

Faculty of Vocational Studies
SYLLABUS FOR
Bachelor of Vocation
(Artificial Intelligence and Data Science)
(Semester I, III,V)
(Under Credit Based Continuous Evaluation Grading System)
Session: 2026-27



The Heritage Institution
KANYA MAHA VIDYALAYA JALANDHAR
(Autonomous)

KANYA MAHA VIDYALAYA JALANDHAR

SCHEME AND CURRICULUM OF EXAMINATION OF THREE-YEAR DEGREE PROGRAMME BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE) SEMESTER-I

Bachelor of Vocation (Artificial Intelligence and Data Science) Semester I									
Course Code	Course Title	Course Type	Credits		Marks				Examination time (in hours)
			L-T-P	Total	Total	Ext.		CA	
						L	P		
BVIL-1421/ BVIL-1031/ BVIL-1431	Punjabi (Compulsory)/ ¹ Basic Punjabi/ ² Punjab History and Culture	C	4-0-0	4	100	70	-	30	3
BVIM-1102	Communication Skills in English-I	C	3-0-1	4	100	50	20	30	3
BVIL-1113	Introduction to Computers and Information Technology	S	2-0-0	2	50	35	-	15	3
BVIL-1114	Introduction to Artificial Intelligence and Data Science	S	4-0-0	4	100	70	-	30	3
BVIL-1115	Office Fundamentals	S	2-0-0	2	50	35	-	15	3
BVIM-1116	Computational Problem Solving-I	S	2-0-2	4	100	35	35	30	3+3
BVIP-1117	Lab in Office Fundamentals	S	0-0-2	2	50	-	35	15	3
USEP-0001	Entrepreneurship Mindset-I	S	0-0-2	2	50	-	50	-	
VACF-1491	*Foundation Course	VAAC	2-0-0	2	50	35	-	15	1
Total				26					

Note: C – Compulsory S – Skill Enhancement VACC-Value Added Audit Course

*Credits/Grade points or grades of these courses will not be included in SGPA/CGPA of the Semester/Programme

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester I
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: INTRODUCTION TO COMPUTERS AND
INFORMATION TECHNOLOGY
COURSE CODE: BVIL-1113**

L - T - P	
2-0-0	Theory: 35
Time: 3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

Unit-I

Introduction to Information Technology: Basic concepts of IT, Data Processing: Data and Information.

Introduction to Computers and its Applications:

- Computer as a system, basic concepts, functional units and their interrelation.
- Milestones in Hardware and Software.
- Batch oriented / on-line / real time applications.
- Application of computers.

Unit-II

Software: System and Application Software, Utility packages, Configuration of Computer System.

Applications of Information Technology: Wide range of Applications in: Home, Education and Training, Entertainment, Science, medicine, engineering etc

Unit-III

Input Devices: Keyboard, mouse, pens, touch screens, Bar Code reader, joystick, source data automation, (MICR, OMR, OCR), screen assisted data entry: portable / handheld terminals for data collection, vision input systems.

Output Devices: Monitor, Serial line page printers, plotters, voice response units.

Data Storage Devices and Media: Primary storage (Storage addresses and capacity, type of memory), Secondary storage, Magnetic storage devices and Optical Storage Device

Unit-IV

Introduction to Emerging Technologies: Big Data: Characteristics, Architecture, Technologies and Applications, Edge Computing

Cloud: Predecessors technologies, characteristics, service models, Deployment models, benefits and challenges, Third Party Cloud Providers: GCP, AWS, Introduction to MICROSOFT AZURE

IoT: History, characteristics, applications and Adoption barriers.

