

OUTLINES OF TESTS,  
SYLLABI AND COURSES OF READINGS

# CHOICE-BASED CREDIT SYSTEM

FOR

B.Sc.(Hons.) in ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

(SEMESTER SYSTEM)

First Year (1st & 2nd Semester)

[Batch 2022-23 & 2023-24]



MATA GUJRI COLLEGE SRI FATEHGARH SAHIB

(AN AUTONOMOUS COLLEGE)

AFFILIATED TO PUNJABI UNIVERSITY, PATIALA

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	External	Internal		
PBI 2001 PBI 2001A	AECC	Punjabi Compulsory/ Punjabi(Mudla Gyan)	3	1	0	75	25	100	4
BSCHAI-102	CC	Computer Oriented Numerical & Statistical Methods	5	1	0	75	25	100	6
BSCHAI -103	CC	Fundamentals of Computer and IT	5	1	0	75	25	100	6
BSCHAI -104	CC	Python Programming	3	1	0	75	25	100	4
BSCHAI-104(P)		Software Lab – I	0	0	4	50	--	50	2
BSCHAI -105	SEC	Software Lab – II (Open OFFICE)	0	0	4	50	--	50	2
		<b>Total</b>	<b>16</b>	<b>4</b>	<b>8</b>	<b>400</b>	<b>100</b>	<b>500</b>	<b>24</b>

The breakup of marks for the continuous assessment for theory paper will be as under

i	Two tests will be conducted during the semester. Both the tests will be considered for assessment.	:	50% of the marks allotted for continuous assessment
ii	Assignment / Presentations	:	20% of the marks allotted for continuous assessment
iii	Class participation & behaviour	:	10% of the marks allotted for continuous assessment
iv	Attendance	:	20% of the marks allotted for continuous assessment

**B.Sc.(Hons.) in ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**  
**First Year - Second Semester Examinations**  
**Batch 2022-23 & 2023-24**

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	External	Internal		
ENG1003	AECC	English(Communication Skills)	3	1	0	75	25	100	4
BSCHAI-202	GE	GE-1	3	1	0	75	25	100	4
BSCHAI -203	CC	Object Oriented Programming using 'C++'	3	1	0	75	25	100	4
BSCHAI-203(P)		Software Lab – III	0	0	4	50	--	50	2
BSCHAI -204	CC	Introduction to Artificial Intelligence and Data Science	3	1	0	75	25	100	4
BSCHAI -204(P)		Software Lab – IV	0	0	4	50	--	50	2
EVS 3001	AECC	Environment and Road Safety Awareness	2	0	0	35	15	50	2
		<b>Total</b>	<b>14</b>	<b>4</b>	<b>8</b>	<b>435</b>	<b>115</b>	<b>550</b>	<b>22</b>

**\*General Elective-I:**

1	BSCHAI-202GE1	Mathematics
2	BSCHAI-202GE2	Basic Electronics

**The breakup of marks for the continuous assessment for theory paper will be as under**

I	Two tests will be conducted during the semester. Both the tests will be considered for assessment.	:	50% of the marks allotted for continuous assessment
ii	Assignment / Presentations	:	20% of the marks allotted for continuous assessment
iii	Attendance, Class participation & behaviour	:	10% of the marks allotted for continuous assessment
iv	Attendance	:	20% of the marks allotted for continuous assessment

**Course Code: BSCHAI-102****COURSE NAME: Computer Oriented Numerical and Statistical Methods**

Maximum Marks: 100

Time: 3 hours

Theory: 75 Marks

Pass Marks: 35%

Internal Assessment: 25 Marks

**Course Objectives:**

- To understand the basic principles of Statistical inference.
- To learn the language and core concepts of the statistical theory.

**Course Learning Outcomes:**

Upon Completion of the course, Students will be able to,

- Skill to choose and apply appropriate numerical methods to obtain approximate solutions to difficult mathematical problems.
- Ability to apply various statistical techniques such as Measures of Central Tendency and Dispersion.

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**UNIT - I**

Introduction: Meaning and Definitions of Statistics, Data and Data Sources, Types of Statistics, Importance of Statistics in computers, an overview of central tendency, Arithmetic Mean, Median, Mode, Relationships of the Mean, Median and Mode.

Dispersion: Meaning and Definition of Dispersion, Significance and Properties of Measuring Variation, Measures of Dispersion, Range, Interquartile Range or Quartile Deviation, Mean Deviation, Standard Deviation.

