

STUDY AND EVALUATION SCHEME
(With effective from academic session 2022-2023)
B. Tech. in Computer Science & Engineering with
specialization in Artificial Intelligence
YEAR III, SEMESTER VII

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY										
1	Professional Core	BCSAI 701	Fuzzy Logic & Application	3	0	0	25	50	75	3
2	Professional Core	BCSAI 702	Supervised & Unsupervised Learning	3	0	0	25	50	75	3
3	Professional Core	BCSAI 703	Online Machine Learning	3	0	0	25	50	75	3
4	Professional Core	BCSAI 704	R Programming	3	0	0	25	50	75	3
5	Project	MGT 103	Project Formulation and Appraisal	3	0	0	25	50	75	3
6	Professional Elective		Electives-III	2	0	0	15	35	50	2
PRACTICALS AND PROJECTS										
7	Professional Core	BCSAI 705	Fuzzy Logic & Application Lab	0	0	4	15	35	50	2
8	Project	BCSAI 706	Mini Project	0	0	4	15	35	50	2
9	Professional Core	BCSAI 707	Campus Recruitment Training	0	0	4	15	35	50	2
10	Skill Enhancement	BCSAI 708	Anandam-III (Happiness Curriculum)	0	0	1	10	15	25	1
			TOTAL	17	0	13	195	405	600	24

L-Lecture, T- Tutorial , P- Practical ,CA- Continuous Assessment, EE- End Semester Examination



Established by Govt. of U.P. u/s 2F of UGC Act, 1956 vide U.P. Act 22 of 2010.

STUDY AND EVALUATION SCHEME
(With effective from academic session 2022-2023)
B. Tech. in Computer Science & Engineering
specialization in Artificial Intelligence
YEAR III, SEMESTER VIII

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY/ PRACTICALS AND PROJECTS										
1	Summer Training	BCSAI 801	Industrial Training/Internship	0	0	12	50	100	150	6
2	Project	BCSAI802	Project	0	0	12	50	100	150	6
3	Professional Elective	BCSAI803	Elective IV	3	0	0	25	50	75	3
TOTAL				3	0	24	125	250	375	15

L-Lecture, T- Tutorial , P- Practical ,CA- Continuous Assessment, EE- End Semester Examination

Course code	Electives– III
MGT 201	Orientation program in Entrepreneurship
MBA 204	Research Methodology
	Elective-IV
BCSAI803	Agile Technology
BCSAI804	Metaverse
BCSAI805	Blockchain Technology

Semester VII

B. Tech CSE (AI)

BCSAI 701 FUZZY LOGIC AND APPLICATION

3L+0T+0P+3C

MM:100

Unit1: Introduction

Classical Set Theory, Fuzzy set theory, membership function, predicate logic, approximate reasoning

Unit2: Approximate Reasoning

categorical , qualitative, syllogistic reasoning, dispositional reasoning, rule base, linguistic variable, quantifiers

Unit 3: Inference System

characteristics, MAMDANI FIS, functional blocks: database, decision making, fuzzification, defuzzification

Unit 4: Quantification

Database and queries, Fuzzy Events, Means, variances, decision making: types, multi-person, multi-objective, multi-criteria

Unit 5: Control System

Adaptive controller, operational concepts ,neural networks fuzziness.

Text/Reference Books

1. Fuzzy logic with Engineering applications by Timothy J Ross
2. fuzzy Sets and Fuzzy Logic: Theory and Application by George J Klir, Bo Yuan
3. Neural Networks,Fuzzy Logic and Genetic Algorithms : Synthesis and Applications byGA Vijayalakshmi Pai

Semester VII

B. Tech CSE (AI)

BCSAI 702: SUPERVISED AND UNSUPERVISED LEARNING

3L+0T+0P+3

MM:100

Unit 1: Overview

Classification, Clustering, Constraints, One-pass learn concepts, Discard after learn concept

Unit 2: Supervised Learning

Logistic Regression, PERCEPTRONS, Neural Networks, Gaussian processes, Support Vector Machines

Unit 3: UnSupervised Learning

Identification, characterization and modeling ,clustering structure, quantum computing, cognitive techniques