References/ Textbooks:

1. P.K.Sinha, “Computer Fundamentals”, Sixth Edition, BPB Publications,2004.
2. N. Subramanian, “Introduction to Computers”, First Edition, McGraw Hill Education India,2001.
3. Peter Norton, “Introduction to Computers”, First Edition, McGrawHill Education,2017.
Gurvinder Singh, Rachpal Singh, “Windows Based Computer Courses”, Third Edition, Kalyani Publishers,2017

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester I
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: INTRODUCTION TO ARTIFICIAL INTELLIGENCE
AND DATA SCIENCE
COURSE CODE: BVIL-1114**

L - T - P	
4-0-0	Theory: 70
Time: 3 Hours	

Instructions for the paper setter:

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

UNIT I

Introduction to AI, History of AI, AI- Intelligent Systems, benefits and Risk of AI, Challenges, Opportunities and Applications. AI its applications in data science, Problem Framing

UNIT II

Introduction to Data Science, Evolution of Data science, Need of Data Science, Components of data Science, Data Science Process. Difference between Data Science and Business Intelligence. Application Areas and Challenges in Data Science, Job Roles in Data Science domain

UNIT III

Data Science Methodologies, Steps Involved in Data Analysis (data collection, integration, management, modelling, analysis, visualization, prediction and informed decision making)

UNIT IV

Statistical description of data: Mean, Median and Mode, Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation

References/ Textbooks:

1. J. Han, M. Kamber and J. Pei , “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann Publishers, 2011.
2. Nong Ye, “Handbook of Data Mining”, First Edition, 2003.
3. Anshuman Sharma, “Fundamentals of Numerical Methods and Statistical Techniques”, Second Edition, Lakhanpal Publishers, 2014.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester I**

(Three Year Degree Programme)

(Session 2026-27)

COURSE TITLE: OFFICE FUNDAMENTALS

COURSE CODE: BVIL-1115

L - T - P	
2-0-0	Theory: 35
Time: 3 Hours	

Instructions for the Paper Setter

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

Unit I

Basics of Document: Creating a New Document, Inserting and Deleting Text, Saving a Document, Opening a Document, Selecting and Replacing Text Using Undo, Redo and Repeat Navigating through a Document, Viewing a Document, Working with the Document, Window Viewing Multiple Document, and Windows Previewing and Printing a Document, Closing a Document

Formatting of a Document: Drop Caps, Add Shading to Draw Reader's Attention, Steps to Add Borders to a Document, work with Word Styles, Adjust the Horizontal Size of Characters, Insert and Prevent certain types of Page Breaks, Using the Word, Themes To Make a Professional Document look. Steps to Create, Modify or Attach a Template. Add, Edit or Delete Headers and Footers, Toolbars of word.

Unit II

Creating and Customizing Tables: Methods to Create a Table, Steps to Create a Table that has Specific Column Widths. Deleting Column, Row or Entire Table in Word, Creating Table of Contents in word

Working with Graphics: Add, Crop, Change Pictures File Size and Wrap Picture with Text, Discover the Proper Steps to Add and Organize Clip Arts, Manipulating Word Art Effects to the Text

Unit III

Presentation: Introduction to PowerPoint, exploring menus, starting a new slide, saving presentation, moving/rearranging slides, printing slides. Applying theme to presentation, Views (slide View, slide sorter, notes view, outline view), Formatting & enhancing text formatting. Creating a graph, displaying slide show, adding multimedia. Slide transitions, applying Animation, Timing slide display, adding movies & sounds. Using a pick look Wizards to change format.

Unit IV

Spreadsheet: Introduction to Worksheet/Spreads, Features of Spreadsheet, Describe the Spreadsheet Window, Creating a new workbook, different functions on different data, creation of graphs, editing

it and formatting, changing chart type to 2d chart or 3d chart, pivot table, creation of worksheet, adding, deleting, moving the text in worksheet, linking different sheets, sorting the data, querying the data, filtering the data (auto and advance filters), What-if analysis, To open an already existing workbook, Saving workbook, printing a worksheet, Closing the workbook & exiting.