Correlation Analysis: Definition, Scatter diagram, Correlation Graph, Pearson's Coefficient of Correlation, Spearman's Rank Correlation, Limitations of Correlation Analysis.

Regression: Linear Regression, Regression Line of Y on X: Scatter Diagram, Fitting a Straight Line, Regression Line of X on Y, Properties of Regression Coefficients, Regression Lines and Coefficient of Correlation, Correlation Analysis Versus Regression Analysis.

**UNIT - II**

Computer Arithmetic: Basics of Floating point representation of numbers, arithmetic operation with normalised floating point numbers and its consequences, errors in numbers, binary representation of numbers.

Iterative Methods for finding roots: Bisection, False Position, Regula-falsi method, Secant Method, Newton Raphson, Discuss convergence only without derivation.

Solution of simultaneous algebraic equations: Gauss elimination method, Gauss-Seidel iterative method, Jacobi's Method, Gauss Jordan Method.

Polynomial interpolation: Lagrange, Newton's Forward Difference, Interpolation, Newton's Backward Difference Interpolation, Newton's Divided Difference Interpolation.

**Text Books:**

1. V. Rajaraman, "Computer Oriented Numerical Methods", PHI, New Delhi.
2. Murray R Spiegel, Larry J. Stephens, - "Statistics" Schaum's Outlines References.

**Reference Books:**

1. J.H. Mathews, "Numerical Methods for Computer Science, Engineering and Mathematics", PHI, 1987.
2. M K. Jain, S.R.K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", NEW AGE;
3. S.C. Chapra and R.P. Canale, "Numerical Methods for Engineers", McGraw-Hill, New York.
4. Balaguruswamy E., "Computer oriented Statistical and Numerical methods", Macmillan India Ltd.

**Teaching Plan**

Week	Content
1-2	<b>Introduction:</b> Meaning and Definitions of Statistics, Data and Data Sources, Types of Statistics, Importance of Statistics in computers, an overview of central tendency, Arithmetic Mean, Median, Mode, Relationships of the Mean, Median and Mode.
3-4	<b>Dispersion:</b> Meaning and Definition of Dispersion, Significance and Properties of Measuring Variation, Measures of Dispersion, Range, Interquartile Range or Quartile Deviation, Mean Deviation, Standard Deviation.
5-6	Correlation Analysis: Definition, Scatter diagram, Correlation Graph, Pearson's Coefficient of Correlation, Spearman's Rank Correlation, Limitations of Correlation Analysis.  Regression: Linear Regression, Regression Line of Y on X: Scatter Diagram, Fitting a Straight Line, Regression Line of X on Y, Properties of Regression Coefficients, Regression Lines and Coefficient of Correlation, Correlation Analysis Versus Regression Analysis
7-8	Computer Arithmetic: Basics of Floating point representation of numbers, arithmetic operation with normalised floating point numbers and its consequences, errors in numbers, binary representation of numbers.
9-10	Iterative Methods for finding roots: Bisection, False Position, Regula-falsi method, Secant Method, Newton Raphson, Discuss convergence only without derivation.
11-12	Solution of simultaneous algebraic equations: Gauss elimination method, Gauss-Seidel iterative method, Jacobi's Method, Gauss Jordan Method.
13-14	Polynomial interpolation: Lagrange, Newton's Forward Difference, Interpolation, Newton's Backward Difference Interpolation, Newton's Divided Difference Interpolation.
15	Revision

## Course Code: BSCHAI -103

## Course Name: Fundamentals of Computer and IT

Maximum Marks: 100

Time: 3 hours

Theory: 75 Marks

Pass Marks: 35%

Internal Assessment: 25 Marks

**Course Objectives:**

- To introduce the students the basics of computer, its organization, Input/output devices etc.
- To introduce the preliminary knowledge of computer, their operations and applications.
- To introduce the various computer languages & Number System.

**Course Learning Outcomes:**

On successful completion of the course, students will be able to:

- Familiarization with the terms like Operating System, peripheral devices, software etc.
- Represent data in binary form, convert numeric data between different number systems and perform arithmetic operations in binary

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**UNIT-I**

**Introduction:** Characteristics of Computers, The Evolutions of Computers, Computer Generations, Classification of computers based on size and application like Notebook Computers, Personal Computers, workstations, Mainframe Systems, Super Computers, Clients and Servers etc.

**Basic Computer Organization:** Block diagram of Computer, Interrelationship between different units: Input Unit, Output Unit, Storage unit, Arithmetic Logic Unit, Control unit, Central Processing unit. Instruction Set, Registers, Processor Speed, Types of Processors.

