COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								CREDITS
			THEORY			PRACTICAL		L	T	P	
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS601N	DCC	Compiler Design	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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Course Objectives:

- To introduce the major concept areas of language translation and compiler design
- To enrich the knowledge in various phases of compiler and its use
- To provide understanding of steps of programming necessary for constructing a compiler

Course Outcomes:

- Ability to apply the knowledge of lex tool &yacc tool to develop a scanner & parser
- Ability to design and develop software system for backend of the compiler
- Ability to comprehend and adapt to new tools and technologies in compiler design

Syllabus

Unit – I: 8 Hours
Introduction: Compiler**,** Compilers analysis of the source program**,** Phases of a compiler**,** Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens.

Unit – II: 10 Hours
Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: 9 Hours
Intermediate Code Generation: Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages**,** Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

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COURSE CODE	CATEGORY	COURSE NAME	END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	L	T	P	CREDITS
			THEORY			**PRACTICAL**					
BTCS601N	DCC	Compiler Design	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 – IV: **10 Hours**

Code Optimization and Run Time Environments: Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: **9 Hours**

Code Generation: Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:
1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:
1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

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*				
BTCS601N	DCC	Compiler Design	60	20	20	30	20	2	1	2	4

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List of Experiments:
1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

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*				
BTCS602N	DCC	Object Oriented Analysis and Design	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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COURSE OBJECTIVES:
1. To learn the concept of Object Oriented Software Development Process
2. To get acquainted with UML Diagrams
3. To understand Object Oriented Analysis Processes

COURSE OUTCOMES:
1. Understand Object Oriented Software Development Process
2. Gain exposure to Object Oriented Methodologies & UML Diagrams
3. To apply Object Oriented Analysis Processes for projects

SYLLABUS

UNIT–I   **10 HOURS**
Introduction: About Object Orientated Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT–II   **9 HOURS**
Class Modeling: Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling:Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling:Use case Models, sequence models, activity models

UNIT–III   **8 HOURS**
Analysis and Design: Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

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BTCS602N	DCC	Object Oriented Analysis and Design	60	20	20	30	20	3	0	2	4

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UNIT–IV   **7 HOURS**
System Design: Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT–V   **8 HOURS**
Class design: Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:
1. Michael Blaha and J. Rumbugh, "Object oriented Modeling and design with UML", Pearson Education

REFERENCES:
1. Satzinger, Jackson and Burd, "Object oriented Analysis and design with the Unified Process", CENGAGE Learning.
2. O'Docherty, "Object Oriented Analysis and Design Understanding, System Development with UML2.0", Wiley India.

LIST OF EXPERIMENTS
1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user's view analysis: Use case diagram.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS602 N	DCC	Object Oriented Analysis and Design	60	20	20	30	20	3	0	2	4

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5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
8. Draw the implementation view diagram: Component diagram.
9. Draw the environmental view diagram: Deployment diagram.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCSIT603N	DCC	Cloud Engineering	60	20	20	30	20	3	0	2	4

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COURSE OBJECTIVES

The student will have ability to:
1. Analyze the SAAS, PAAS IAAS services of Cloud Computing to represent how engineering agility inan organization can be created.
2. Assess the exploitation of web services from cloud computing.
3. Configure essential infrastructural components used for implementing Cloud.
4. Understand the evolution and impact of cloud computing in the world today.

COURSE OUTCOMES

Upon completion of the subject, students will be able to:
1. Investigate the trade-offs among deploying applications in the cloud and over the local infrastructure.
2. Compute the real-world problems security, privacy issues using cloud computing through group collaboration.
3. Development and Deployment applications over commercial cloud computing infrastructures.
4. Understand how deep our industries and societies rely on the cloud computing global

Syllabus

UNIT I

General Cloud Concepts: What is Cloud Computing: Meaning of cloud, Cloud Services, Virtualization, Grid Computing, Cloud Service Attributes: Access to the Cloud, Cloud Hosting, Information Technology Support, Provisioning, Pricing, User Interface, System Interface, Shared Resources/Common Versions**,** Characteristics of Cloud Computing: Rapid elasticity, Pay per use, Independent resource pooling, Load Balancing, Network access, On-demand self-service, The Five Levels of Redundancy, Measured Service, Virtual resource, Availability zone, Region.

