of mathematical functions.
2. Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning.
3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB.
4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
5. Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB/SCILAB tools.

SYLLABUS

Unit I **10HRS**

INTRODUCTION TO SIMULATION SOFTWARE: About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting SCILAB/MATLAB.
EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.

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Unit II **9HRS**

FLOW CONTROL: If, else, and else if, switch and case, for, while, continue, break try - catch, return.

COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.

Unit-III **8HRS**

MATRICES AND ARRAYS: Entering Matrices sum and transpose, subscripts, colon Operator, magic Function.

WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.

Unit-IV **7HRS**

SCRIPTS & FUNCTIONS: Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation.

OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures

Unit-V **8HRS**

GRAPHICS: Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. SIMULINK

TEXT BOOKS & REFERENCES:

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.
2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. HemaRamachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011

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4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner's Approach by Anil Kumar Verma
6. http://in.mathworks.com/
7. https://www.scilab.org/resources/documentation/tutorials

LIST OF PRACTICALS:

1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using *find( ).*
4. Solve simultaneous equations (maximum of three) using Cramer's rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A*B)=\log_{10} A+ \log_{10} B$ and $\log_{10}(A/B)=\log_{10} A-\log_{10} B$
1. b) Plot the voltage across capacitor during charging $V_c=V_0[1-e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
1. b) Differentiate and integrate y=mx+c, separately, and display the results on the same plot.
7. Plot $y_1=A*\sin(2\pi f_1 t)$, $y_2=B*\cos(2\pi f_2 t)$ and $y_3=A*\sin(2\pi f_1 t)+B*\cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.
8. Integrate and differentiate sin(x) and display the results on the same plot in different colors. Also display sin(x) on the same plot.
9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
10. Find all the even and prime numbers between two numbers (range).
11. Demonstrate (a) reading and display image, (b) converting color image to gray and black-and-white and plotting their histograms, and (c) conversion of image file formats.

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12. Compare the results of the built-in and user-defined function to compute ***cos(x)*** [the series ***cos(x)=1-(x^2/2!)+ (x^4/4!)- (x^6/6!)+ …*** can be used]
13. **Write a program to compute roots of a quadratic equation *$ax^2+bx+c=0$* given a, b and c.**

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BTCS606	**DCC**	**Minor Project**	0	0	0	60	40	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

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.

Course Outcomes (COs):

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:

1. Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology
2. 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

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BTCS606	**DCC**	**Minor Project**	0	0	0	60	40	0	0	4	2

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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 behaviour 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:**

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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:

1. Identify a task or problem relevant to /or IT
2. Search and review of the relevant literature
3. Propose a solution to the task or problem
4. Develop a software and/or algorithmic solution to the task or problem
5. Implement solutions to meet high quality requirements developed by the supervisor
6. Carry out research under supervision
7. Present the research in a written form like that used for published papers
8. 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.

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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:

1. Research project comprising an implemented and critically analyzed solution to the task or problem
2. Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area
3. 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.