**Main Memory:** Memory Organization, RAM, ROM, PROM and EPROM, Cache Memory

**Input-output Devices:** Characteristics of I/O devices, Input Devices (Keyboard, Point-and-draw Devices, Data scanning Devices, Digitizer, Electronic Card reader, Voice Recognition Devices, Vision-Input System). Output Devices (Monitors, printers, plotters, Screen Image Projector, Voice Response System)

**UNIT-II**

**Secondary Storage Devices:** Sequential and Direct-Access Devices, Magnetic Tape, Hard Disk, Optical Disks. Basic principles of Operations, Advantages and limitations.

**Types of Software:** System Software, Application Software, Overview (function) of different types of system software's: Operating Systems, Language Translators. Overview of different types of Application Software: word Processing, spreadsheet, Database.

**Computer languages:** Machine Language, Assembly Language, High Level Language, Compiler, Linker, Interpreter, Object Oriented Programming Languages, Characteristics of Good Programming Language.

**Number System & Codes:** Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other. Binary Arithmetic: Addition, subtraction and multiplication. Character codes (ASCII, EBCDIC, BCD, 8421, 2421, Excess-3, Gray, Hamming).

**Text Books:**

1. P.K Sinha "Fundamentals of IT", B.P.B Publications
2. Peter Norton "Computers today".

**Reference Books:**

1. D. H. Sanders, "Computers Today", McGrawHill,
2. Satish Jain, "Information Technology", BPB,
3. V. Rajaraman, "Fundamentals of Computers" (2nd edition), Prentice Hall of India, New Delhi,

4. B. Ram, "Computer Fundamentals", Wiley,

**Teaching Plan:**

Week	Content
1-2	<b>Introduction:</b> Characteristics of Computers, The Evolutions of Computers, Computer Generations, Classification of computers based on size and application like Notebook Computers, Personal Computers, workstations, Mainframe Systems, Super Computers, Clients and Servers etc.
3-4	<b>Basic Computer Organization:</b> Block diagram of Computer, Interrelationship between different units: Input Unit, Output Unit, Storage unit, Arithmetic Logic Unit, Control unit, Central Processing unit. Instruction Set, Registers, Processor Speed, Types of Processors.
5-6	<b>Input-output Devices:</b> Characteristics of I/O devices, Input Devices(Keyboard, Point-and-draw Devices, Data scanning Devices, Digitizer, Electronic Card reader, Voice Recognition Devices, Vision-Input System). Output Devices (Monitors, printers, plotters, Screen Image Projector, Voice Response System).
7-8	<b>Secondary Storage Devices:</b> Sequential and Direct-Access Devices, Magnetic Tape, Hard Disk, Optical Disks. Basic principles of Operations, Advantages and limitations.
9-10	<b>Types of Software:</b> System Software, Application Software, Overview (function)of different types of system software's: Operating Systems, Language Translators. Overview of different types of Application Software: word Processing, spreadsheet, Database.
11-12	<b>Computer languages:</b> Machine Language, Assembly Language, High Level Language, Compiler, Linker, Interpreter, Object Oriented Programming Languages, Characteristics of Good Programming Language.
13-14	<b>Number System &amp; Codes:</b> Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other.
15	Binary Arithmetic: Addition, subtraction and multiplication. Character codes (ASCII, EBCDIC, BCD, 8421, 2421, Excess-3, Gray, Hamming).

**Course Code: BSCHAI -104**  
**Course Name: Python Programming**

Maximum Marks: 100

Time: 3 hours

Theory: 75 Marks

Pass Marks: 35%

Internal Assessment: 25 Marks

**Course Objectives:**

- To introduce students to a powerful programming language – Python
- To gain knowledge of various programming concepts.

**Course Learning Outcomes:**

After Completion of this course the students will be able to

- Read, understand and trace the execution of programs written in Python language.
- Analyze the real life problems and write a program in Python to solve the problem.

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**Unit-I**

**Program Planning:** Algorithms, characteristics and Examples of algorithms, Flowcharts, symbols used in flowcharts, Examples of flowcharts, Pseudocode.

