Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. (EC/ECIOT)
(2021-2025)

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*				
BTEC301	DCC	Advanced Programming Concepts	60	20	20	30	20	3	0	4	5

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

Course Educational Objectives (CEOs):

The objective of this course is to-

1. Understand principles of object-oriented programming paradigm including abstraction, encapsulation, inheritance, and polymorphism.
2. Understand Java as a dynamic programming language.
3. Solve computing problems using advanced programming techniques.
4. Apply various system libraries for problem solving.

Course Outcomes (COs):

After completion of this course the students will be able to-

1. Explain the object-oriented concepts.
2. Write programs using object-based programming techniques including classes, objects and inheritance.
3. Demonstrate understanding of Java by implementing test cases.
4. Create, debug, and run Java programs using the Java SDK environment.

Syllabus

UNIT I **9 Hrs.**

Introduction

Review of Object-oriented concepts, Features of Java, Java Environment setup, JVM, JRE and JDK, Java Classes and Objects, Basic syntax, Basic Data Types, Variable Types, Basic Operators, Loop Control, Decision Making, Arrays.

UNIT II **9 Hrs.**

Java Fundamentals

Constructors, Methods and Variables, Method Overloading, Use of this and static keyword in Java, Static and Instance Initializer Blocks, Inner and Nested classes, Wrapper Classes, Autoboxing and Unboxing, Enumerations, Garbage collection.

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UNIT III

Inheritance and Polymorphism **9 Hrs.**

Understanding Inheritance, Types of Inheritance, Use of super keyword in Java, Polymorphism, Types of polymorphism, Method Overloading, Constructor Overloading, Method Overriding, Access Specifier, Packages, Interfaces, Abstract classes.

UNIT IV

Exception Handling and Multithreading **9 Hrs.**

Exceptions and errors, Exception hierarchy: Checked Unchecked exceptions, Types of Exception, Exception Handling using try, catch, finally, throw, throws, User Defined Exceptions.
Understanding Threads, Need of Multi-Threaded Programming, Thread Life cycle, Priorities and scheduling, Thread Synchronization, Inter Communication of Threads, Deadlock.

UNIT V

Java Library **8 Hrs.**

Java String class, String Buffer, String Builder, String Handling. Exploring java.lang, Object class. Exploring java.util package. Exploring java.io package.

Text Books:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw-Hill Education, 2018.
2. E Balagurusamy, "Programming with Java: A Primer", 6th Edition, McGraw Hill Education, 2019.

References:

1. T. Budd, "Understanding Object-Oriented Programming with Java", Pearson Education, 2nd Edition, 2002.
2. J. Nino, F. A. Hosch, "An Introduction to programming and Object-Oriented design using Java", John Wiley & Sons, 3rd Edition 2002.
3. Y. Daniel Liang, " Introduction to Java programming", Pearson Education, India, 7th Edition, 2010.
4. Cay Horetmann, Gary Cornelll, "Core Java 2", Volume II-Advanced Feature", 7th Edition, Pearson Education, 2013

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BTEC301	**DCC**	**Advanced Programming Concepts**	60	20	20	30	20	3	0	4	5

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List of Experiments:

1. Write a program to show concept of Class in Java.
2. Write a program to show Scope of Variables.
3. Write a program showing Type Casting.
4. Write a program to demonstrate use of different types of constructors
5. Write a program for inheritance.
6. Write a program in java to demonstrate access modifiers in java.
7. Write a program showing different types of Polymorphism.
8. Write a program for Exception Handling in Java.
9. Write a Multithreaded program in Java.
10. Write a program for string handling using different methods.

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BTEE503	DCC	Control System Engineering	60	20	20	30	20	2	1	2	4

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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 course will provide understanding of control system and mathematical modeling of the system

Course Outcomes (COs):
After the successful completion of this course students will be able to

1. Demonstrate the understanding of basic element and modeling of the control system.
2. Analyze the stability in time domain and frequency domain
3. Design the controller and compensators for the system

Syllabus

UNIT I **8 Hrs**

Introduction: Basic Elements of Control System, Open loop and Closed loop systems, Differential equation, Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph, Constructional and working concept of ac servomotor.

