Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Lead College, Karmaveer Bhaurao Patil University

Reaccredited by NAAC (3rdCycle) with 'A+' grade (CGPA 3.57).

ISO 9001:2015 Certified

Bachelor of Science

Part - I

Artificial Intelligence

Syllabus
To be implemented

w.e. f. June, 2024

NEP 2020

Yashavantrao Chavan Institute of Science, Satara (Autonomous)
Department of Artificial Intelligence

Syllabus for Bachelor of Science Part-I

1. **TITLE:** ARTIFICIAL INTELLIGENCE

2. **YEAR OF IMPLEMENTATION:** New Syllabi for the B.S. I Artificial Intelligence will be implemented from June 2024 onwards.

3. **PREAMBLE:**

   Bachelor of Science is an integrated academic degree in the faculty of science. The revision of existing syllabus of Artificial Intelligence subject in Science Faculty is essential. This is a humble endeavor to initiate the process towards an era of knowledge. Intelligent machines have replaced human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the branch of computer science that emphasizes on creating intelligent machines that work and reacts like humans. This course is designed to span a wide variety of topics in computer science research, including machine learning, Game playing, Expert Systems etc.

4. **GENERAL OBJEVTIVES OF THE COURSE:**
   1) To undertake industry careers involving innovation and problem-solving using software and other information technologies.
   2) To undertake research careers in Computer Sciences and allied areas.
   3) To contribute to society by becoming a model professional who can communicate effectively and observes ethical behaviour
   4) To inculcate the software development attitude and generate interest in the field of Technology.
   5) To develop programming skills, management skills, writing skills, Project Analysis skill among students.

5. **PROGRAM SPECIFIC OUTCOMES (PSO's):**
   1) Ability to contribute to problem identification, analysis, design, and development of systems using principles and concepts of Artificial Intelligence and Machine Learning.
   2) Apply the concepts and practical knowledge in analysis, design and development of computing systems and applications to multi-disciplinary problems.
   3) To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in Artificial Intelligence and Data science with ethical values.
   4) Ability to use Artificial Intelligence and Machine Learning models on data for enabling better decision making.

6. **DURATION:**
   - The course shall be a full-time course.
   - **PATTERN:** Semester

7. **MEDIUM OF INSTRUCTION:** ENGLISH

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(Autonomous)
Department of Artificial Intelligence

Evaluation Structure for B.S. I
2024-25

Theory: UG

Assessment Category	Internal Evaluation				ESE	Total Marks	Credits
	CCE-I	CCE-II	Mid Sem	Total			
Theory Paper of 2 Credits	05	05	10	25	30	50	02

Note: 1) For IKS, CC & VEC - Evaluation Structure will be informed separately

Practical: UG

Assessment Category	Internal Evaluation	ESE	Total Marks	Credits
	Journal / Viva / Activity			
Practical Paper of 2 Credits	20	30	50	02

Semester: I

Sr. No.	Course	Name of the course	Name of the Paper	Credits
1	Course 1	DSC -I	Fundamental of Artificial Intelligence	2
		DSC -II	Programming in C	2
		DSC (P) -I	Lab based on Fundamental of Artificial Intelligence and Programming in C	2
2	Course 2	DSC -I	Fundamental of Computers	2
		DSC -II	Computational Statistics-I	2
		DSC (P) -I	Lab based on Fundamental of Computers and Computational Statistics-I	2
3	Course 3	DSC -I	Software Quality Assurance	2
		DSC -II	Computational Mathematics-I	2
		DSC (P) -I	Lab based on Software Quality Assurance and Computational Mathematics-I	2
4	Open Elective	OE-1	Business Economics	2
5	IKS-I	Generic		2
			Total	**22**

Semester : II

Sr. No.	Course	Name of the course	Name of the Paper	Credits
1	Course 1	DSC –III	Object oriented programming using Python	2
		DSC –IV	Database Systems	2
		DSC (P) -II	Lab based on Object oriented programming using Python and Database Systems	2
2	Course 2	DSC –III	Operating Systems	2
		DSC –IV	Computation mathematics-II	2
		DSC (P) -II	Lab based on Operating Systems and Computation mathematics-II	2
3	Course 3	DSC –III	Introduction to Machine Learning	2
		DSC –IV	Computational Statistics-II	2
		DSC (P) -II	Lab based on Introduction to Machine Learning and Computational Statistics-II	2
4	Open Elective	OE - 2	Business Economics-II	2
5	VEC – I	DEIC	Democracy, Election and Indian Constitution	2
			Total	**22**

B.Sc. I- Semester-I

Theory: Course- I: Paper I
BAIT111: Fundamental for Artificial Intelligence

Course Objectives: Students should be able to…

1. Understand a historical perspective of AI and its foundations.
2. Study basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Identify To design and program python applications.
4. Learn to use list, tuples and dictionaries in python program.

Credits=2	SEMESTER-I Paper- I: BAIT111: Fundamental of Artificial Intelligence	No. of hours per unit/ credits
Unit I	**Introduction and Problem-Solving Methods**	(8)
	Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems. Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning	
Unit II	**Knowledge Representation**	(8)
	Architecture for Intelligent Agents, First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information	
Unit III	**Basics of Python Programming**	(8)
	Introduction to Python - Python Interpreter - Data types - Identifiers and keywords - Integral Types - Floating Point Types – Strings. Case Sensitive - Scripts - Sequence Types - Tuples - Named Tuples - Sets - Mapping Types - Dictionaries-Generators – Iterators.	
Unit IV	**Programming Paradigms in Python**	(6)
	Array definition and declaration, initialization of arrays, types of arrays, String handling functions, Arrays and functions.	

Course Outcomes: Students will be able to…

1. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and itsfoundations.

2. Evaluate basic principles of AI In solutions that require problem solving, inference, perception, knowledge representation and learing.