Unit 4: Reinforced Learning

Environment, State, reward,policy, multi-task agents,state abstractions

Unit 5: Deep Reinforcement Learning

Continuity analysis, Monte Carlo Tree search , Gradient methods

Text/Reference Books

1. Machine Learning Algorithms for Supervised and Unsupervised Learning: The Future is Here by William Sullivan, Create space independent publishing platform, 2018
2. A systematic Review on Supervised and Unsupervised Machine Learning Algorithms for Data Science, Alloghani, Mohamed(et al.)
3. The elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman; Springer

BCSAI 703: ONLINE MACHINE LEARNING

3L+0T+0P+3C

MM:100

Unit 1: Introduction

Introduction to Bandit Algorithms, Language, Probability spaces, Independence, Integration and Expectation, batch to online setting,

Adversarial setting with full information, Halving algorithm, WM Algorithm, Regret Lower Bounds

Unit 2: Stochastic Setting

STOCHASTICS processes, Markov Chains, Martingales, Stopping Times, Regret notions, concentration inequalities, Stochastic Bandit Algorithms, UCB, KL-UCB

Unit 3: Contextual Bandits

Overview, Regret Analysis, Stochastic Linear Bandits, Method of Mixtures, Kiefer-Wolfowitz Theorem, Sparse Stochastic Linear Bandits

Unit 4: Pure Explorations

Fixed confidence, budget, pure exploration setups, Best Arm identification, Bayesian Bandits, Gittins Index, Thompson Sampling

Unit 5: Pure Explorations Algorithms

LUCB, KL-LUCB, $\text{lil}'\text{UCB}$, Partial Monitoring, Optimal Policy, Proof of Upper and Lower Bound

Text/Reference Books

1. Bandit Algorithms by Tor Lattimore and Csaba Szepesvari, Cambridge University Press
2. Bandit Algorithms for Website Optimization by John Myles White, O'Reilly Media
3. Regret Analysis of Stochastics and nonstochastic multi-armed bandit problems by Nicolo Cesa-bianchi and Sebastien Bubeck
4. J.A. Tropp, Foundations and Trends in Machine Learning

BCSAI 704: R PROGRAMMING LANGUAGE

2L + 0T + 0P + 2C

MM 100

Unit 1: Introduction to R Environment

History and development of R Statistical computing programming language, installing R and R studio, getting started with R, creating new working directory, changing existing working directory, understanding the different data types, installing the available packages, calling the installed packages, arithmetic operations, variable definition in R, simple functions, vector definition and logical expressions, matrix calculation and manipulation using matrix data types, workspace management.

Unit 2: Data Structures, Looping and Branching

Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing, function applying on the lists, adding and deleting the elements of lists, attributes, name and factors, matrices and arrays, matrix indexing, filtering on matrix, generating a covariance matrix, applying function to row and column of the matrix, data frame – creating, coercion, combining data frames, special types in data frames, applying functions: `lapply()` and `sapply()` on data frames, control statements, loops, looping over non vector sets, arithmetic and Boolean operators and values, branching with **if**, looping with **for**, **if-else** control structure, looping with **while**, vector based programming.

Unit 3: R - Object Oriented Programming

Introduction to object oriented concepts in R, basics of S3 classes – S3 Generic functions, OPP in linear model functions, writing S3 classes, using inheritance, introduction to S4 classes, writing S4 Classes, implementing a generic function on an S4 Classes, comparison of S3 and S4 classes, management of objects – listing objects, removing specific objects from the existing function and working directory, saving the collection of objects with `save()` function.

Unit 4: R for Statistics

Descriptive statistics – mean (arithmetic, geometric and harmonic), median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance, correlation and regression – significance of correlation and regression coefficients, chi-square test, non-parametric test, Analysis of Variance for one way variation and two variation – with and without interaction.

Unit 5: R with C, C++ and Python

Introduction to C and C++ programming concepts, writing C/C++ functions to be called from R, preliminaries of R to C and C++ programming languages, some mathematical programming example with R and C/C++, compiling and running the code, debugging R/C code, introduction to Python and its components, installing packages related with python in R, syntax of RPy packages.

Text Book

1. The art of R programming – Norman Matloff, no starch Press, San Francisco.
2. R in Action – Robert I. Kabacoff, Second Edition, Dreamtech Press.
3. Introduction to Scientific Programming and Simulation using R – Owen Jones, Robert Maillardet and Andrew Robinson, CRC Press
4. Advanced R – Hadley Wickham, CRC Press.

