SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS501	UG	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 on the 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 formallan guages.

COURSE OUTCOMES

Upon completion of the course, 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.
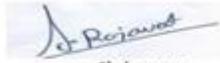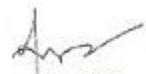
SEMESTER -VI

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.

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, Closureproperties 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.
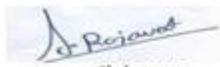
UNIT–V Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.
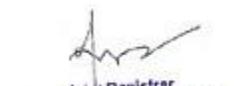
TEXT BOOKS:

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

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

Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS608	UG	Data Science	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 the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES
The objective of this course is to impart necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

COURSE OUTCOMES
Upon completion of the course, students will be able to:
1. Demonstrate understanding of the mathematical foundations needed for data science.
2. Collect, explore, clean, munge and manipulate data.
3. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
4. Build data science applications using Python based toolkits.

SYLLABUS

UNIT–I
Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT–II
Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.
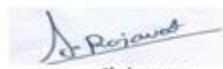
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

UNIT–III

Mathematical Foundations: Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference.

UNIT–IV

Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT–V

Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

List of Practical's:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTIT603	UG	Cyber and Network Security	60	20	20	30	20	3	-	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based on the 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:
1. To gain a fundamental knowledge of Cyber crime and Network Security.
2. To gain a fundamental understanding of a Cyber-attack and Challenges in identify and prevent them from occurring.
3. To gain a fundamental knowledge of Tools and Methods used in Cyber crime for prevention.
4. To understand the need of Cyber law and the fundamental concepts of Cyber Forensic.
5. To provide the fundamental skills and understanding needed to identify Cyber Security threats.

COURSE OUTCOMES:
Upon completion of the course, students will be able to:
1. Identify physical points of vulnerability in simple networks and security needs of an organization.
2. Evaluate the Legal Perspective of Cyber crime and Cyber Security.
3. Formulate, update and communicate short- and long-term organizational cyber-security strategies and policies.
4. Troubleshoot, maintain and update an enterprise-level information security system.
5. Investigate the Cybercrime with the help of Cyber Forensic.

SYLLABUS

UNIT–I
Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services,
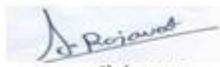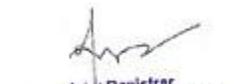
SEMESTER -VI

Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security.

Introduction to Cyber crime, Cyber crime and Information Security, Classification of Cyber crimes, Cyber crime: The Legal Perspective, Cyber crime: An Indian Perspective.

UNIT–II

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cyber crime, Botnets: The fuel of cybercrime, Attack vector, cloud computing.
Cyber crime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT–III

Tools and Methods Used in Cyber crime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT–IV

Cyber crime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, Cybercrime and Punishment.
Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT–V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:
1. William Stallings, "Cryptography and Network Security: Principles and Practice",7th EditionPearson,2017
2. Sunit Belapure, Nina Godbole"Cyber Security",1st edition, Wiley Publication, 2011

REFERENCES:
1. Carl Endorf, Eugene Schultz, Jim Mellander"Intrusion Detection & Prevention", 1st Edition, TMH, 2007
2. Neal, Krawetz, Introduction to Network Security,1st Edition ,Cengage Learning,2006
3. Atul Kahate,"Cryptography and Network Security",McGraw Hill,2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, " Network Security -

SEMESTER -VI

Private communication in a public world" ,2nd Edition,TMH,2002

5. Fourozon, "Cryptography & Network Security" 4thEdition ,TMH,2005
6. Mayank Bhushan "Fundamentals of Cyber Security",1st Edition ,BPB Publication,2017
7. Gaurav Gupta, Sarika Gupta "Information Security and Cyber Laws",1st Edition, Khanna Book Publishing,2011.

List of Practical:

At least 10 experiments Based on the syllabus.

Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTMACS 601	UG	Virtual and Augmented Reality with iOS	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 the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
1. To describe the fundamental concept and components of virtual reality and augmented reality
2. To illustrate the advance concepts and interactive techniques in virtual reality
3. To illustrate the augmented and mixed reality concepts.
4. To describe advanced concepts of ARKit and SceneKit.

Course Outcomes:
At the end of the course the students will be able to: -
1. Ability to develop virtual environments.
2. Ability to develop interaction techniques.
3. Ability to develop immersive augmented reality applications.
4. Ability to develop application using ARKit and SceneKit.