**Programming Fundamentals:** Designing a Program, identifiers, keywords, constants, variables.

**Data types:** Strings and numbers, Lists, tuple, Dictionaries, displaying output, User input, type conversion, basic string operations & methods, format specifiers

**Operators:** Arithmetic, Relational, Logical, Bitwise, Assignment operators and expressions.

**Decision Structures:** If, If\_else, if\_elif\_else, nested if decision flow statements.

**Unit-II**

**Repetition Structures:** while loop, for loop, sentinels, continue and break statements

**Functions:** Prototype, definition and calling, formal, actual and default arguments, value returning functions, methods of parameter passing to functions, recursive function, Function overloading, Local variables and scope.

**Exception Handling:** Exceptions, try, except, finally and raise

**Files:** Introduction to file, attributes of files, operation of files, Types of files, input and output in files.

## References:

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. How to think like a computer scientist : learning with Python / Allen Downey, Jeffrey Elkner, Chris Meyers. 1st Edition

**Teaching Plan:**

Week	Content
1-2	<b>Program Planning:</b> Algorithms, characteristics and Examples of algorithms, Flowcharts, symbols used in flowcharts, Examples of flowcharts, Pseudocode.
3-4	<b>Programming Fundamentals:</b> Designing a Program, identifiers, keywords, constants, variables.
5-6	<b>Data types:</b> Strings and numbers, Lists, tuple, Dictionaries, displaying output, User input, type conversion, basic string operations & methods, format specifiers
7-8	<b>Operators:</b> Arithmetic, Relational, Logical, Bitwise, Assignment operators and expressions. <b>Decision Structures:</b> If, If_else, if_elif_else, nested if decision flow statements.



9-10	<b>Repetition Structures:</b> while loop, for loop, sentinels, continue and break statements
11-12	<b>Functions:</b> Prototype, definition and calling, formal, actual and default arguments, value returning functions, methods of parameter passing to functions, recursive function, Function overloading, Local variables and scope.
13-14	<b>Exception Handling:</b> Exceptions, try, except, finally and raise <b>Files:</b> Introduction to file, attributes of files, operation of files, Types of files, input and output in files.

**Course Objectives:**

This laboratory course will comprise as exercises to supplement what is learnt under paper **BSCHAI-104** Python Programming

**Course Learning Outcomes:**

After Completion of this course the students will be able to

- Write program code in Python to solve real world problems.
- Debug a program.

**Implement programs in Python:**

Students are required to develop the following programs

1. To convert temperature from Fahrenheit to Celsius.
2. To find simple interest and compound interest.
3. To check whether the given number is even number or odd.
4. To accept three numbers and find the largest among them.
5. To find factorial of a number.
6. To check whether a number is prime or not.
7. To print all the Arm strong numbers between any 2 given limits.
8. To find largest element in an array.
9. To check whether a string is a Palindrome.
10. To perform matrix addition using array and functions.
11. To perform matrix multiplication using array and functions.
12. To swap two numbers using function.
13. To find the factorial of a number using Recursion.
14. To find then the Fibonacci number using Recursion.
15. To create an employee structure and display the same.
16. Write a function to swap two numbers using pointers.
17. Create a file and store some records in it. Display the contents of the same. Count numbers of characters, word sand lines in the file.

Along with the above mentioned programmes the students can also implement additional programmes as per Teacher's instructions.

**The break up of marks for the practical will be as under**

- |  |          |
|--|----------|
| i. Lab Record (External Evaluation)                          | 10 Marks |
| ii. Viva Voce (External Evaluation)                          | 20 Marks |
| iii. Program Development and Execution (External Evaluation) | 20 Marks |

**Course Code: BSCHAI-105**  
**Course Name: Software Lab- II**

External Examination: 50

Maximum Time: 3 Hrs.

Min Pass Marks: 35%

**Course Objectives:**

- To facilitate and make the students learn to use open source software.
- To give hands on practice on libre / open office that facilitates them to create documents, spreadsheet and effective presentations.

**Course Learning Outcomes:**

- Skill to work with open source software.
- Initiation into the process of writing business letters or job applications, tabulating data, preparing PPTs etc.

**Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter**

**Word Processing Orientation:**

1.Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

2.Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes

3.Creating a Newsletter Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

4.Creating a Feedback form. Features to be covered: - Forms, Text Fields, Inserting objects, Mail Merge in Word

**Spreadsheet Orientation:**

1. Creating a Scheduler Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text

2.Calculations Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKU

3.Performance Analysis Features to be covered: - Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**Presentation Orientation:**

1. Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

2. Making their presentations interactive: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

3. Interacting Power Point Presentation from the following topics: Global Warming, Pollution,Future of IT etc

**The breakup of marks for the practical will be as under**

- Lab Record(External Evaluation) 10 marks
- Viva Voce(External Evaluation) 20marks
- Program Development and Execution(External Evaluation) 20marks

**Course Code: BSCHAI-202GE1**  
**Course Name: Mathematics**

Maximum Marks: 100  
 Theory: 75 Marks  
 Internal Assessment: 25 Marks

Time: 3 hours  
 Pass Marks: 35%

**Course Objectives:**

- To develop logical thinking and its application to computer science

**Course Learning Outcomes:**

After Completion of this course the students will be able to

- Construct simple mathematical proofs and possess the ability to verify them
- Specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**UNIT-I**

**Set Theory:** Sets, Type of sets, Set operations, Principle of Inclusion-Exclusion, Cartesian product of sets, Partitions.

**Logic :** Propositions, Implications, Precedence of logical operators, Translating English sentences into logical expressions, Propositional equivalence Principle of Mathematical induction.

**Relations:** Relations and diagraph, n-ary relations and their applications, properties of relations, representing relations, closure of relation, equivalence relation, operation on relations, partial ordering.

**UNIT-II**

**Functions:** Functions, One-to-one Functions, Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.

**Basic Concepts** (Only Definition): Big-O Notation, Big-Omega and Big-Theta Notation.

**Graphs:** Introduction to Graph, Graph terminology, Representing graphs and Graph Isomorphism, Connectivity, Euler Paths and Circuits, Hamiltonian paths and circuits, Shortest Path Problems, Planar Graphs.

**Trees :** Trees, labeled trees, Tree Traversal, Undirected trees, Spanning Trees, Minimum spanning trees.

**Text Book :**

1. Discrete Mathematical Structures-Bernard Kolman, Robert C. Busby, Sharon C. Ross, 4th Edition, Pearson Education Asia.

**Reference Books :**

1. Discrete Mathematics-Richard Johnsonbaugh, 5th Edition, Pearson Education, Asia.
2. Elements of Discrete Mathematics, Second Edition, Tata McGraw Hill.
3. Discrete Mathematics, Seymour Lipschutz & Max Lans Lipson, Tata McGraw Hill.

**Teaching Plan:**

Week	Content
1-2	<b>Set Theory:</b> Sets, Type of sets, Set operations, Principle of Inclusion-Exclusion, Cartesian product of sets, Partitions.
3-4	<b>Logic :</b> Propositions, Implications, Precedence of logical operators, Translating English sentences into logical expressions, Propositional equivalence Principle of Mathematical induction.
5-6	<b>Relations:</b> Relations and diagraph, n-ary relations and their applications, properties of relations, representing relations, closure of relation, equivalence relation, operation on relations, partial ordering.
7-8	<b>Functions:</b> Functions, One-to-one Functions, Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.
9-10	<b>Basic Concepts</b> (Only Definition): Big-O Notation, Big-Omega and Big-Theta Notation. <b>Graphs:</b> Introduction to Graph, Graph terminology, Representing graphs and Graph Isomorphism, Connectivity, Euler Paths and Circuits, Hamiltonian paths and circuits, Shortest Path Problems, Planar Graphs.
11-12	<b>Trees :</b> Trees, labeled trees, Tree Traversal, Undirected trees, Spanning Trees, Minimum spanning trees.
13-14	Revision
15	Revision

**Course Code: BSCHAI-202GE2**  
**Course Name: Basic Electronics**

Maximum Marks: 100  
 External Marks: 75  
 Internal Marks: 25

Pass Marks: 35 %  
 No. of Lectures: 60

**Course Objective:** The objective of the course is to expose the students to the topics like electronic devices and their qualitative. Students will be able to understand the current voltage characteristics of semiconductor devices and understand the use of zener diode as voltage regulator , basic concepts of digital circuits and other devices.

**Course Outcomes:** On completion of this course, student will be able to understand:

- The fundamental concepts of Semiconductor devices like Diodes.
- biasing of transistors and V-I characteristics of semiconductor devices,
- The fundamental concepts and design of FET,
- Learn basic operational amplifiers characteristics, OP-AMP parameters
- Learn about the digital and integrated circuits
- Principle and working of photo electric devices and power supplies

**Instructions for the Paper Setter**

The question paper will consist of three sections A, B and C. Sections A and B will have four questions from respective sections of the syllabus carrying 12 marks each. Section C will have 9 short answer type questions, which will carry 3 marks each and cover the entire syllabus uniformly.

**Instruction for the candidates**

The candidates are required to attempt two questions each from sections A and B of the question paper and the entire section C.