MGT 103 PROJECT FORMULATION AND APPRAISAL

3L+0T+0P+3C

MM:100

Unit 1:Introduction

Project attributes; project life cycle; role of managers; Management – scheduling; Gantt charts; CPM; PERT; crashing; Generation of project ideas – resource allocation; environment analysis PEST analysis porter’s model; analysis of strategic capabilities – value chain, BCG matrix, Flexibility.

Unit 2: Appraisal Methods In Project Scanning And Selection – market appraisal; technical appraisal; environmental appraisal; evaluating intangibles, social appraisal – SCBA, UNIDO, LM, CSR

Unit 3: Total quality management

Unit 4: Financial Appraisal

Time value of money; cost of capital – equity, debt, preference; weighted average cost; marginal And average cost; Capital budgeting – investment appraisal techniques; NPV; IRR; Payback period; replacement decisions; selection of exact discount factor – problems, inflation, taxation

Unit 5: Risk Analysis Models

Single probability analysis; sensitivity analysis; break even analysis; certainty equivalent; Uncertainty analysis, simulation; decision tree model; risk and utility.

References & Text Books

1. Khatua Sitangshu. *Project Management and Appraisal*, Oxford University Press
2. Pandey, I.M. *Financial Management*. Vikas Publishing House
3. Prasanna, Chandra. *Financial Management*. Tata McGraw-Hill
4. Maheshwari, S .N. & Maheshwari, S. K. *Advanced Management Accounting Vol.1 & Vol.2*. Vikas Publishing House
5. Paresh Shah. *Management Accounting*. Oxford University Press

Semester VII

B. Tech CSE (AI)

BCSAI 705: FUZZY LOGIC AND APPLICATIONS LAB

0L + 0T + 4P + 2C

MM 100

List of Experiments

1. Overview of Fuzzy Set
2. Implementation of Membership functions
3. Design of Fuzzy Rule Base
4. Defining the entire Fuzzy Inference System
5. Fuzzy Control System design and implementation

BCSAI 706: MINI PROJECT**0L+0T+4P+2C****MM: 100**

The objective of Project Work is to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a Departmental Committee.

BCSAI 707: CAMPUS RECRUITMENT TRAINING

0L+0T+4P+2C

MM:100

Unit 1: Quantative Aptitude: Numbers Theory, Averages, Ratio, Proportion & Variation, Percentages, Mixtures & Allegation, Time and Work, Speed, Time and Distance, Pipes & Cisterns, Clocks and Calendars, Profit and Loss, Interest and Discount, Partnership, Progressions, Logarithm, Quadratic Equations, Inequalities, Functions, Basic Geometry, Menstruation, Co-ordinate Geometry, Permutation and Combination, Probability.

Unit 2: Verbal Ability And Reading Comprehension: Fill in the blanks, Synonyms and Antonyms, Analogies.

Unit 3: Data Interpretation & Data Sufficiency: Tables, Graphs, Pie-Charts, Bar Charts, Mixed Charts, Data Sufficiency Statements.

Unit 4: Analytical And Logical Reasoning: Puzzle Test, Coding- Decoding, Blood Relations, Day Sequence, Directional Sense Test, Symbol based problems, Syllogism, Cubes and Dices.

Unit 5: General Knowledge

Text/Reference Books:

1. R.S. Aggarwal, A Modern Approach to Verbal and Non-Verbal Reasoning, S. Chand Publication
2. Wren & Martin, High School English Grammar, S.Chand Publication
3. Nem Singh, Reasoning & Aptitude 2015, Made Easy Publication.

Semester VII

B. Tech CSE (AI)

BCSAI 708: Anandam-III Happiness Curriculum

0L + 0T + 1P + 1C

MM 100

List of Experiments:

1. Practicing Gratitude, Giving and Celebrating your Successes and Achievements
2. The importance of Human Connections, Selective Relationships and a Supportive Network
3. The Art of Influence, Persuasion and Negotiation
4. Saying Goodbye to Stress and Anxiety and Hello to a Happy Life

MGT 201: Orientation Program in Entrepreneurship

2L + 0T + P + 2C

MM 100

OBJECTIVE: The goal of this programme is to inspire students and help them imbibe an entrepreneurial mindset. Student will learn what entrepreneurship is and how it has impacted the world and their country. They will introduce to the key traits and the DNA of an entrepreneur. This certificate program focuses on a specific Entrepreneurial knowledge or skill requirement such as creative thinking, communication, risk taking and resilience.