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BTCSIT603N	DCC	Cloud Engineering	60	20	20	30	20	3	0	2	4

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UNIT II
Cloud Categories: Public Cloud, Private Cloud, Hybrid Cloud, Multi Cloud vs Hybrid Cloud, OpenStack/OpenShift, ECP Architecture & IaaS/PaaS/XPaaS/CICD realization, Community Cloud Cloud Delivery Models: SaaS, PaaS, Iaas, Design for Failure (DFF). Traditional, Customization, Cloud Architectural Models: Service Reliability and Disruptions, Loss of Control, Emerging Technology, Vendor Choices (Comparison of AWS, Azure , GCP, Ali cloud) Integration Challenges: Infrastructure Limitations, Negligence, Advantages, Savings, Benefits.

UNIT III
AWS General Services: AWS: Cloud computing and Top cloud providers, Service offerings (Paas, Iaas, SaaS), Regions and Availability Zones, Understand pricing model.
IAM: IAM as centralized Access Management, Security Credentials, Access Keys and Key Pairs, Identities (Users, Groups, Roles), Manage IAM policies and permissions for Identities, Create delegated IAM User and assign privileges to access S3 and EC2.
EC2: Scalable computing with EC2, Instances types and AMIs, Instance Lifecycle, EBS and Root device volume , Create and Launch EC2 instance, Access EC2 Instances through CLI and API, what is internal IP, static IP, public IP , Monitoring, Load Balancing, Auto Scaling and Elastic IP, Deploy simple web application on single node, Deploy simple web application on multiple nodes, configure ELB and access the web application using ELB, Auto scale web application and test/ assert based on policies.

UNIT IV
AWS Data & Integration: Data Lake: Object based storage and Key fundamentals, Access management and Security, Lifecycle Management, Storage classes and Glacier, create a bucket and explore operations on object, Encryption options for data stored on S3.

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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BTCSIT603N	DCC	Cloud Engineering	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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Integration: Lambda- Building server less architecture with Lambda, Lambda concepts and Limitations, Lambda functions - configuration and invocation, Types of all Synchronous and Asynchronous event invocations supported, Supported Development Languages, Develop, configure and Use a Lambda, Integration with other services

SNS- What is SNS and How it works? Core components of SNS (Publisher/Subscriber and Topics), Integrate other services with SNS, Invoke Lambda function using SNS notification SQS- What is SQS and How it works? Difference between SNS and SQS, What is Queue and its Types? Understanding Integration Patterns, Create a SQS Queue, Create and Subscribing SQS Queue to SNS Topic.

UNIT V

Monitoring & Advanced Services: CloudWatch: How CloudWatch Works, Monitoring Instances Using CloudWatch, Understanding Metrics and Alarms, create a Cloud Watch alarm to trigger a lambda function, Analyze MR job performance from EMR cloud metrics.

Networking: understand security groups, Network ACLs, VPC, Connectivity between on-premise to VPC, VPC Peering, Direct Connect, VPN, Internet Gateway, NAT, Bastion hosts, Routing - DNS, Route 53, A Record, Routing policies, CDN (CloudFront) Security: understand shared security model.