**Syllabus:**
UNIT-I
Introduction to Virtual Reality
Introduction, Fundamental Concept and Components of Virtual Reality, Primary Features and Present Development on Virtual Reality, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR

UNIT-II
Interactive Techniques in Virtual Reality
Introduction, Form 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of
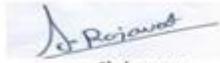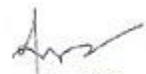
SEMESTER -VI

interaction, VR Systems.

UNIT-III
Augmented and Mixed Reality
Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

UNIT-IV
ARKit and SceneKit Fundamentals:
Introduction, ARKit Game from a Single View Application, UIButton in an ARKit game and LBTA Components, How to Add a box in an ARKit Game with SCNBox, Remove Objects from ARKit Game Scene Tutorial, Reset ARSCN View in ARKit and Default Shapes, Plane detection in ARKit, Add a Floor with SCNPlane and to an ARKit game, Textures Materials in ARKit, Measure Distance in ARKit, Drawing App in ARKit.

UNIT-V
Augmented Reality apps with ARKit and SceneKit on iOS:
SceneKit Basics, disign 3D objects, solar system without code using scene editor, flat surface detection system, image detection system, measuring apps etc.

Text Books:
1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
3. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
4. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.

Reference Books:
1. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
2. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
3. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006.
4. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.

List of Practicals:
1. Developing architecture of a house using Virtual Reality.
2. Perform CRO based experiment using Virtual Reality.
3. Undertaking qualitative analysis in Chemistry using Virtual Reality.
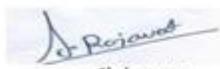
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore
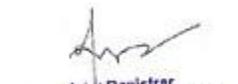
Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

4. Carry out assembly/disassembly of an engine using Virtual Reality.
5. Develop plane detection system apps ARKit or SceneKit.
6. Develop measuring real world distance apps using ARKit or SceneKit.
7. Develop image recognition and tracking apps using ARKit or SceneKit.
8. Develop real world's apps using ARKit or SceneKit.
9. Develop flat surface detection system using ARKit or SceneKit.

Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

| COURSE CODE | CATEGORY | COURSE NAME | TEACHING & EVALUATION SCHEME | | | | | L | T | P | CREDITS |
| | | | THEORY | | | PRACTICAL | | | | | |
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCSMOB 601	UG	Mobile App Development-VI	-	-	-	-	100	-	-	4	2

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

Course Objectives:

1. To illustrate the use of animation in iOS applications.
2. To design complex iOS application.
3. To introduce SwiftUI.

Course Outcomes:

At the end of the course the students will be able to: -

1. Implement animations in iOS applications.
2. Implement complex applications that use notifications and advance layouts.
3. Create applications using third party APIs.
4. Understand new features of SwiftUI.

Syllabus:

UNIT-I
Animations and Collection Views
Animations: How do the pieces fit together?, Conveying an app's personality, Why animate? , What can be animated? , UIView animation methods, Animation closures, The transform property, Animation in practice.
Collection Views: UICollectionView, Collection View Examples, Anatomy of a Collection View, Collection view cells, UICollectionViewLayout, Compositional layout.
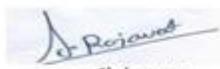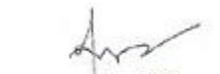
SEMESTER -VI

UNIT-II

Generics and Dynamic Data

Generics: Array, Dictionary, Type constraints, Functions and methods, Associated types.

Dynamic Data: Search Controllers, Handling Data Changes, Diffable Data Sources.

UNIT-III

Layout and Notifications

Compositional Layout: UICollectionViewCompositionalLayout, Core components, Compositional Layout Sizes, Compositional Layout Items, Compositional Layout Groups, Compositional Layout Sections, Compositional Layout Supplementary Views, Multiple Layouts.

Advanced Layout: Advanced Compositional Layout, Section providers, unique sections, Orthogonal scrolling.

Local Notifications: Overview, Local and remote notifications, Best practices, requesting permission, scheduling local notifications, Handling and responding to notifications, actionable notifications.

UNIT-IV

Cloud Based Backend And User Authentication:

Integrate Third party APIs, Store data in Cloud using Firebase, Query Firebase, Firebase for user Authentication .

### UNIT-V

Introduction to SwiftUI:

Overview: App Structure and behavior, User Interface: Views and controls, View Layout and presentation, Drawing and Animation, Framework Integration; Data and Events: Events and Data flow, Gestures.