References/ Textbooks:

1. Joyce Cox, Joan Lambert and Curtis Frye, “Microsoft office Professional 2010 Step by Step”, First Edition, Microsoft Press, 2010.
2. Bucki Lisa A, “Office 2016 Bible”, First Edition, Wiley, 2013.
3. Weverka Peter, “Office 2016 All in One for Dummies”, First Edition, Wiley India, 2015.
4. Satish Jain, Kratika, M. Geetha, “MS–Office 2010”, First Edition, BPB Publications, 2012.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE - Semester I
(Three Year Degree Programme)
(Session 2026-27)
COURSE TITLE: COMPUTATIONAL PROBLEM SOLVING-I
COURSE CODE: BVIM-1116**

L - T – P	
2-0-2	Theory: 35
Time : 3 Hours	

Instructions for Paper Setter –

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

UNIT-I

Basic Programming concepts: Generations of programming languages, Machine language, Assembly language, High level language, Compiler, Interpreter, Assembler, Programming environment, Text Editor

UNIT-II

Introduction to Python: Applications and features of Python, Process of Computational Problem

Data and Expressions: Literals, Variables, Identifiers, Keywords, Expressions, Statements and Data Types, Python Operators, Data Types: Numbers, String, List, Tuple, Array, Set, Tuples, Dictionaries

UNIT-III

Control Structures: Selection control, Iterative statements, Jumping statements

UNIT-IV

Functions: Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments, Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion, Basic OOPs concept

References/ Textbooks:

1. Charles Dierbach, “Introduction to Computer Science Using Python: A Computational Problem-Solving Focus”, First Edition, John Wiley & Sons, 2013.
2. GUTTAG JOHN V, “Introduction to Computation and Programming Using Python”, Second Edition, PHI, 2014.
3. Jeeva Jose, Sojan P.Lal, “Introduction to Computing & Problem Solving Through Python”, First Edition, Khanna Publishers, 2015.
4. Mark J. Guzdial, Barbara Ericson, “Introduction to Computing and Programming in Python”, First Edition, Pearson Education, 2015.

Signature of Head of Department

KANYA MAHA VIDYALAYA JALANDHAR

**SCHEME AND CURRICULUM OF EXAMINATION OF THREE-YEAR DEGREE
PROGRAMME
BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE)
SEMESTER-III**

Bachelor of Vocation (Artificial Intelligence and Data Science) Semester III									
Course Code	Course Title	Course Type	Credits		Marks				Examination time (in hours)
					Tot al	Ext.		CA	
			L-T-P	Total		L	P		
BVIL-3111	Statistical Inference-I	C	4-0-0	4	100	70		30	3
BVIL-3112	Data Mining and Data Warehousing	S	4-0-0	4	100	70		30	3
BVIL-3113	Data Processing and Visualization	S	2-0-0	2	50	35		15	3
BVIL-3114	Workplace Management	C	2-0-0	2	50	35		15	3
BVIM-3115	Machine Learning-I	S	2-0-2	4	100	35	35	30	3
BVIP-3116	Lab on Data Processing and Visualization	S	0-0-2	2	50		35	15	3
BVIP-3117	Data Storytelling and Presentation	C	0-0-2	2	50		35	15	3
USEP-0003	Entrepreneurship Mindset Level-III	SEC	0-0-2	2	50	-	50	-	-
VACE-3221	Environmental Studies	VAC	2-0-0	2	50	35	-	15	3
Total				24					

Note: C – Compulsory S – Skill Enhancement VACC-Value Added Audit Course

Scheme and Curriculum of Examinations of Three-Year Degree Programme

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester III
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: STATISTICAL INFERENCE-I
COURSE CODE: BVIL-3111**

L-T-P	
4-0-0	Theory:70
Time: 3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

UNIT-I

Cumulative distribution function, Two dimensional random variables, joint distribution, marginal and conditional distributions, Stochastic independence, Introduction to function of random variables.

UNIT-II

Mathematical expectations and moments, moment generating function and its properties, Chebyshev's inequality and its application, central limit theorem (Laplace Theorem)

UNIT-III

Discrete Probability Distributions: Binomial, Poisson, Geometric, Continuous probability distributions: Uniform, Exponential, Gamma, Beta, Normal distributions.