**SECTION-A**

**Semiconductor Devices and Amplifiers:** Semiconductor Diodes: p and n type semiconductors, Barrier Formation in PN Junction Diode, Biasing of diode, V-I characteristics, Zener Diode and Zener Diode as a Voltage Regulator.

**Bipolar Junction transistors:** Introduction, Transistor Construction, Operations on n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations, Active, Cutoff, and Saturation Regions, Current gains  $\alpha$  and  $\beta$ , Relations between  $\alpha$  and  $\beta$ , Amplifying action of CE and CB configurations. Introduction to JFET and MOSFET. Characteristics and applications of OP-AMP.

**SECTION-B**

**Digital Circuits:** Difference between Analog and Digital Circuits, Logic gate circuits: Basic gates, universal gates, special gates (XOR, XNOR), degenerative forms of gates

**Integrated Circuits:** Scale of integration and basics of SSI, MSI, LSI and VLSI, Classification of ICs, Examples of Linear and Digital ICs.

**Photo Electric Devices:** Light-Emitting Diodes (LEDs), IR Emitters, Photo diode, Photo transistors, Structure and operation of LDR.

**Power Supplies:** Rectifiers- Half wave, full wave and bridge rectifiers-Efficiency-ripple factor Regulation, choke input filters, I.C. regulated and basic concept of SMPS (switch mode power supplies)

**Text Books:**

1. Basic Electronics and linear Circuits by N.N Bhargave, D.C Kulshreshtha and S.C Gupta.
2. Electronic Fundamentals and Applications: J.D. Ryder, Prentice Hall of India (5<sup>th</sup> Ed.), New Delhi.
3. Electronic Devices and Circuits: G.K. Mithal, Khanna Publishers
4. Basic Electronics and Linear Circuits: N. N. Bhargava, D. C. Kulshreshtha, S. G. Gupta (TTTI Chandigarh ), Mc. Graw Hill.
5. Basic Electronics by D.C Tayal (Himalaya Pub.).
6. Integrated Electronics, J. Millman and C.C. Halkias, Tata Mc-Graw Hill.
7. Electronic devices and Circuits, S. Salivahanan and N. Suresh Kumar, Tata Mc-Graw Hill.
8. Foundations of Electronics by D. Chatopadhyay, P.C Rakshit, B.Saha and N.N Purkit.

**REFERENCE BOOKS**

1. Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha, 7th Ed., Tata McGraw Hill
2. Linear Integrated Circuit: D. Roy Choudury and Shail Jain, Wiley Eastern, New Delhi

**Teaching Plan:**

Week	Content
1-2	<b>Semiconductor Devices and Amplifiers:</b> Semiconductor Diodes: p and n type semiconductors, Barrier Formation in PN Junction Diode, Biasing of diode, V-I characteristics, Zener Diode and Zener Diode as a Voltage Regulator.
3-4	<b>Bipolar Junction transistors:</b> Introduction, Transistor Construction, Operations on n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations, Active, Cutoff, and Saturation Regions
5-6	Current gains $\alpha$ and $\beta$ , Relations between $\alpha$ and $\beta$ , Amplifying action of CE and CB configurations. Introduction to JFET and MOSFET. Characteristics and applications of OP-AMP.
7-8	<b>Digital Circuits:</b> Difference between Analog and Digital Circuits, Logic gate circuits: Basic gates, universal gates, special gates (XOR, XNOR), degenerative forms of gates
9-10	<b>Integrated Circuits:</b> Scale of integration and basics of SSI, MSI, LSI and VLSI, Classification of ICs, Examples of Linear and Digital ICs.
11-12	<b>Photo Electric Devices:</b> Light-Emitting Diodes (LEDs), IR Emitters, Photo diode, Photo transistors, Structure and operation of LDR.
13-14	<b>Power Supplies:</b> Rectifiers- Half wave,full wave and bridge rectifiers-Efficiency-ripple factorRegulation, choke input filters, I.C.regulated and basic concept of SMPS(switch mode power supplies)
15	Revision

**Course Code: BSCHAI-203**  
**Course Name: Object Oriented Programming using 'C++'**

Maximum Marks: 100

Time: 3 hours

Theory: 75 Marks

Pass Marks: 35%

Internal Assessment: 25 Marks

**Course Objectives:**

- To provide information about concepts of OOPS.
- By the end of the course a student will be capable to design and develop different computer software applications and to implement various algorithms in programming languages for research purpose.