TEXTBOOKS:
1. Cloud Computing: A Practical Approach by Anthony T. Velte Toby J. Velte,
2. Robert Elsenpeter, 2010 by The McGraw-Hill.
3. Buyya, Selvy," Mastering Cloud Computing ", TMH Pub.
4. Michael Miller, Cloud computing – Web based Applications, Pearson, Publishing, 2011

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			THEORY			PRACTICAL					
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BTCSIT603N	DCC	Cloud Engineering	60	20	20	30	20	3	0	2	4

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REFERENCES:
1. https://www.lifewire.com/what-is-the-cloud-in-computing-3486259
2. https://www.skyhighnetworks.com/cloud-security-blog/what-is-a-cloud-service/
3. https://data-flair.training/blogs/virtualization-in-cloud-computing/
4. https://data-flair.training/blogs/grid-computing-vs-cloud-computing/
5. https://www.oreilly.com/library/view/practical-cloud-security/9781492037507/ch04.html
6. https://blog.resellerclub.com/6-benefits-of-moving-to-cloud-hosting/
7. https://www.hindawi.com/journals/tswj/2014/894362/
8. https://towardsdatascience.com/pricing-on-the-cloud-9a2d3f61b67f
9. https://searchcloudcomputing.techtarget.com/feature/7-key-characteristics-of-cloud-computing
10. https://data-flair.training/blogs/features-of-cloud-computing/
11. https://link.springer.com/content/pdf/10.1186%2Fs13677-016-0066-8.pdf
12. https://www.cvm.com/redundancy-in-the-cloud/
13. https://azure.microsoft.com/en-us/overview/what-are-private-public-hybrid-clouds
14. https://www.abacusnext.com/blog/whats-difference-between-public-private-hybrid-and-community-clouds
15. https://www.cloudtp.com/doppler/hybrid-cloud-vs-multi-cloud-whats-difference-matter/
16. https://linuxhint.com/openshift_vs_openstack/

| 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*				
BTDSE611M	DSC	Block Chain	60	20	20	0	0	3	0	0	3

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COURSE OBJECTIVES
The student will have ability to:
1. Provide conceptual understanding of how block chain technologycan be used to innovate and improve business processes.
2. Covers the technological underpinning of block Chain operations in both theoretical and practical implementation ofsolutions using block Chain technology.

COURSE OUTCOMES
Upon completion of the subject, students will be able to:
1. Understand block chain technology.
2. Develop block chain based solutions and write smart contract using Hyperledger Fabric andEthereum frameworks.
3. Build and deploy block chain application for on premise and cloud based architecture.
4. Integrate ideas from various domains and implement them using block chain technology indifferent perspectives.

SYLLABUS:
UNIT–I   10 Hours
Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Cryptocurrency to Block chain, Permissioned Model of Block chain, Overview of Security aspects ofBlock chain.
Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointerand Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT–II   10 Hours
Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

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			THEORY			PRACTICAL					
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BTDSE611M	DSC	Block Chain	60	20	20	0	0	3	0	0	3

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Working with Consensus in Bitcoin**:** Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashcashPoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT–III   **9 Hours**
Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and usecases, Design issues for Permissionedblock chains, Execute contracts, State machine replication, Overview of Consensus models forpermissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus,Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFTAlgorithm, BFT over Asynchronous systems.

UNIT–IV   **8 Hours**
Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), FoodSecurity, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade FinanceNetwork, Supply Chain Financing, Identity on Block chain.

UNIT–V   **8 Hours**
Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies,Membership and Access Control,Channels, Transaction Validation, Writing smart contract usingHyperledger Fabric, Writing smartcontract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:
1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, 2015.

REFERENCES:
1. Josh Thompsons, "Block Chain: The Block Chain for Beginners- Guide to Block chainTechnology and Leveraging Block Chain Programming".
2. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE611M	DSC	Block Chain	60	20	20	0	0	3	0	0	3

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

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

3. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.
4. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralizationand Smart Contracts Explained", Packt Publishing.
5. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build SmartContracts for Ethereum and Block Chain", Packt Publishing.
6. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman.Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer", Import, 2018

| 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*				
BTDSE612 M	DSC	Robotics	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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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 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   8 Hours
Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop andopen-loopcontrol systems.
Kinematics systems; Definition of mechanisms and manipulators, Social issues andsafety.

UNIT–II   8 Hours
Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation,Coordinatetransformation, DH parameters, Jacobian, Singularity, and StaticsDynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT–III   9 Hours
Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc.
Introductionto Cameras, Camera calibration, Geometry of Image formation,Euclidean/Similarity/Affine/Projective transformations. Vision applications in robotics.