UNIT-IV

Sampling Distributions: Chi-square, t and F-distributions with their properties, distribution of sample mean and variance. Introduction to Estimators, Types of Estimators

References/Textbooks:

1. Hogg R.V., McKean, J.W. and Craig A.T. : Introduction to Mathematical Statistics
2. Gupta S.C. and Kapoor V.K. : Fundamentals of mathematical statistics
3. Goon,A.M.,Gupta M.K. & Dasgupta B. : Fundamental of statistic, Vol. I
4. Goon,A.M.,Gupta M.K. & Dasgupta B. : An outline of statistical theory, Vol. I

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester III
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: DATA MINING AND DATA WAREHOUSING
COURSE CODE: BVIL-3112**

L-T-P	
4-0-0	Theory:70
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

UNIT-I

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Applications, Information Retrieval, Web search engines, Frequent pattern mining.

UNIT-II

Data Mining Techniques-association, classification, clustering, prediction, sequential patterns and decision tree. Classification- Distance based algorithms, K-nearest neighbours, Euclidean distance, city block distance, Tangent distance, Clustering Algorithms, Cluster analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods.

UNIT-III

Introduction to Data Warehousing: Evolution of Data Warehousing, Data Warehousing concepts, Benefits of Data Warehousing, Problems of Data Warehousing, Data Warehousing Architecture, OLAP

UNIT-IV

Types of Data Warehouses- Host based, single stage, LAN based, Multistage, stationary distributed & virtual data-warehouses, Data warehouse tools and technologies

References/ Textbooks:

1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill, Thirteenth Edition, Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
3. Parteek Bhatia, "Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, First Edition, 2019.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester III
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: DATA PROCESSING AND VISUALIZATION
COURSE CODE: BVIL-3113**

L-T-P	
2-0-0	Theory: 35
3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

UNIT-I

Introduction: Data, Characteristics of Data, Prerequisite for Data Processing, Problems associated with raw data, Data cleansing methods, Principles of Data Processing, Data Processing Systems, Data Processing Cycle, Role of Data Processing.

UNIT-II

Types of Data Processing (Batch Processing, Real-time Processing, Online Processing, Distributed Processing, Multiprocessing and Time-sharing). Methods of Data Processing (Manual Data Processing, Mechanical Data Processing, Electronic Data Processing), Applications of Data Processing, Different data formats, Conversion and Aggregation.

UNIT-III

Data Visualization: Introduction of Data Visualization, Importance of Data Visualization, Data Visualization project, User psychology of Visualization, UX in Data Visualization, Introduction to DIKW hierarchy, Goals of Data Visualization. User interface design principles based on Human perception.

UNIT-IV

Basic Visualization tools - Area Plots, Histograms, Bar Charts, Specialized Visualization tools - Pie Charts, Box Plots, Scatter Plots, Bubble Plots. Charts and their applicability for different data types. Advanced Visualization tools - Waffle Charts, Word Clouds.

References/ Textbooks:

1. Satish Jain, "Computer Fundamental & Data Processing", BPB Publications, First Edition, 2010.
2. Andy Kirk, "Data Visualization: A Handbook for Data Driven Design" SAGE Publications Ltd, First edition, 2016
3. Kieran Healy, "Data Visualization: A Practical Introduction" Kindle Edition, Princeton University Press, First edition, 2018.

4. Claus O. Wilke, “Fundamentals of Data Visualization”, O'Reilly Publishers, First Edition, 2019

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester III**

(Three Year Degree Programme)

(Session 2026-27)

COURSE TITLE: WORKPLACE MANAGEMENT

COURSE CODE: BVIL-3114

L-T-P	
2-0-0	Theory:35
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

UNIT I

Formal Communication: Etiquettes of Public speaking, Business meetings, Telephonic communication, Email etiquettes.