UNIT II **9 Hrs**

Time Domain Analysis: Standard test signals, Time response of first order systems, Characteristic Equation of Feedback control systems, Transient response of second order systems ,Time domain specifications , Steady state response , Steady state errors and error constants , P, PI, PD and PID Compensation

UNIT III **8 Hrs**

Stability Analysis and Root locus: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

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BTEE503		Control System Engineering	60	20	20	30	20	2	1	2	4

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UNIT IV **8 Hrs**

Frequency domain Analysis: Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots, Stability analysis. Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain

UNIT V **8 Hrs**

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Textbooks:

1. I.J.Nagrath and M.Gopal," Control System Engineering", New Age International Pu blishers, 7th Edition, 2021.
2. Richard C Dorf; Robert H Bishop, "Modern control system", Pearson Education, 13th Edition, 2017.

References:

1. M F Golnaraghi and Benjamin C Kuo, "Automatic control systems", New York McGraw-Hill Education, 9th Edition, 2017.
2. M.Gopal, Digital Control and State Variable Methods, Tata McGraw- Hill 4th Edition, 2014.
3. Joseph J DiStefano, Allen R Stubberud and Ivan J Williams, Schaum's Outline Series, "Feedback and Control Systems", Tata McGraw- Hill, 2nd Edition 2014.
4. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGraw-Hill., 8th Edition.

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BTEE503	DCC	Control System Engineering	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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List of Experiments:

1. Perform step response of a transfer function
2. Perform impulse response of a transfer function
3. Perform ramp response of a transfer function
4. Analyze torque speed characteristics and determine the transfer function of a DC servomotor.
5. Analyze characteristics of a small AC servomotor and determine its transfer function.
6. Perform the transient and frequency response of a second order network.
7. Perform the performance of various types of controllers used to control the temperature of an oven.
8. Draw nyquist plot from a transfer function
9. Draw root locus from a transfer function
10. Draw bode plot from a transfer function

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT401	DCC	Sensors and Signal Conditioning	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 Educational Objectives (CEOs):
This course deals with various types of sensors and different signal conditioning methods.

Course Outcomes (COs):
The students will be able to
1. Identify the different sensors available for specific engineering applications.
2. Understand the construction and working of different types of sensors.
3. Apply the various signal conditioning techniques on different sensors and analyze the effects.

Syllabus

UNIT I **10 Hrs.**

Introduction to Sensor-Based Measurement Systems: Concepts and Terminology: Measurement systems, Transducers, sensors and actuators, Signal conditioning and display, Interfaces, data domains, and conversion, Sensor Classification, Interfering and modifying inputs, Compensation techniques.

UNIT II **9 Hrs.**

Primary Sensors: Temperature sensors, Bimetals, Pressure sensors, Flow velocity and Flow-rate sensors, Level sensors, Force and torque sensors, Acceleration and inclination sensors, Velocity sensors.
Materials for Sensor: Conductors, semiconductors, and dielectrics, Magnetic materials, Thick-Film technology, Thin-Film technology, Micromachining technologies.

UNIT III **10 Hrs.**

Resistive Sensors: Potentiometers, Strain Gauges Fundamentals: Piezoresistive effect, types and applications. Resistive Temperature Detectors (RTDs), Thermistors: Models, Thermistor Types and Application, Magneto-resistors, Light-Dependent Resistors, Resistive Hygrometers, Resistive Gas Sensors, Liquid Conductivity Sensors.

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BTECIOT401	DCC	Sensors and Signal Conditioning	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 following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Signal Conditioning: Measurement of Resistance, Voltage Dividers, Wheatstone Bridge: Balance and Deflection Measurements, Sensitivity and linearity, linearization of resistive sensor bridges, Sensor bridge calibration and balance, Power supply of Wheatstone bridges, Detection methods of Wheatstone bridge, Differential and Instrumentation Amplifiers, Interference types and reduction.

UNIT IV **9 Hrs.**

Reactance Variation Sensors: Capacitive Sensors: variable and differential capacitor. Inductive Sensors: Variable Inductance, eddy current sensor, LVDT, Electromagnetic Sensor.
Signal Conditioning: Problems and alternatives, AC Bridges: Sensitivity and linearity, Capacitive bridge analog linearization, ac amplifiers and power supply decoupling, Electrostatic shields and driven shields.