3. Apply the structure and components of a python program.
4. Analyze to write loops and decision statements in python

Reference Books:

1. Stuart Russell, peter Norvig (2020), Artificial Intelligence: A Modern Approach, 4th Edition,University of California at Berkeley, Pearson education.
2. Miguel Grinberg(2018), "Flask Web Development: Developing Web Applications with Python", 2nd Edition, O'Reilly Media. ISBN-13: 978-1491991732
3. Wesley J Chun, (2015),"Core Python Applications Programming", 3rd Edition, Pearson Education India. ISBN-13: 978-9332555365
4. Gerhard Weiss, (2013), Multi Agent Systems, Second Edition, MIT Press.
5. S. Russell and P. Norvig,(2009) "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition.
6. M. Tim Jones,(2008),Artificial Intelligence: A Systems Approach (Computer Science),Jones and Bartlett Publishers, Inc.; First Edition..

Theory: Course- I: Paper II
BAIT112: Programming in C

Course Objectives: Students should be able to…

1. understand working of hardware and software and the importance of operating systems
2. identify programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
3. Study of the syntax and semantics of the C programming language.
4. Learn the usage of structured programming approaches in solving problems.

Credits=2	SEMESTER-I Course I Paper II: BAIT112: Programming in C	No. of hours per unit/ credits
Unit I:	**Introduction to C Programming**	(8)
	Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C, Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants, Formatted I/O functions - printf and scanf, control stings and escape sequences, output specifications with printf functions; Unformatted I/O functions to read and display Single character and a string - getchar, putchar, gets and puts functions.	
Unit II:	**Operators and Control Structures**	(8)
	Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Specialoperators; OperatorPrecedence and Associatively; Evaluation of arithmetic expressions;Type conversion, Decision making Statements - Simple if, if else,nested if else, else if ladder, Switch Case, goto, break & continuestatements; Looping, Statements - Entry controlled and exit controlled statements, while, do-while, for loops, Nested loops	
Unit III:	**Arrays and functions**	(8)
	Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Need for user applied functions; Format of C user applied functions; Components of user applied functions - return type, name, parameter list, function body, return statement and function call; Categories of user applied functions - With and without parameters and return type, Strings: Declaring & Initializing string variables; String handling functions - strlen, strcmp, strcpy and strcat; Character handling functions - toascii, toupper, tolower, isalpha, isnumeric etc.	

Unit IV:	Pointers in C	(6)
	Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using Pointers	

Course Outcomes: - Students will be able to…

1. Perform input and output operations using programs in C
2. Create and Write programs that perform operations on arrays
3. Analyse, read, understand and trace the execution of programs written in C language
4. Decompose a problem into functions and to develop modular reusable code.

Reference Books:

1. P. K. Sinha & Priti Sinha(2022), Foundations of Computing(BPB)
2. Yashwant Kanetkar(2021), Let Us C : Authentic guide to C programming language (18th Edition)
3. V. Rajaraman(2019), Programming in C (PHI – EEE), 2nd edition,PHI Learning Private Limited.
4. S. Byron Gottfried (2018) Programming with C (TMH), 4th edition.
5. E. Balaguruswamy(2017), Programming in ANSI C (TMH),7th Edition McGraw-Hill
6. Kamthane(2008), Programming with ANSI and TURBO C ,3rd edition,(Pearson Education)

Practical-I

Course I Lab: BAIP113: Practical-I

Course Objectives: Students should be able to…
1. study of awareness of fundamental understanding of various applications of AI techniques
2. identify programming skills in core Python.
3. learn an IDE to create, edit, compile, run and debug programs
   understand the various steps in program development.

Credits=2	SEMESTER-I Lab Course I- Practical-I	No. of hours per unit/ credits (60)
Part A :	**Introduction to Artificial Intelligence**	

	1. Study of basics of Artificial Intelligence and its algorithms.
	2. Write a program to demonstrate different number data types in Python.
	3. Write a program to perform different Arithmetic Operations on numbers in Python.
	4. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
	5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
	6. Write a program to create, append, and remove lists in python.
	7. Write a program to demonstrate working with tuples in python.
	8. Write a program to demonstrate working with dictionaries in python.
	9. Write a python program to find largest of three numbers.
	10. Write a Python program to construct the following pattern, using a nested for loop
	
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Part B :	**Programming in C**	

	11. Program to read radius of a circle and to find area and circumference.
	12. Program to read three numbers and find the biggest of three
	13. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
	14. Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
	15. Program to find the roots of quadratic equation (demonstration of switch Case statement)
	16. Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
	17. Program to demonstrate string functions.
	18. Program to demonstrate pointers in C
	19. Program to demonstrate student structure to read & display records of n students.
	20. Program to demonstrate the difference between structure & union.

Course Outcomes: - Students will be able to…

1. elaborate problems where artificial intelligence techniques are applicable
2. use of the python programming language to construct basic programs
3. translate given algorithms to a working and correct program and correct syntax errors as reported by the compilers
4. demonstrate and correct logical errors encountered during execution and represent and manipulate data with arrays, strings and structures

Reference Books:

1. P. K. Sinha & Priti Sinha(2022), Foundations of Computing(BPB)
2. Yashwant Kanetkar(2021), Let Us C : Authentic guide to C programming language (18th Edition)
3. Stuart Russell, peter Norvig (2020),Artificial Intelligence: A Modern Approach, 4th Edition, University of California at Berkeley, Pearson education.
4. V. Rajaraman(2019), Programming in C (PHI – EEE), 2nd edition,PHI Learning Private Limited.
5. Miguel Grinberg(2018), "Flask Web Development: Developing Web Applications with Python", 2nd Edition, O'Reilly Media. ISBN-13: 978-1491991732
6. Wesley J Chun, (2015),"Core Python Applications Programming", 3rd Edition, Pearson Education India. ISBN-13: 978-9332555365
7. Gerhard Weiss, (2013),Multi Agent Systems, Second Edition, MIT Press.

Theory: Course- II: Paper I
BAIT114: Fundamentals of Computers

Course Objectives: - Students should be able to…

1. study the basics of computer.
2. learn algorithm, Flowchart and Pseudo code with Examples.
3. understand the fundamentals of operating systems.
4. identify WebBasics and internet features.