Informal Communication: Introduction, expressing gratitude, expressing regret, Apologize, Resolving conflicts.

UNIT II

Presentation Skills: Preparing presentation, making presentation meaningful and engaging, making effective use of the visual aid, interacting with audiences, dealing with queries from the audiences.

Preparing for Interviews: Key factors for being successful in an interview, body language, confidence, subject expertise. Resume Writing.

UNIT III

Maintaining Relationships at workplace, Maintaining Client Satisfaction, Identify Skills required for the job, Work effectively with colleagues.

UNIT IV

Personality Development, Self-Esteem & Confidence Building, Power Dressing: Wardrobe Etiquette, Grooming for Success, Body Language, Poise, and Eye Contact, Pronunciation, Voice Modulation, Assertive Behaviour, Leadership Qualities, Handling difficult situations with grace, Style and Professionalism

References/ Textbooks:

1. Chaturvedi P.D. , “ Business Communication”, Pearson Education India, Third Edition, 2013.
2. Robin Ryan, “60 Seconds and You're Hired!", Fourth Edition, Penguin Books, 2016
3. Joan van Emden, Lucinda Becker, “Presentation Skills for Students”, Palgrave, Third Edition, 2016

4. David Barron, “Resume: The Definitive Guide on Writing a Professional Resume to Land You Your Dream Job”, CreateSpace Independent Publishing Platform, First Edition, 2017

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester III
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: MACHINE LEARNING-I
COURSE CODE: BVIM-3115**

L-T-P	
2-0-2	Theory:35
Time: 3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

Unit I

Introduction: Foundations for ML, ML Techniques, Validation Techniques, Basic definitions, types of learning, hypothesis space and inductive bias, Boolean Functions: Boolean Algebra

Unit II

Linear Regression: Regression basics: Relationship between attributes using Covariance and Correlation, Relationship between multiple variables: Regression (Linear, Multivariate) in prediction. **Multiple Linear Regressions** Polynomial Regression, Regularization methods, Categorical Variables in Regression.

Unit III

Clustering: Distance measures, Different clustering methods (Distance, Density, Hierarchical), Iterative distance-based clustering.

Classification: Naïve Bayes Classifier, Model Assumptions, Probability estimation, Required data processing

Unit IV

Latest Machine Learning models: Decision Trees, Random Forest, Principal Component analysis, Support Vector Machine, Markov decision process, Stochastic Gradient Descent.

References/ Textbooks:

1. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, Second Edition, 2010
2. Judith Hurwitz, Daniel Kirsch"Machine learning for dummies", Wiley, First Edition, 2018
3. Parteek Bhatia, "Data Mining and Data Warehousing: Principals and Practical Techniques", Cambridge University Press, First Edition, 2019
4. Miroslav Kubat, "An Introduction to Machine Learning", Springer, First Edition, 2015

Signature of Head of Department

KANYA MAHA VIDYALAYA JALANDHAR

**SCHEME AND CURRICULUM OF EXAMINATION OF THREE-YEAR DEGREE
PROGRAMME
BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE)
SEMESTER-V**

Bachelor of Vocation (Artificial Intelligence and Data Science) Semester V									
Course Code	Course Title	Course Type	Credits		Marks				Examination time (in hours)
					Total	Ext.		CA	
			L-T-P	Total		L	P		
BVIL-5111	Research Methodology	C	2-0-0	2	50	35	-	15	3
BVIL-5112	Principles of Artificial Intelligence	C	4-0-0	4	100	70	-	30	3
BVIL-5113	Soft Computing	S	4-0-0	4	100	70	-	30	3
BVIL-5114	Project Management	C	4-0-0	4	100	70	-	30	3
BVIM-5115	Machine Learning- II	S	2-0-2	4	100	35	35	30	3
BVIM-5116	Generative Artificial Intelligence	S	2-0-2	4	100	35	35	30	3+3
CCFC-5522	Community Outreach-I	CCFR	0-0-2	2	50	-	35	15	
Total				24					