**Course Learning Outcomes:**

After Completion of this course the students will be able to

- Apply the concepts of object-oriented programming.
- Analyze the real life problems and write a program in C++ language to solve the problem.

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**UNIT-I**

**Introduction:** Basics of Object Oriented Programming (OOP), Difference between C & C++, Manipulators, Storage classes. **Classes and Objects:** Class Declaration and Class Definition, Defining member functions, inline functions, Nesting of member functions, Members access control, this pointer.

**Objects:** Object as function arguments, array of objects, functions returning objects, Const member. Static data members and Static member functions, Friend functions and Friend classes

**Constructors:** Properties, types of constructors, Dynamic constructors, Constructor overloading.

**Destructors:** Properties, Virtual destructor. Destroying objects. Rules for constructors and destructors. Array of objects. Dynamic memory allocation using new and delete operators, Nested and container classes, Scopes: Local, Global, Namespace and Class.

**UNIT-II**

**Inheritance:** Defining derived classes, Types of inheritance, types of derivation- public, private, protected, function redefining, constructors in derived class, Types of base classes – abstract and virtual.

**Operator overloading:** rules for operator overloading binary operator, overloading unary operators.

Function overloading. Polymorphism: virtual functions, late binding, pure virtual functions and abstract base class Difference between function overloading, redefining, and overriding.

**Text Books:**

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw's Hill.
2. Deitel & Deitel, "C++ How to Program", Pearson Education.

**References:**

1. Herbert Schildt, "The Complete Reference C++", Tata McGraw-Hill.
2. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publications.



3. Bjarne Strastrup, "The C++ Programming Language", Addison- Wesley Publication Co.

4. E. Balagurusamy, " Object Oriented Programming with C++", Tata McGraw-Hill.

5. Anshuman Sharma, "Learn Programming in C++", Lakhanpal Publishers.

### Teaching Plan

Week	Content
1-2	<b>Introduction:</b> Basics of Object Oriented Programming (OOP), Difference between C & C++, Manipulators, Storage classes. <b>Classes and Objects:</b> Class Declaration and Class Definition, Defining member functions, inline functions, Nesting of member functions, Members access control, this pointer.
3-4	Objects: Object as function arguments, array of objects, functions returning objects, Const member. Static data members and Static member functions, Friend functions and Friend classes <b>Constructors:</b> Properties, types of constructors, Dynamic constructors, Constructor overloading.
5-6	<b>Destructors:</b> Properties, Virtual destructor. Destroying objects. Rules for constructors and destructors. Array of objects. Dynamic memory allocation using new and delete operators, Nested and container classes, Scopes: Local, Global, Namespace and Class.
7-8	<b>Inheritance:</b> Defining derived classes, Types of inheritance, types of derivation- public, private, protected, function redefining, constructors in derived class, Types of base classes – abstract and virtual.
9-10	<b>Operator overloading:</b> rules for operator overloading binary operator, overloading unary operators.
11-12	Function overloading. Polymorphism: virtual functions, late binding, pure virtual functions and abstract base class Difference between function overloading, redefining, and overriding.
13-14	Revision
15	Revision

**Course Code: BSCHAI-203(P)**

**Course Name: Software Lab – III**

Maximum Marks: 50

Maximum Time: 3 Hrs.

External Examination: 50

Minimum Pass Marks: 35%

**Objectives of the Lab**

- i. To learn how to design C++ classes for code reuse.
- ii. To learn how to implement copy constructors and class member functions.
- iii. To learn how inheritance and virtual functions implement dynamic binding with polymorphism.

**PROGRAMMING USING C++**

1. Write a program to find area of rectangle using the concept of classes & object.
2. Write a program to implement the concept of array of object.
3. Write a program to show the use of friend function.
4. Write a program to show the use of constructor overloading.
5. Write a program to show the use of copy constructor.
6. Write a program to show the use of destructors.
7. Write a program to show the use of virtual function.
8. Write a program to implement the concept of multilevel inheritance.
9. Write a program to implement the concept of multiple inheritance.
10. Write a program of unary operator overloading
11. Write a program of Binary operator overloading.
12. Write a program to demonstrate how to insert and extract an object to and from data files.
13. Write a program to count the total number of account objects in a file and then display information of a particular account object.