Credits=2	SEMESTER-I Course I-BAIT114: Fundamentals of Computers	No. of hours per unit/ credits
UNIT I	**Fundamentals of Computer**	(8)
	Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organisation of a Digital Computer; NumberSystems– different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs– Assembler, Interpreterand Compiler; Planning a Computer Program- Algorithm, Flowchart and Pseudo code with Examples	
UNIT II	**Introduction to computers**	(8)
	Input and Output Devices: Keyboard, mouse, touch screen, joystick, scanner, web camera, MICR, OCR, OMR, bar-code reader, monitor, printer, plotter. Memory: Primary, secondary, auxiliary memory; RAM, ROM, cache memory, magnetic tape, magnetic disks, hard disk drives, optical disks, CD-R, DVD, flash drives, blue ray disc, Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, LOCF - Page: 1 of 35 processors., motherboard, ports and interfaces, expansion cards, ribbon cables, SMPS, memory chips.	
UNIT III	**Operating System Fundamentals**	(6)
	Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting	
UNIT IV	**Internet Basics**	(8)
	Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. Web Basics: Introduction to web, web browsers, http/https, URL, HTML5, CSS	

Course Outcomes: - Students will be able to…
1. apply Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
2. analyse introduction of computers, classification of computers, anatomy of computer.
3. evaluate the constituents and architecture of computers and microcontrollers.
4. explain Web Programming basics, introduction of HTML and CSS programming

Reference Books:
1. J. Glenn Brook shear,(2015)," Computer Science: An Overview", Addision-Wesley, Twelfth Edition
2. David Riley and Kenny Hunt(2014), Computational thinking for modern solver, Chapman & Hall/CRC
3. Pradeep K. Sinha and Priti Sinha(2010), Computer Fundamentals (Sixth Edition), BPB Publication
4. R.G. Dromey,(2005), "How to solve it by Computer", PHI.

Course II- Paper II
BAIT115: Computational Statistics-I

Course Objectives: Students should be able to…
1. learn to impart adequate knowledge on the need of statistics.
2. study the technique of data collection & its presentation, concept of correlation and regression.
3. introduce concept of correction coefficient and how to interpret it's value.
4. establish relationship between two or more variables and predict the value by Regression analysis
5. understand basic concept of probability, distribution probabilities of different events and time series.

Credits=2	SEMESTER-I Course II-BAIT115: Computational Statistics-I	No. of hours per unit/ credits
UNIT I	**Data Condescension, Presentation and Measure of Central tendency**	(8)
	1.1 Introduction to statistics, Scope of Statistics, Data, Primary and secondary data, Classification of data Tabulation and Diagrammatic Representation of statistical data 1.2 Graphical Representation of data Bar-charts, Pie-diagrams Histograms, Frequency Polygon and Frequency curve. Population, Sample, Sampling Methods: Simple Random Sample (SRSWR and SRSWOR), Stratified Random Sample, Systematic sampling, Cluster sampling. 1.3 Mathematical and positional averages: Data Presentation: M, G.M, H.M, relation between them and their properties. Median, mode, partition values	
UNIT II	**Measure of Dispersion and moments**	(8)
	2.1 Measures of Dispersion: Range, Quartile deviation, Mean deviation, standard deviation, coefficient of variation. Various properties of these measures and their utility. 2.2 Raw and central moments, factorial moments, central moments in terms of raw moment's up to 4th order. Definition, Measures of skewness: Bowley's coefficient, Karl Pearson's coefficient, measure of skewness based on moment Kurtosis: Definition, measures of kurtosis, Sheppard's correction.	
UNIT III	**Correlation and Regression**	(8)
	3.1 Concept of correlation, Karl Pearson's coefficient of correlation, Correlation coefficient for A bivariate frequency distribution, Spearman's Rank correlation 3.2 Concept of Regression, Properties of regression coefficient.	
UNIT IV	**Probability & Conditional Probability**	(6)
	4.1 Events and sets, Sample space, Concept of probability, Addition and multiplications Theorem on probability 4.2 Conditional probability and independence of events, Baye's Theorem, Concept of random variable,Mathematical Expectation.	

Course Outcomes: Students will be able to…
1. Evaluate the graph and types of graphs, representation of graphs.
2. Compute Measure of central tendency and Measure of Dispersion.
3. Acquire Knowledge about the correlation.
4. Understand Linear regression analysis
5. Explain events, sample space, probabilities and conditional probability.

Reference Books:
1. Parimal Mukhopadyay(2011), An Introduction to the Theory of Probability (World Scientific Publishing Company).
2. S.P. Gupta(2011),Statistical Methods, Sultan Chand and sons Publications, 4th Edition.
3. Dr. S. Arumugam and A. Dhandapani Issac,(2002),Statistics, New Gamma Publication house.
4. Kishor S. Trivedi (1997), Probability and statistics with reliability queuing and Computer Science Applications - Prentice Hall of India (P) Ltd., New Delhi.
5. P. S. Grewal(1990), Methods of Statistical Analysis (Sterling Publishers).

Course II Lab: BAIP116: Practical-II

Course Objectives: Students should be able to…

1. learn algorithm, Flowchart and Pseudo code with Examples.
2. understand the fundamentals of operating systems.
3. define computer programming and its role in mathematics problem solving.
4. identify programming skills using the fundamentals and basics of Python Language.

Credits=2	SEMESTER-I Course II Lab: BAIP116: Practical-II	No. of hours per unit/ credits (60)
Part A:	**Fundamentals of Computer**	
	1. Identification of the peripherals of a computer, components in a CPU and their functions. 2. Assembling and disassembling the system hardware components of personal computer. 3. Basic Computer Hardware Trouble shooting. 4. Study of internet basics 5. Familiarization of Basic Software – Operating System, Word Processors. 6. Study of Internet Browsers, Integrated Development Environment (IDE) with Examples. 7. Verify the components of a typical computer system. 8. Study of number systems. 9. Study of HTML tags 10. Study of table tags, ordered and unordered lists.	
Part B:	**Computational Statistics-I**	
	11. Graphical Representation 12. Measures of Central Tendency I 13. Measures of Central Tendency II 14. Measures of dispersion I 15. Measures of dispersion II 16. Correlation coefficient 17. Spearman's Rank correlation coefficient 18. Regression 19. Application of Probability and Conditional probability 20. Application on Baye's Theorem	

Course Outcomes: - Students will able to…
1. evaluate introduction of computers, classification of computers, anatomy of computer.
2. explain Study of constituents and architecture, microcontrollers.
3. learn solve mathematics problems using Python Language.
4. draw diagram and graphs based on frequency distribution
5. understand how to summarized data and find averages as well as spread of the data from central value (average).
6. find correlation coefficient and regression coefficient.