Note: C – Compulsory S – Skill Enhancement VACC-Value Added Audit Course

*Credits/Grade points or grades of these courses will not be included in SGPA/CGPA of the Semester/Programme

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: RESEARCH METHODOLOGY
COURSE CODE: BVIL-5111**

L-T-P	
2-0-0	Theory:35
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

UNIT I

Overview of Research: Meaning, purpose, significance of ethical conduct in research, Classification of Research based on its purpose (Basic, Applied, Evaluation and Action Research)

UNIT II

Method: Types of approaches – Narrative, phenomenological, grounded theory, ethnographic, case study, Data Sources: Interviews, Focus groups, observations, approaches to analysis of qualitative data –coding, content analysis

UNIT III

Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Oral Presentation

UNIT IV

RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING:

Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement

References/Textbooks:

1. Research Methodology (Kindle Edition) by R. Panneerselvam
2. Research Methodology: A Step-by-Step Guide for Beginners (Paperback) by Ranjit Kumar

3. Case Study Research: Design and Methods (Applied Social Research Methods) by Robert K.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: PRINCIPLES OF ARTIFICIAL INTELLIGENCE
COURSE CODE: BVIL-5112**

L-T-P	
4-0-0	Theory:70
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

Unit-I

Introduction: What is AI? Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. Problem-solving: Problem-solving agents, Example problems, Searching for Solutions

Unit-II

Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search. Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions Logical Agents: Knowledge-based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic

Unit-III

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic. Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution

Unit-IV

Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited

References/Textbooks:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson,2015
2. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013

3. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V**

(Three Year Degree Programme)

(Session 2026-27)

COURSE TITLE: SOFT COMPUTING

COURSE CODE: BVIL-5113

L-T-P	
4-0-0	Theory:70
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

Unit-I

Soft Computing: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Techniques, Applications of Soft Computing.

Unit-II

Fuzzy Logic: Introduction, Architecture of a Fuzzy Logic System, characteristics, fuzzy sets and relation, applications, advantages and disadvantages. Fuzzy versus crisp, crisp set, crisp relation, Crisp logic, predicate logic, fuzzy logic, defuzzification and fuzzification.

Unit-III

Neural Networks: Biological vs Artificial neurons, Difference between ANN and BNN, architecture, working/training of ANN, ADALINE and MADALINE Networks, Backpropagation networks-architecture, advantages, disadvantages, learning rules (Hebbian, perceptron, delta, correlation, out star).

Unit-IV

Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators, Convergence of GA, Bitwise operation in GA, Multi-level Optimization.

References/Textbooks

1. Principles of Soft Computing, S.N. Sivanandam, S.N. Deepa, Wiley India
2. Neuro - Fuzzy & Soft Computing - C. T. Sun, E. Mizutani, J. S. R. Jang, Pearson
3. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V**

(Three Year Degree Programme)

(Session 2026-27)

COURSE TITLE: PROJECT MANAGEMENT

Course Code: BVIL-5114

L-T-P	
4-0-0	Theory:70
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

Unit-I

Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management Software engineering, A Process Framework, Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, Specialized process models, Software development life cycle, Software Effort Estimation, Resource Allocation, Software testing methods

Unit II

Methods and Methodologies, categories of Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices.

Unit III

Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.

Unit IV

Software Quality: Introduction to software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans.

References/Textbooks:

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.

4. Deepak Gaikwad, Viral Thakkar, DevOps Tools From Practitioner's Viewpoint, Wiley.
5. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V
(Three Year Degree Programme)
(Session 2026-27)
COURSE TITLE: MACHINE LEARNING II
COURSE CODE: BVIM-5115**

L-T-P	
2-0-2	Theory:35
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 7 Marks.