UNIT V **8 Hrs.**

Self-Generating Sensors and its Signal Conditioning: Thermoelectric Sensors: Thermocouples, Piezoelectric Sensors, Pyroelectric Sensors, Photovoltaic Sensor, Electrochemical Sensors.
Signal Conditioning: Chopper and Low-Drift Amplifiers, Electrometer and Trans-impedance amplifiers, Charge Amplifiers.

Text Books:

1. Ramón Pallás-Areny, John G. Webster, "Sensors and Signal Conditioning", 2nd Edition, John Wiley & Sons, 2012.
2. Walt Kester, "Practical Design Techniques for Sensor Signal Conditioning", Analog Devices, 1999.

References:

1. E.O. Doebelin, D.N. Manik, "Measurement systems", 6th Edition, Tata McGraw Hill, 2012.
2. R. Pallas-Areny and J. G. Webster, "Analog Signal Processing", John Wiley & Sons, 1999.

List of Experiments:

1. To study various Primary sensor.
2. To study RTD for Temperature measurement.
3. To study Strain Gauge for pressure measurement.

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BTECIOT401	**DCC**	**Sensors and Signal Conditioning**	60	20	20	30	20	3	0	2	4

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4. To study LDR and Photodiode for sensing light intensity.
5. To study Thermocouple for Temperature measurement.
6. To study Photovoltaic for sensing light parameter.
7. Measuring the temperature using temperature sensor.
8. Measuring the light intensity using sensor.
9. Measuring the humidity using humidity sensor.
10. Measuring the distance using sensor.

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Choice Based Credit System (CBCS)-2018-19

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS403	UG	**Data Structure and Algorithms**	**3**	**1**	**2**	**5**	**60**	**20**	**20**	**30**	**20**

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:

1. To understand efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To understand the concept of protection and management of data.

Course Outcomes:

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

1. Get a good understanding of applications of Data Structures.
2. Develop application using data structures.
3. Handle operations like searching, insertion, deletion, traversing mechanism etc.on various data structures.
4. Decide the appropriate data type and data structure for a given problem.
5. Select the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc.

Syllabus:

UNIT I

Introduction: Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II

Linked List: Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

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UNIT III

Stack: The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi

The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV

Tree: Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion.

Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V

Sortings: Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text Books:

1. Ashok N. Kamthane, "Introduction to Data structures", 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, "Introduction to Data- Structure with applications", 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", 2nd Edition, Tata Mc-GrawHill 2009.
4. Robert Kruse, "Data Structures and Program Design",2nd Edition,PHI,1997.
5. Lipschutz Seymour,"Data structures with C" ,1st Edition ,Mc- GrawHill,2017.

References:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,"Data Structure Using C" ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015 .
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:

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1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

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BTEC405	**AEC**	**Programming with Arduino**	0	0	0	30	20	0	0	4	2

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Course Educational Objectives (CEOs):
The objective of this course is to-
1. Being one of the fundamental courses of Electronics stream its prime objective is to make the students capable of analyzing given electrical network composed by passive element and some active element.
2. To make the students learn how to synthesize an electrical network from a given impedance/admittance function

Course Outcomes (COs):
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:
1. Apply the fundamental concepts in solving and analyzing different Electrical networks.
2. Select appropriate and relevant technique for solving the Electrical network in different conditions.
3. Apply mathematics in analyzing and synthesizing the networks in time and frequency domain.
4. Estimate the performance of a particular network from its analysis.

Syllabus

Study of Arduino and various programs based on Arduino.

Experiment List

E.N.	Aim
1.	Understanding Arduino IDE and Arduino board family.
2.	Understanding I/O access on ATMega328p
3.	Interfacing LED and Seven Segment.
4.	Interfacing Switch and Keypad.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. (EC/ECIOT/RA)
(2021-2025)

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*				
BTEC405	**AEC**	**Programming with Arduino**	0	0	0	30	20	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.

5.	Program based on Timers.
6.	Experimenting data transfer using SPI Communication.
7.	Establishing i2c interface with ATMega328p
8.	Program based on Interrupts.
9.	Program based on Serial Communication.
10.	Interfacing GSM, RFID, Wi-Fi.

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