Reference Books:

1. J. Glenn Brook shear,(2015),” Computer Science: An Overview”, Addision-Wesley,Twelfth Edition
2. David Riley and Kenny Hunt(2014), Computational thinking formodern solver,Chapman & Hall/CRC
3. Seymour Lipschutz, Marc Lars Lipson Schaum’s Outlines(2012),Discrete Mathematics, 3rd Edition., Tata McGraw Hill, Education Pvt. Ltd., New Delhi. 5thReprint.
4. Kenneth. H. Rosen(2012)Discrete Mathematics and its applications, Seventh Edition,Mc Graw Hill Publishing Company.
5. Pradeep K. Sinha and Priti Sinha(2010), Computer Fundamentals (SixthEdition), BPBPublication
6. M. Venkataraman, N. Sridharan and N. Chandrasekaran(2009),Discrete Mathematics, The NationalPublishing Company.

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Course III- Paper I
BAIT117: Software Quality Assurance

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Course Objective: - Students should be able to
1.Understand principles of quality assurance used for software development.'
2.Implementing quality attributes, standard quality procedures used for Quality checking of software product.

Credits=2	Course III Paper I Software Quality Assurance	No. of hours per unit/ credits (30)
Unit I:	**Introduction to Software Quality Assurance**	**(8)**
	1. Definitions of Quality, Quality Attributes, Organizational Framework for Software Quality Assurance. 2. Different Views of Quality, Principles of Software Quality Assurance. 3. Quality Assurance vs Quality Control.	
Unit II:	**Managing SQA Operations**	**(8)**
	1.Quality Assurance indicators during SDLC phase. 2. Contents of SQA Plan, Software Quality Assurance. 3.Organizational Initiatives, Need for SQA function benefits	
Unit III:	**Defect Management for Quality and Improvement**	**(8)**
	1.Defect Life Cycle, Defect Classification with Bug Tracking Process. 2.Importance of Defect Leakage Prevention, Residual Defect Density, Detecting and Analysing Software Defects - Techniques for Root 3.Cause Analysis, Orthogonal Defect Classification	
Unit IV:	**Metrics and Measurements**	**(8)**
	1.Understanding Measurement and Metrics, Metrics for Tracking System Test, 2. Metrics for Defect Management, Metrics for Software Maintenance, Metrics for Requirement, Defect Causal Analysis, Metrics for SDLC phases	

Course Outcome:
At the end of this course , students should be able to:
1.Understand Quality Assurance.
2.To check and verify Quality Standards for Software.
3.To learn advanced techniques which can be used for Software Quality Assurance.

Textbooks
1. Kshisagar Naik Priyadarshini Tripathy "Software Testing and Quality Assurance: TheoryandPractice", WILEY,2017.
2. Nina S. Godbole" Software Quality Assurance", Alpha Science International Ltd.,2nd
Edition,June 2017
3. Jack T. Marchewka" Information Technology Project Management", Wiley India,4th Edition,2014.

References
1. M.G.Limaye" Software Testing Principles, Techniques and Tools", Tata McGrawHill,July2017
2. Solis Tech, "Quality Assurance: Software Quality Assurance Made Easy", Createspace
Independent Publishing Platform, January 2016.

<h1 style="text-align:center">BAIT 118: Computational Mathematics -I</h1>

Course Objectives: Students will be able to

1. introduce numerical methods for solution of AI problems.
2. this course emphasizes algorithm development for realistic AI problems.

Credits=2	Course- III: Paper I BAIT 118: Computational Mathematics - I	No. of hours per unit/ credits
Credit –I UNIT I	**UNIT I: Error and Approximation**	(10)
	1.1 Introduction, Importance of Numerical Methods 1.2 Approximation and Errors in computation 1.3 Newton's Finite differences (forward, backward, central difference, divided difference) 1.4 Difference operators, shift operators, differential operators	
Credit –I UNIT II	**UNIT II: Interpolation**	(7)
	2.1 Newton's forward Interpolation 2.2 Newton's backward Interpolation 2.3 Central difference interpolation: Stirling's Formula, Bessel's Formula 2.4 Divided difference interpolation 2.5 Lagrange interpolation	
Credit –I UNIT III	**UNIT III: Numerical Interpolation and Differentiation**	(7)
	3.1 Numerical Differentiation formulae 3.2 Newton-Cote general quadrature formula 3.3 Trapezoidal rule 3.4 Simpson's 1/3 rule 3.5 Simpson's 3/8 rule 3.6 Romberg integration.	
Credit –I UNIT IV	**UNIT IV: Solution of Ordinary Differential Equation**	(6)
	4.1 Euler's Method 4.2 Modified Euler's method 4.3 Runge Kutta methods for 1st order ordinary differential equations 4.4 Runge Kutta methods for 2nd order ordinary differential equations .	

Course Outcomes:

At the end of this course, students should be able to:

1. understand numerical methods
2. solve the Errors and Approximation
3. solve differentiation using numerical methods.

Reference Books:

1. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science ", Khanna Publication.
2. Robert J schilling, Sandra l harries, "Applied Numerical Methods for Engineers using MATLAB and C.", Thomson Brooks/cole.
3. Richard L. Burden, J. Douglas Faires, "Numerical Analysis", Thomson / Brooks/cole
4. John. H. Mathews, Kurtis Fink ,"Numerical Methods Using MATLAB" ,Prentice Hall publication
5. JAAN KIUSALAAS , "Numerical Methods in Engineering with MATLAB", Cambridge Publication

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Practical – I
Course III : Lab I: BAIP 119 : Practical I

Course Objectives: students will be able to:

1. Improve Computational Skills.
2. Develop Problem Solving Skills.
3. Develop testing Skills.
4. Apply Quality Assurance Methodology.