UNIT–IV   8 Hours
Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID.Non-linear and advanced controls.

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*				
BTDSE612 M	DSC	Robotics	60	20	20	0	0	3	0	0	3

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

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UNIT–V   **9 Hours**

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, NewDelhi, 2014.

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

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

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*				
BTDSE613N	DSC	Internet of Things	60	20	20	0	0	3	0	0	3

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

The objective of this course is to impart necessary and practical knowledge of components ofInternet of Things and develop skills required to build real-life IoT based projects.

COURSE OUTCOMES

Upon completion of the subject, students will be able to:
1. Understand internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Remotely monitor data and control devices
4. Develop real life IoT based projects

SYLLABUS:

UNIT–I   10 HOURS
Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing,Actuation, Basics of Networking, M2M and IoT Technology Fundamentals-Devices andgateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role ofCloud in IoT, Security aspects in IoT.

UNIT–II   9 HOURS
Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing,Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication.Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT–III   8 HOURS
IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT–IV   7 HOURS
Device data storage: Unstructured data storage on cloud/local server,Authentication, authorization of devices.

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE613 N	DSC	Internet of Things	60	20	20	0	0	3	0	0	3

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

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXT BOOKS:
1. Vijay Madisetti, ArshdeepBahga, Ïnternet of Things, "A Hands on Approach", UniversityPress.
2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: ApracticalApproach", ETI Labs.
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies,Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi.
5. Adrian McEwen, "Designing the Internet of Things", Wiley.
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill.
7. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media.

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| 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*				
BTCS607N	**PW**	**Minor Project**	0	0	0	60	40	0	0	4	2

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

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.

COURSE OUTCOMES

This course contributes to the following program learning outcomes:

- ### EnablingKnowledge:

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
  ➢ Recognize and use research principles and methods applicable to InformationTechnology.

- ### CriticalAnalysis:

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

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

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BTCS607N	**PW**	**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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- ## ProblemSolving:

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 andScholarship:

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.

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| 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*				
BTCS607N	**PW**	**Minor Project**	**0**	**0**	**0**	**60**	**40**	**0**	**0**	**4**	**2**

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

Course Learning Outcomes

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

- Identify a task or problem relevant to /orIT
- Search and review of the relevantliterature

- Propose a solution to the task orproblem
- Develop a software and/or algorithmic solution to the task orproblem
- Implement solutions to meet high quality requirements developed by thesupervisor
- Carry out research undersupervision
- Present the research in a written form like that used for publishedpapers
- Present the research in an oralseminar.

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 oralseminar.

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:

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BTCS607N	PW	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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- ➢ 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 thearea
- ➢ Seminar on your research (of 20 minutes) soon after your Project issubmitted.

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

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BTCS708 N	DCC	Introduction to Data science	0	0	0	30	20	0	0	2	1

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***Teacher Assessment** shall be based 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 necessary knowledge of the mathematical foundations needed for data science and develop programming skills required to build data science applications.

Course Outcomes (COs):
Upon completion of the subject, 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, Analysisvs 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: Usingthe Twitter APIs),Cleaning and Munging, Manipulating Data, Rescaling,Dimensionality Reduction.

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.

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Information Technology
Choice Based Credit System (CBCS) in the light of NEP-2020
B.Tech. (CSE - Big Data and Cloud Engineering – Impetus Technologies)
SEMESTER-VI(2023-2027)

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*				
BTCS708N	DCC	Introduction to Data science	0	0	0	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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UNIT–IV
Machine Learning: Overview of Machine learning concepts – Over fitting and train/test splits, Typesof 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 TimeSeries-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. AurélienGéron, "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, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, MorganKaufmann Publishers

LIST OF PRACTICALS:
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.

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BTCS708N	DCC	Introduction to Data science	0	0	0	30	20	0	0	2	1

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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