Text Books:

1. Develop in Swift Data Collections. (as available on Apple Book Store)
2. Develop in Swift Fundamentals.
3. Jon Hoffman ,Mastering Swift 5: Deep dive into the latest edition of the Swift programming language, 5th Edition
4. Matthew Mathias, John Gallagher, Swift Programming: The Big Nerd Ranch Guide 4th edition, 2018.
5. Matt Neuberg , iOS 12 Programming Fundamentals with Swift, OReilly; 5th edition.

Reference Books:

1. Paris Buttfield-Addison, Jonathon Manning , Tim Nugent   Learning Swift: Building Apps for macOS, iOS, and Beyond, O'Reilly Media, Inc., 3rd ed, 2018.
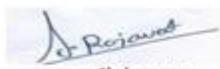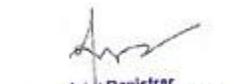
SEMESTER -VI

2. Vandad Nahavandipoor. iOS 11 Swift Programming Cookbook, O'Reilly Media, 2020

List of Practical:

Complete All the Lab Exercises, playgrounds and projects given in student material of Develop in swift Data Collections.

1. Create different apps using view-based animations and UI dynamics.
2. Create different apps using different Advance layout.
3. Create an App to Handle Local and Remote Notifications.
4. Create different apps using third party APIs.

5. Create an App for User Authentication using FireBase.
6. Create an App that Uses Cloud based Storage.
7. Create different applications using new features of SwiftUI.
8. Create an App to recognize gestures.

SEMESTER -VI

COURSE CODE	CATE GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS606	-	**Minor Project**	-	-	-	60	40	-	-	4	2

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 on the 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**
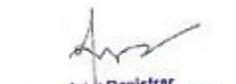
Program Learning Outcomes

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
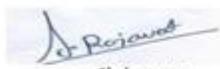
SEMESTER -VI

- 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 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:**

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
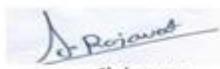
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore
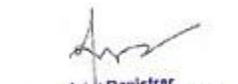
Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

➤ 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.
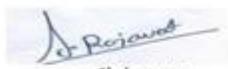
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore
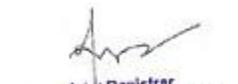
Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

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

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS612	UG	**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 the 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. 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 course, 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 suitabilityto 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.
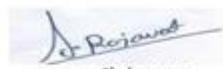
SEMESTER -VI

SYLLABUS

UNIT–I
INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, 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 Taha H, Operations Research; PHI.
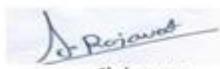
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore
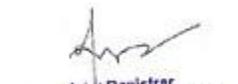
Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

3. Payer, T., Introduction to system simulation, McGraw Hill.
4. 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 Practical:

1. Simulate CPU scheduling algorithm using queuing 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.

Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS613	UG	**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 the 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. 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
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.
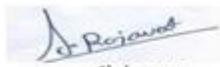
Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore
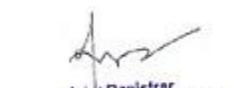
Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

SYLLABUS

UNIT–I
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.

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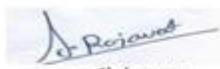
UNIT–IV
SYSTEM TESTING - Functional testing-non-Functional testing-acceptancetesting-performance testing –Factors and Methodology for Performance testing, Regression testing-Methodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality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

UNIT–V
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.

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.
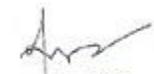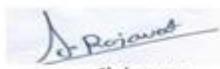
SEMESTER -VI

3. Waman S.Jawadekar,"Software Enginerring", TMH
4. Sommerville,"Software Enginerring",Pearson Education.
5. "IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle)", IBM Careeer Education
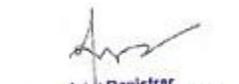
REFERENCES:

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 Practical: (At least 10 based on Syllabus)

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

SEMESTER -VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment	END SEM University Exam	Teachers Assessment*				
BTCS617	UG	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 the following components: Quiz/Assignment/
Project/Participation in Class, given that no component shall exceed more than 10 marks.

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

COURSE OUTCOMES
Upon completion of the course, 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.
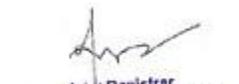
SYLLABUS

UNIT–I
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
Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation,
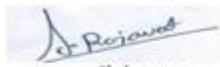
SEMESTER -VI

Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics
Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT–III
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.

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

UNIT–V
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.

List of Practical:
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.

Chairperson
Board of Studies
(Computer Science & Engineering,
Information Technology & Computer Applications)
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

SEMESTER -VI

9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work