Credits=2	Course III: Lab I BAIP 119: Practical I	No. of hours per unit/ credits (30)
	1. Newton finite difference forward and backward difference 2. Newton finite difference central and divided difference 2. Newton's forward interpolation 3. Newton's backward interpolation 4. Central difference interpolation 5. Lagrange's interpolation 6. Divided Difference interpolation 7. Trapezoidal Rule 8. Simpsons 1/3rd rule 9. Simpsons 3/8th rule 10. Euler Method	
	11. Application of Requirement Stability Index and Requirement Traceability Matrix for given case study. 12. Study of Pareto Chart on the given case study. 13. Defect Matrices Calculation. 14. Maintenance Metrics visualization and creation. 15. Study of Software Testing Metrics. 16. Application of Quality Indicators of SDLC. 17. SQA plan creation 18. Audit Checklist for SQA plan 19. Root Cause Analysis Techniques 20. Implementation of Root Cause Analysis Technique.	

Course Outcomes: Students are able to

1. Understanding Forward and backward interpolation and solve example on it.
2. Understanding to solve Numerical Differentiation and Integration.
3. Design Effective test plans.
4. Demonstrate Understanding of Quality Assurance.

Reference Books:

1. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science ", Khanna Publication.
   2. Robert J schilling, Sandra l harries, "Applied Numerical Methods for Engineers using MATLAB
   3 Richard L. Burden, J. Douglas Faires, "Numerical Analysis", Thomson / Brooks/cole
4. John. H. Mathews, Kurtis Fink, "Numerical Methods Using MATLAB", Prentice Hall publication
5. JAAN KIUSALAAS, "Numerical Methods in Engineering with MATLAB", Cambridge Publication

Course- I: Paper II

BAIT121: Object Oriented Programming using python

Course Objectives: Students should be able to…

1. learn fundamental concepts of objects.
2. Study of principles of programming.
3. understand the concept of object-oriented programming like classes, constructors, Polymorphism, inheritance, and file handling.
4. identify the open source libraries.

Credits=2	SEMESTER-II **Course I: Paper II** **BAIT121: Object Oriented Programming using python**	No. of hours per unit/ credits
UNIT I	**Introduction to Object Oriented Programming**	(8)
	Features of Object oriented programming system (OOPS) – Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism, Classes and Objects: Creating a class, The Self variable, Constructor, Types of Variable, Namespaces, Types of Methods, Inheritance and Polymorphism – Constructors in inheritance, the super() method, types of inheritance, polymorphism, abstract classes and interfaces	
UNIT II	**Strings, functions and Python libraries**	(8)
	Strings: Creating strings and basic operations on strings, string-testing methods. Functions: Defining a function, Calling a function, returning multiple values from a function, functions are first class objects, formal and actual arguments, positional arguments, recursive functions, Basics of open-source libraries for data prepressing, modelling and visualization, Using Python to Access Web Data Regular Expressions, Extracting Data, Sockets, Using the Developer Console to Explore HTTP, Retrieving Web Page, Parsing Web Pages Module	
UNIT III	**Exception Handling**	(6)
	Exception: Errors in a Python program, exceptions, exception handling, types of exceptions, the except block, the assert statement, user-applyd exceptions	
UNIT IV	**Graphical User Interface and databases**	(8)
	GUI in Python: The root window, fonts and colors, working with containers, Canvas, Frames, Widgets – Button widget, Label widget, message widget, text widget, radio button widget, entry widget, Using Databases, Single Table CRUD, Designing and Representing a Data Model, Inserting Relational Data, Reconstructing Data with JOIN, Many to Many Relationships.	

Course Outcomes: - Students will be able to…

    1. evaluate the basic concepts of OOPs.

    2. apply different Python library to solve programming problems.

    3. explain the advanced concepts of python and apply for accessing databases and web data.

    4. analyze APIs and third-party libraries to be used with Python.

Reference Books:

1. Robert Sedgewick, Kevin Wayne, Robert Dondero(2016), "Introduction to Programming in Python: AnInter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd.,
2. Timothy A. Budd,(2015)," Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,
3. Charles Dierbach,(2013) "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition
4. Kenneth A. Lambert,(2012), "Fundamentals of Python: First Programs", CENGAGE Learning.
5. Michael H.Goldwasser, David Letscher,(2007), "Object Oriented Programming in Python", Prentice Hall, 1st Edition

BAIT122: Database Systems

Course Objectives: Students should be able to…
1. understand various basics of DBMS and query languages.
2. learn different types of database systems and their applications in different scenarios.
3. identify the process of drawing the ER-Diagrams.
4. study of the importance of database analysis and learn any database application.

Credits=2	SEMESTER-II Course I: Paper IIBAIT122: Database Systems	No. of hours per unit/ credits
UNIT I	**Introduction**	(8)
	Characteristics and fundamental concepts of Databases, Types of Data Models and Data Modelling,Elements of Database Systems, Classification and comparison of Database Management Systems (Regular and NoSQL Page), concurrency control, Lock based concurrency control, Time stamping methods	
UNIT II	**Structured and semi-structured data management**	(7)
	Structured data, relational databases, Relational model, Functional Dependencies, normal forms, algorithms for query optimization, Semi-structured data, document-databases, semi-structured data abstraction, representation and search	
UNIT III	**Transaction Management**	(7)
	Transaction concept, transaction state, ACID properties, serializability, Recoverability, Implementation of Isolation, Testing for serializability	
UNIT IV	**Unstructured Data Management and Big Data Management**	(8)
	Unstructured text, Information retrieval systems, document retrieval and ranking, Platforms for Big Data, algorithms for Map-Reduce & Hadoop, Platforms for Big Graphs, algorithms for large graphs.	

Course Outcomes: - Students will be able to…

1. apply the basics of databases and data management.
2. evaluate various theoretical and practical principles involved in the design and use ofdatabases systems with the help of database
3. design and implement databases for various scenarios.
4. modify database scenario for handling big data.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan,(2006), Database System Concepts, Tata McGraw Hill
2. Elmsari and Navathe(2013), Fundamentals of Database Systems, Pearson Education.
3. Ramakrishnan and Gehrke,(2003), Database Management Systems, McGrawHill
4. C.J.Date, A.Kannan, S.Swamynathan, (2006),"An Introduction to Database Systems", Pearson

Course-I: Lab BAIP123: Practical-II

Course Objectives: Students should be able to…
1. learn principles of programming.
2. understand the concept of object-oriented programming like classes, constructors, Polymorphism, inheritance, and file handling.
3. study of how to implement databases for various scenarios.
4. identify the design a database scenario for handling big data.