The breakup of marks for the practical will be as under:

- i. Lab Record (Internal Assessment) 10 Marks
- ii. Viva Voce (External Evaluation) 20 Marks
- iii. Program Development and Execution(External Evaluation) 20 Marks

**Course Code: BSCHAI -204****Course Name: Introduction to Artificial Intelligence and Data Science**

Maximum Marks: 100

Time: 3 hours

Theory: 75 Marks

Pass Marks: 35%

Internal Assessment: 25 Marks

**Course Objectives:**

The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI and Data Science is.

**Course Learning Outcomes:**

Upon Completion of the course, Students will be able to,

- Understand the basic concepts of Artificial Intelligence.
- Acquire fundamentals of Data Science.

**(A) INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III, Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

**(B) INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory.

**UNIT-I**

**Introduction to Artificial Intelligence:** Definitions of AI, Intelligent Agents, Problem solving.

**Knowledge, Reasoning and Planning:** Logical Agents, Classical Planning, Knowledge Representation and Reasoning.

**Learning:** Learning from examples, Knowledge in learning.

**Communicating, Perceiving and Acting:**

Communication, Natural Language Processing, Perception, Robotics.

**UNIT-II**

**Introduction to Data Science:** Data Science-a discipline, Landscape-Data to Data science, Data Growth-issues and challenges, data science process. foundations of data science.

**Data Exploration and Preparation:** Messy data, Anomalies and artefacts in datasets. Cleaning data.

**Data Representation and Transformation:** Forms of data-tabular, text data, graph-based data. Modern databases- text files, spreadsheets, SQL databases, NoSQL databases, distributed databases, live data streams.

Representation of data of special types-acoustic, image, sensor and network data.

**Computing with Data:** Overview of R, Python and Julia.

**Data Modeling:** Basics of Generative modeling and Predictive modeling.

**Data Visualization and Presentation:** Charts-histograms, scatter plots, time series plots etc. Graphs, 3D Visualization and Presentation

**Text Books:**

- 1.S.J. Russell and P.Norvig: "Artificial Intelligence: A Modern Approach", Pearson.
2. Sinan Ozdemir, "Principles of Data Science", Packt Publishing.

**Reference Books:**

- 1 E.Rich, K.Knight, S.B. Nair: "Artificial Intelligence", Tata McGraw Hill Ed Pvt Ltd.
- 2 Joel Grus: "Data Science from Scratch", O'Reilly.
- 3 Foster Provost & Tom Fawcett: "Data Science for Business" O'Reilly
- 4 Roger D. Peng & Elizabeth Matsui: "The Art of Data Science" Lean Publishing.

**Teaching Plan**

Week	Content
1-2	<p><b>Introduction to Artificial Intelligence:</b> Definitions of AI, Intelligent Agents, Problem solving.</p> <p><b>Knowledge, Reasoning and Planning:</b> Logical Agents, Classical Planning, Knowledge Representation and Reasoning.</p>
3-4	<p><b>Learning:</b> Learning from examples, Knowledge in learning.</p> <p><b>Communicating, Perceiving and Acting:</b> Communication, Natural Language Processing, Perception, Robotics.</p>
5-6	<p><b>Introduction to Data Science:</b> Data Science-a discipline, Landscape-Data to Data science, Data Growth-issues and challenges, data science process. foundations of data science.</p>
7-8	<p><b>Data Exploration and Preparation:</b> Messy data, Anomalies and artefacts in datasets. Cleaning data.</p> <p><b>Data Representation and Transformation:</b> Forms of data-tabular, text data, graph-based data. Modern databases- text files, spreadsheets, SQL databases, NoSQL databases, distributed databases, live data streams.</p> <p>Representation of data of special types-acoustic, image, sensor and network data.</p>
9-10	<p><b>Computing with Data:</b> Overview of R, Python and Julia.</p> <p><b>Data Modeling:</b> Basics of Generative modeling and Predictive modeling.</p>
11-12	<p><b>Data Visualization and Presentation:</b> Charts-histograms, scatter plots, time series plots etc. Graphs, 3D Visualization and Presentation</p>
13-14	Revision
15	Revision

**Course Code: BSCHAI -204(P)**  
**Software Lab IV**

Maximum Marks: 50

External Examination: 50

Practical units to be conducted: 45-55

Maximum Time: 3 Hrs.

Minimum Pass Marks: 35%

This lab will be based on Paper BSCHAI -204, it will cover introduction to basic python libraries like NumPy, Pandas, Tensor Flow etc

The breakup of marks for the practical will be as under:

- i. Lab Record (Internal Assessment) 10 Marks
- ii. Viva Voce (External Evaluation) 20 Marks
- iii. Program Development and Execution(External Evaluation) 20 Marks