Unit-I

Reinforcement learning, Reinforcement Learning Algorithm : Python Implementation using Q-learning, Introduction to Thompson Sampling, Genetic Algorithm for Reinforcement Learning, SARSA Reinforcement Learning, Q-Learning in Python

Unit-II

Introduction to Dimensionality Reduction, Introduction to Kernel PCA, Principal Component Analysis(PCA), Principal Component Analysis with Python, Low-Rank Approximations, Overview of Linear Discriminant Analysis (LDA), Mathematical Explanation of Linear Discriminant Analysis (LDA), Generalized Discriminant Analysis (GDA)

Unit-III

Independent Component Analysis, Feature Mapping, Extra Tree Classifier for Feature Selection, Parameters for Feature Selection, Underfitting and Overfitting in Machine Learning

Unit-IV

Introduction to Natural Language Processing , Overview and language modeling: Overview: Origins and challenges of NLP-Language and Grammar,Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model, Text Preprocessing, Tokenize text , sentence, words ,Introduction to Stemming, Stemming words with NLTK, Lemmatization with NLTK, Lemmatization with Text Blob

References/Textbooks

- 1 The Hundred-Page Machine Learning Book,Andriy Burkov, First Edition
- 2 Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies by John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy

3 Machine Learning in Action by Peter Harrington

4 Machine Learning: A Probabilistic Perspective by Kevin P. Murphy

Signature of Head of Department

**BACHELOR OF VOCATION (ARTIFICIAL INTELLIGENCE AND DATA
SCIENCE) - Semester V
(Three Year Degree Programme)
(Session 2026-27)**

**COURSE TITLE: GENERATIVE ARTIFICIAL INTELLIGENCE
Course Code: BVIM-5116**

L-T-P	
2-0-2	Theory:35
Time:3 Hours	

Instructions for Paper Setter -

Eight questions of equal marks are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be sub divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each Question Carries 14 Marks.

Unit-I

Introduction: What is Generative AI; overview, definition, and scope of Natural Language Processing (NLP); the role of NLP in Generative AI; applications such as text generation, conversational agents, and content automation; key challenges including linguistic ambiguity, contextual understanding, and scalability with large datasets and models.

Unit-II

Text Preprocessing: Tokenization: word-level, sentence-level, subword tokenization; stopword removal; lowercasing and punctuation removal; stemming and lemmatization.

Text Representation and Encoding Methods: Bag-of-Words (BoW), Term Frequency Inverse Document Frequency (TF-IDF), n-grams, and phrase modeling; limitations of sparse vector representations; need for dense word embeddings.

Unit-III

Word Embeddings: Introduction to feedforward neural networks; Word2Vec (CBOW and Skip-gram models); GloVe embeddings; training objectives (e.g., negative sampling, hierarchical softmax); evaluation of word embeddings (intrinsic and extrinsic methods).

Unit-IV

Transformer Networks and Contextual Embeddings: Overview of Recurrent Neural Networks (RNNs), Limitations of static embeddings and the need for contextual representations; self-attention mechanism; Transformer architecture (encoder-decoder, multi-head attention); positional encodings (sinusoidal vs. learned); role of contextual embeddings in generative and discriminative NLP tasks.

Visualization and Evaluation of Word Embeddings: Dimensionality reduction techniques (PCA, t-SNE); visualization of high-dimensional word vectors; interpreting word clusters and semantic relationships; evaluation of embeddings using

analogy tasks and downstream performance; intrinsic vs. extrinsic evaluation metrics.

Text Books

1. Jurafsky, D., & Martin, J. H. (2023). Speech and Language Processing (3rd ed.). Pearson.
2. Goyal, P., Pandey, S., & Jain, K. (2021). Deep Learning for Natural Language Processing. Apress.

Reference Books

1. Goldberg, Y. (2017). Neural Network Methods in Natural Language Processing. Morgan & Claypool Publishers.
2. Bird, S., Klein, E., & Loper, E. (2009). Natural Language Processing with Python (2nd ed.). O'Reilly Media.
3. Rothman, D. (2020). Transformers for Natural Language Processing. Packt Publishing

Signature of Head of Department