Credits=2	SEMESTER-II Course-I: Lab BAIP123: Practical-II	No. of hours per unit/ credits(60)
Part A :	**Object Oriented Programming using python**	

	1. Write a NumPy program to compute the cross product of two given vectors
	2. Write a NumPy program to calculate the QR decomposition of a given matrix
	3. Write a Pandas program to convert a Panda Module Series to Python list and it's type.
	4. Write a Pandas program to convert a NumPy array to a Pandas series
	5. Implement the concept of Classes and objects
	6. Implement the concept of inheritance
	7. Implement the concept of polymorphism
	8. Write a menu-driven program to create mathematical 3D objects
	   I. curve
	   II. sphere
	   III. cone
	   IV. arrow
	   V. ring
	   VI. Cylinder.
	9. WAP to read n integers and display them as a histogram.
	10. WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.	

Part B :	**Database systems**	
	11. Implement normal forms in a database. 12. Implement basic SQL commands on a database. 13. Programs on relational models 14. Implementation of queries and subqueries 15. Implement information and raking using any language. 16. Implement document retrieval and ranking using any algorithm. 17. Programs on serializability. 18. Programs on concurrency control. 19. Implement different algorithm using Hadoop. Implement Map-reduce algorithm on any big data task.	

Course Outcomes: - Students will be able to…
1. explain basic principles of Python programming language
2. implement database and GUI applications.
3. demonstrate normalization techniques with simple examples.
4. describe transaction processing and concurrency control concepts.

Reference Books:
1. Robert Sedgewick, Kevin Wayne, Robert Dondero, (2016),"Introduction to Programming in Python: AnInter-Disciplinary Approach", Pearson India Education Services Pvt. Ltd.,
2. Timothy A. Budd(2015)," Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,
3. Charles Dierbach,(2013), "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition
4. Kenneth A. Lambert(2012), "Fundamentals of Python: First Programs", CENGAGE Learning.
5. David L. Poole and Alan K. Mackworth, (2010), Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press.

B.Sc.I- Semester-II
Course II : Paper I:
BAIT124: Operating Systems

Course Objectives: - Students should be able to…

1. aware different types of Operating System and their services.
2. learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3. understand virtual memory concepts.
4. remember the concept of secondary memory management.

Credits=2	SEMESTER-II Course I : BAIT124: Operating Systems	No. of hours per unit/ credits
UNIT I	**Concepts of Operating Systems**	(7)
	Computer system overview, concept of an operating system, batch system, multiprogramming, multiprocessing, multi user, time sharing, personal system, parallel system, real time system, simplemonitors, general system architecture, System components, operating system services, system calls, system programs, system structure, Approaches to OS design and implementation: Microkernel, Layered, Kernel Approach	
UNIT II	**Processes and Threads**	(7)
	Concept of process, process states, process state transitions, process control block, operations on processes, threads, concurrent processes, mutual exclusion and synchronization, principles of deadlocks, integrated deadlocks strategy, scheduling levels, scheduling criteria, Inter process synchronization, Inter process communication, Linux, IPC Mechanism, Remote procedure calls, RPC exception handling, security issues	
UNIT III	**Memory Management and Data Management**	(8)
	Logical and physical address space, storage allocation and management techniques, swappingconcepts of multi programming, paging, segmentation, virtual storage management strategies, demand paging, page replacement algorithm, thrashing, File organization, record blocking, access method, directory structure, protection file system structure, allocation methods, free space management, directory implementation, disk structure, disk scheduling, disk management, buffering, swap space management, RAID levels	
UNIT IV	**Case Studies and OS Abstractions**	(8)
	Linux/Unix OS design and architecture, Unix shell, Unix operating system services, user perspective, representation of files in Unix system processes and their structure, input-outputsystem, memory management in Unix, Processes: fork, wait, exec, exit, kill, getpid, brk, nice, sleep,trace,Files: open, close, read, write, lseek, stat, sync, Directories: mkdir, rmdir,link, unlink, mount, umount users +, Security: chown, chmod, getuid, setuid, Inter process communication: signals, pipe, Networking: socket, accept, snd, recv, connect	

Course Outcomes: - Students will able to…

1. control access to a computer and the files that may be shared
2. demonstrate the knowledge of the components of computer and their respective roles in computing.
3. recognize and resolve user problems with standard operating environments.
4. apply practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

Reference Books:

1. Ekta Walia(2020),Operating System Concepts, Khanna Book Publishing.
2. Crowley(2017),Operating System A Design Approach-, McGraw Hill Education.
3. Kernighan and Pike(2015),UNIX programming environment, PHI/ Pearson Education
4. Andrew S. Tanenbaum(2014),Modern Operating Systems, 2nd edition, Pearson/PHI
5. William Stallings(2012),Operating systems Internals and design principles,Pearson Education,
6. Abraham Silberchatz, Peter B. Galvin, Greg Gagne(2006) Operating System Principles- 7th Edition, John Wiley Publication
7. W. Stallings(2005),Operating Systems – Internals and Design Principles, Fifth Edition, Pearson Education/PHI
8. W.R. Stevens(2000),Advanced programming in the UNIX environment, Pearson education.

Theory: Course II: Paper II
BAIT125: Computational Mathematics -I

Course Objectives: Students should be able to…

1. learn to impart adequate knowledge on the need of mathematics.
2. understand the need of problem-solving techniques.
3. introduce the fundamental of logic, relations and counting.
4. identify basic concept of graphs, matrices, different types of graphs and matrices.

Credits=2	**SEMESTER-I** **Course II: BAIT125: Computational Mathematics -I**	**No. of hours per unit/ credits**
UNIT I	**The Fundamental of Logic and Relations**	(8)
	Propositional logic, Applications of Propositional logic, Propositional equivalences (Exclude Propositional satisfiability, Applications of satisfiability, solving satisfiability problems, and its related problems), Predicates and Quantifiers, Rules of inference, Relations and their properties, representing relations, Closures of relations, Partial orderings (Theorems statement only; Exclude lexicographic ordering - Exclude Lattices)	
UNIT II	**Counting**	(8)
	The basic of counting, the pigeonhole principle, Permutation and Combinations, Applications of recurrence relations, solving recurrence relations, Divide and Conquer algorithms and recurrence relations. (All theorems and Results statement only)	
UNIT III	**Graphs**	(8)
	Graphs and Graphs models (Excluding Biological networks; Tournaments; all its related examples and problems), Graph terminology and special types of graphs, representing graphs and Graph isomorphism, Connectivity (paths – connectedness in undirected graphs – paths and isomorphism – counting paths between vertices), Shortest path problems.	
UNIT IV	**Matrices**	(6)
	Introduction, Operations on Matrices and examples, Inverse of Matrices and examples, Rank of a matrix, Solution of simultaneous linear equations, Eigen values and Eigen Vectors.	