Unit 1:

Entrepreneurship; Concept, functions, Need, Characteristics and competency. How has entrepreneurship change the world? Process of Entrepreneurship development , Idea Generation exercises.

Unit 2:

Entrepreneurial DNA, Traits Gaps and Gap Analysis. Relevance of Entrepreneurship in Socio-Economic development. Barriers to Entrepreneurship. Case studies.

Unit 3:

Entrepreneurial Pursuits and Human Activities; nature, purpose and pattern of Human activities: Economic and non-economic, need for innovation. Creativity. Case studies

Unit 4:

Entrepreneurial Values, Attitudes and Motivation-Meaning and concept. Developing entrepreneurial Motivation -concept and process of achievement motivation. Leadership, Communication and influencing ability. Success stories.

Unit 5:

Enterprise and Environment: Environmental function, Critical factors for launching of a new enterprise, Understanding a market, Competitive analysis of the market.

Text/Reference Books:

Online course through massive open online classes (MOOC), classroom learning through an experienced facilitator/faculty on campus (games, video, and practical experience

1. Vasanta Desai: Dynamics of entrepreneurial development and management;
2. Vasanta Desai: Entrepreneurial development;
3. Peter F. Drucker: Innovation and development;
4. M.V. Deshpande: Entrepreneurship of small scale industries;
5. Balakrishnan, G. Financing of small scale industries.

MBA 204: RESEARCH METHODOLOGY

2L+0T+0P+2C

MM:100

Unit 1: Meaning And Importance Of Research

Review of Literature, Objectives of the research, Types of Research- Exploratory Research – Descriptive Research – Casual Research - Research Approaches- Research Process —Defining Research Problem- Selection and necessity of defining the problem.

Unit 2: Research Design

meaning, need and features of good research design- Important concepts related to research design. Experimental research designs: Before and After without control design, After only with control design, Before and after with control design, Completely randomized design (C.R Design).

Sampling and Sampling Design – Sampling Methods – Simple Random Sampling – Stratified Sampling – Systematic Sampling – Cluster Sampling – Multistage Sampling, Non-Probability Sampling – Convenience Sampling – Judgment Sampling – Quota Sampling- Snowball sampling.

Unit 3: Data Collection

Primary and Secondary Data – Designing of Questionnaire –**Measurement and Scaling** – Nominal Scale – Ordinal Scale – Interval Scale – Ratio Scale –Guttman Scale – Likert Scale – Schematic Differential Scale. Descriptive statistics- Measures of central tendency- Dispersion- Skewness -Correlation and Regression Analysis.

Unit 4: Editing

Coding – Classification of Data – Tables and Graphic Presentation –Basics of inferential statistics- Types of Errors- **Hypothesis testing** -Parametric test - T-test, Z test, Chi Square test- ANOVA Test. Introduction of SPSS.

Unit 5 : Non Parametric Tests

Kolmogorov – Smirnov Test – Runs Test for Randomness. Sign Test – Median Test –Factor Analysis.

Preparation and Presentation of Research Report- Types of reports- Layout of Research Report- Bibliography-References writing- Precautions for writing Research Report.

Text/ Reference Books:

1. Mark Saunders, Philip Lewis, Adrian Thornbill, Research Methods for Business Students, Pearson,ND
2. Churchill, Iacobucci & Israel, Marketing Research: A South Asian Perspective, Cengage, NewDelhi
3. C.R. Kothari, Research Methodology, New Age International.
4. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi
5. Alan Bryman & Emma Bell, Business Research Methods, Oxford University Press.
6. Donald R. Cooper & Pamela S. Schindler, Business Research Methods 8th Edition, Tata McGraw Hill.
7. K.V.S. Sarma, Statistics made sample, do it yourself on PC, PrenticeHall.
8. V P Michael, Research Methodology in Management, Himalaya, Mumbai

**BCSAI 801: INDUSTRIAL TRAINING/INTERNSHIP INDUSTRY
(ONE SEMESTER)**

0L+0T+0P+10C

MM:100

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The practical training aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The purpose of practical training is not only to get acquainted with the culture of companies, but also to realize something of importance for the company visited. By working in a group within the company, it is expected that the trainee gets a better insight in the practical aspects of the industry. This is intended to facilitate the transition from the thorough theoretical education, dispensed at our University, into an industrial professional career.