Course Outcomes: - Students will be able to...

1. evaluate fundamental of logic, application of logic and relations.
2. explain the pigeonhole principle and applications of recurrence relations.
3. demonstrate graphs and its types, solve problems on it.
4. apply matrices and its types, eigen values and eigen vectors

Reference Books:

1. Seymour Lipschutz, Marc Lars Lipson Schaum's Outlines(2012),Discrete Mathematics, 3rd Edition., Tata McGraw Hill, Education Pvt. Ltd., New Delhi. 5th Reprint.
2. Kenneth. H. Rosen(2012)Discrete Mathematics and its applications, Seventh Edition, Mc Graw Hill Publishing Company.
3. M. Venkataraman, N. Sridharan and N. Chandrasekaran(2009),Discrete Mathematics,The National Publishing Company.

Course II Lab : Practical II

BAIP126: Lab based on (BAIT124 and BAIT125)

Course Objectives: Students should be able to…
1. understand and implement shell programing.
2. learn how to create and/or modify concurrent programs.
3. identify computer programming and its role in statistics problem solving.
4. study of programming skills using the fundamentals and basics of Python Language.

Credits=2	SEMESTER-II Lab Course II :BAIP126: Lab based on (BAIT124 and BAIT125)	No. of hours per unit/ credits (60)
Part A:	**Operating systems**	
	1. Study on different operating systems.	
	2. Experiments to understand operating system (Ubuntu) installation process, file system portioning and dual boot setup.	
	3. Experiment to learn command line interface (shell) and exploring various commands of UNIX.	
	4. Writing programs to create and execute shell script.	
	5. Program to implement various algorithms for process scheduling	
	6. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)	
	7. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.	
	8. Use the following system calls of UNIX operating system: mkdir, rmdir, link, unlink, mount, umount users +, chown, chmod, getuid, setuid.	
	9. Use the following system calls of UNIX operating system: fork, wait, exec, exit, kill, getpid,brk, nice, sleep, trace, open, close, read, write, lseek, stat, sync	
	10.Use the following system calls of UNIX operating system: signals, pipe, socket, accept, snd,recv, connect.	
Part B :	**Computational Mathematics -I**	
	11. Write a Python Program to Print a Multiplication Table for the given number.	
	12. Write a Python Program to check whether the given number is prime or not.	

	13. Write a Python Program to display the Fibonacci series for a given number.	
	14. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.	
	15. Write a Python Program to Transpose the Matrix.	
	16. Write a Python Program to Multiply Two Matrices.	
	17. Write a Python Program to Generate the Calendar for the Given Month and Year.	
	18. Write a Python Program to Find factorial of the given number.	
	19. Inverse of Matrix by Cayley Hamilton Method.	
	20. Eigen Values and Eigen Vectors.	

Course Outcomes: - Students will be able to...

1. evaluate the basics of an operating systems and its major components.
2. apply security as well as recovery features in the design of algorithm.
3. solve statistics problems using Python Language.
4. sketch time series plots using python, find the probabilities ofevents and conditionalprobabilities.

Reference Books:

1. Dr. Marlapalli Krishna & S. Jaya Prakash Dr. Marlapalli Krishna, K. Varada Rajkumar(2021),Basic Python Programming forBeginners , Bluerose Publishers Pvt. Ltd.
2. Eric Matthes(2019),Python Crash Course, 2nd Edition: AHands-On, Project-BasedIntroduction to Programming.
3. S.P. Gupta(2011),Statistical Methods, Sultan Chand and sons Publications, 4thEdition.
4. Dhamdhare(2006),Operating Systems-A Concept Based Approach, TMH
5. John Willey (2004),Operating system, Galvin & Silberschatz, 7th Edition
6. Maurice J. Bach,(1986), The design of Unix Operating system, PearsonEducation, India.

B.sc I – Semester I
Course III: Paper I
BAIT 127: Introduction to Machine Learning

Course Objective: - Students should be able to…
1.Understand principles of Machine Learning.
2. Develop foundational knowledge in various machine learning techniques.

Credits=2	Course III: Paper I BAIT 127: Introduction to Machine Learning	No. of hours per unit/ credits (30)
Unit I:	**Fundamental of Machine Learning**	**(8)**
	1.1 Definition and types (supervised, unsupervised, reinforcement learning).	
	1.2 Applications of machine learning. Basic Concepts of ml- Data, features, and labels.	
	1.3 Training and testing datasets.	
	1.4 Overfitting and underfitting.	
Unit II:	**Supervised Machine Learning**	**(8)**
	Linear Regression-	
	2.1 Simple linear regression	
	2.2 Multiple linear regression	
	2.3 Evaluation metrics (R-squared, Mean Squared Error).	
	Classification Algorithms-	
	2.4 Logistic regression	
	2.5 K-Nearest Neighbors (KNN)	
	2.6 Decision Trees.	
Unit III:	**Unsupervised Learning**	**(8)**
	Clustering Techniques	
	3.1 K-Means clustering.	
	3.2 Hierarchical clustering.	
	Dimensionality Reduction	
	3.3 Principal Component Analysis (PCA).	
	3.4 t-Distributed Stochastic Neighbor Embedding (t-SNE).	
Unit IV:	**Reinforcement learning**	**(8)**
	Basic Concepts	
	4.1 Definition of reinforcement learning (RL).	
	4.2 Difference between RL, supervised learning, and unsupervised	

	learning.	
	4.3 Key components: agent, environment, states, actions, rewards.	
	4.4 Examples of RL applications (e.g., games, robotics, finance).	

Course Outcomes:

Students are able to:

1. Implement and evaluate various machine learning algorithms.
2. Perform data manipulation and visualization using Python.
3. Understand and apply quality assurance methods in the context of machine learning.

Textbooks
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron- O'Reilly Media
2. Pattern Recognition and Machine Learning by Christopher M. Bishop- Publisher: Springer
3. Machine Learning Yearning by Andrew Ng- Self-published (available as a free PDF)
4. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili- Packt Publishing
5. Deep Learning with Python by François Chollet- Manning Publications

Reference Books:

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop.
3. "Machine Learning Yearning" by Andrew Ng.
4. "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili.
5. "Deep Learning with Python" by François Chollet.

Course III-Paper II
BAIT128: Computational Statistics-II

Course Objectives: Students should be able to…

1. find multiple and partial correlation.
2. establish relationship between two or more variables and predict the value by Regression analysis
3. evaluate mathematical expectation for univariate distribution.
4. introduce students with standard discrete probability distributions.
5. understand use of discrete probability distributions in different situations .

Credits=2	SEMESTER-I Course II-BAIT128: Computational Statistics-II	No. of hours per unit/ credits
UNIT I	**Multiple and Partial Correlation (for trivariate data only)**	(8)
	1.1 Concept of multiple correlations. Definition of multiple correlation coefficient Ri.jk, derivation of formula for multiple correlation coefficient .Properties of multiple correlation coefficient; coefficient of multiple determination R1.23. 1.2 Concept of partial correlation. Definition of partial correlation coefficient, derivation of formula for rij.k. Properties of partial correlation ,relation between simple, multiple and partial correlation. Illustrative Examples.	
UNIT II	**Multiple Linear Regression (for triradiate data only)**	(8)
	2.1 Concept of multiple linear regression, Plane of regression, Yule's notation, correlation matrix. Fitting of regression plane by method of least squares, definition of partial regression coefficients and their interpretation. 2.2 Residual: definition, order, properties, derivation of mean and variance, Covariance between residuals. Illustrative Examples.	
UNIT III	**Univariate Probability Distributions And Mathematical expectation**	(8)
	3.1 Definition of discrete random variable. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.) of a discrete random variable, Properties of c.d.f. (statements only). 3.2 Definition of expectation of a random variable, expectation of a function of a random variable. Results on expectation, Definitions of mean, variance of univariate distributions. Definition of probability generating function (p.g.f.) of a random variable. 3.3 Effect of change of origin and scale on p.g.f. Definition of mean and variance by using p.g.f. Examples	
	Some Standard Probability Distribution	(6)

UNIT IV	4.1 Bernoulli Distribution: p.m.f., mean, variance, distribution of sum of independent and identically distributed Bernoulli variables. 4.2 Discrete Uniform Distribution: p.m.f., mean and variance 4.3 Binomial Distribution: Binomial random variable, p.m.f. with parameters (n, p), Recurrence relation for successive probabilities, Computation of probabilities of different events, mean and variance, mode, skewness, p.g.f., Additive property of binomial variates. Examples. 4.4 Poisson Distribution: Definition of Poisson with parameter λ. Mean, variance, probability generating function (p.g.f.). Recurrence relation for successive Probabilities, Additive property of Poisson distribution. Poisson distribution as a limiting case of Binomial distribution, examples. 4.5 Normal Distribution: Probability density function, mean and variance, properties of normal curve, standard normal distribution, numerical problem	

Course Outcomes: Students will be able to…
1. find multiple and partial correlation.
2. know multiple regression coefficient
3. understand probability mass function, cumulative distribution function.
4. evaluate expectation of random variable.
5. understand various univariate probability distribution.

Reference Books:

6. Parimal Mukhopadyay(2011), An Introduction to the Theory of Probability (World ScientificPublishing Company).
7. S.P. Gupta(2011),Statistical Methods, Sultan Chand and sons Publications, 4th Edition.
8. Dr. S. Arumugam and A. Dhandapani Issac,(2002),Statistics, New Gamma Publication house.
9. Kishor S. Trivedi (1997), Probability and statistics with reliability queuing and ComputerScience Applications - Prentice Hall of India (P) Ltd., New Delhi.
10. P. S. Grewal(1990), Methods of Statistical Analysis (Sterling Publishers).

Course III Lab: BAIP 129 : Practical II

Course Objectives: students will be able to:

1. To Enhance Computational Skills.
2. Solve real-world problems using various machine learning techniques.
3. Evaluate model performance and troubleshoot issues.
4. Ensure the quality and robustness of machine learning models.

Credits=2	SEMESTER – II BAIP 119: Lab BAIT 129: Practical II	No. of hours per unit/ credits (30)
	Part A	
	1. Machine Learning and its application-oriented algorithms. 2. Introduction to Machine Learning using Python and its libraries. 3. Installation of pandas and use of pip command. 4. Python program using NumPy for some basic mathematical operations 5. Implementing KNN- classification algorithm using Python on IRIS dataset. 6. Python script using Scipy for image manipulation. 7. Python program using Theano for computing a Logistic Function. 8. Python program using TensorFlow for multiplying two arrays. 9. Python program using Pandas for arranging a given set of data into a table. 10. Python program using Matplotlib	
	Part B	
	11.Multiple correlation coefficients 12. partial correlation coefficients 13.Multiple regressions - I. 14.Multiple regressions - II. 15.Application of Bernoulli distribution 16. Application of discrete uniform distribution. 17. Application of binomial distribution 18. Application of Poisson distribution. 19. Application of normal distribution. 20. Model sampling from discrete uniform distribution , binomial distribution, poisson distribution	

Course Outcomes:

Students are able to:

1. Implement and evaluate various machine learning algorithms.
2. Perform data manipulation and visualization using Python.
3. Understand and apply quality assurance methods in the context of machine learning.

Reference Books:

1."Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.

2."Pattern Recognition and Machine Learning" by Christopher M. Bishop.

3. B. L. Agarwal, Basic Statistics (New Age International (P) Ltd., 2015) for Unit-I , II, III, IV; Unit-I: P. No. 13-41, Unit-II: P. No.42-97, Unit-III: P.. No. 368-384.

4. A. M. Goon, M. K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol. I and II (Calcutta: World Press, 2016) Unit-I : P. No- 42-89, Unit-II ,III : P. No. 90-158.