KANNUR UNIVERSITY

(Abstract)

B.Sc Computer Science with Artificial Intelligence and Machine Learning Programme -Scheme & Syllabus, Pattern of Question Paper and Model question paper of Two Discipline Specific Elective courses - Approved- Implemented with effect from 2023 admission- Orders issued

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ACADEMIC C SECTION

ACAD C/ACAD C5/25729/2023 Dated: 22.01.2024

Read:-1. U.O No. ACAD A/ASO/ A2/14713/2022 Dtd; 26/11/2022

2. U.O No.ACAD/ACAD A2/3817/2023 06/05/2023

3. Lr. No LIST/036/2023 11/12/2023

4. ACAD C/ACAD C5/25729/2023 Dtd: 21/12/2023

5. E-mail Dtd 27/12/2023 from Dr Sreekanth N S, Head, Dept. of information Technology,

6. E-mail Dtd: 29/12/2023 From Dr. Bindu V R, Dean, Faculty of Technology

7. Lr No. ACAD C/ACAD C5/25729/2023 Dtd: 10/01/2024

8. E-mail dtd.17.01.2024, from the Principal, Lourde Institute of Science and Technology

9. U.O No. Acad. C2/12371/2019 Dated: 21/6/2019

ORDER

1. Provisional Affiliation was granted for B.Sc Computer Science programme at Lourde Institute of Science and Technology, Taliparamba for the academic year 2022-23, vide paper read (1) above, and later permission was granted to change the Programme to B.Sc Computer Science with Artificial Intelligence and Machine learning from 2023-24 academic year onwards with the introduction of two Discipline Specific Elective courses 1. Artificail Intelligence & 2. Machne Learning in V th & VI th semester respectively.(Paper read (2)

2. As Kannur University is not having the Syllabus of aforementioned courses, and in the circumstance of non existence of Board of Studies, as ordered by the Vice Chancellor, the syllabus of the courses prepared and submitted by the college authorities were forwarded to Dean, Faculty of Technology, Convener, Ad hoc committee for Computer Science (PG), Head, Dept. of information Technology, vide paper read (4) for verification and scrutiny.

3. After vetting the syllabus of two discipline specific elective courses of B.Sc Computer Science Programme, the experts put forth their suggestions vide paper read (5 & 6) above and the same has been forwarded to the Principal, Lourde Institute of Science and Technology vide paper read 7 above, for incorporating in the syllabus.

4. The Principal, Lourde Institute of Science and Technology, vide paper read 8 above, resubmitted the draft scheme, syllabus, pattern of question paper and model question papers of two Courses after incorporating the suggestions put forth by subject experts, and the same has been verified by the HoD, Dept.of Information Technology and recommended for approval.

5. The Vice Chancellor after considering the matter in detail and in exercise of the powers of the Academic Council conferred under Section 11(1) Chapter III of Kannur University Act 1996 approved the syllabus of two ***Discipline Specific Elective courses: Elective-I ARTIFICIAL INTELLIGENCE (5B11CSC - D)and Elective-II MACHINE LEARNING (6B15CSC-D) in the V th & VI th semester of B.Sc Computer Science programme and accorded sanction to implement***

the same w.e.f.2023 admission subject to report to Academic Council.

6.The syllabus of other common courses, core courses and complementary courses are similar to that of B.Sc Computer Science programme implemented in Affiliated Colleges w.e.f 2019 admission, with Mathematics and Statistics as Complementary Elective Courses.

7. The Scheme, Syllabus, Pattern of Question Papers and Model Question papers of two discipline specific elective courses viz, Artificial Intelligence and Machine learning are uploaded on the University website. (www.kannuruniversity.ac.in)

8. Orders are issued accordingly

Sd/-

Narayanadas K

DEPUTY REGISTRAR (ACAD)

For REGISTRAR

To: 1. The Principal , Lourde Institute of Science and Technology, Taliparamba

Copy To: 1. The Examination Branch (through PA to CE)
2. AR III/ES Section (Exam)
3. EX C I, EG I
4. PS to VC/PA to Registrar/PA to FO
5. DR/AR-1 Academic
5. The Computer Programmer, Web Manager
5. SF/DF/FC

KANNUR UNIVERSITY CIVIL STATION P.O. Pin-670 002 THAVAKKARA

Forwarded / By Order

SECTION OFFICER

KV

KANNUR UNIVERSITY

SYLLABUS FOR B.SC. COMPUTER SCIENCE WITH AI & ML, SPECIFIC ELECTIVE I- ARTIFICIAL INTELLIGENCE SPECIFIC ELECTIVE II- MACHINE LEARNING COURSE

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE-Outcome Based Education System)

(2023 ADMISSION ONWARDS)

KANNUR UNIVERSITY

BSC COMPUTER SCIENCE WITH AI & ML PROGRAMME

WORK AND CREDIT DISTRIBUTION STATEMENT

Semester	Course Title*	Credits	Hours per week	Total Credits	Total Hours
I	Common Course – English I	4	5	19	25
	Common Course – English II	3	4		
	Common Course – Additional Language I	4	5		
	Core Course I – 1B01CSC Introduction to C Programming	2	1		
	Core Course III – 2B03CSC Lab 1: C Programming*	0	2		
	Complementary Elective I-1C01MAT-CS (Mathematics)	3	4		
	Complementary Elective II- (Statistics)	3	4		
II	Common Course – English III	4	5	21	25
	Common Course – English IV	3	4		
	Common Course – Additional Language II	4	5		
	Core Course II – 2B02CSC Advanced C Programming	2	1		
	Core Course III – 2B03CSC Lab 1: C Programming*	2	2		
	Complementary Elective I- 2C02MAT-CS (Mathematics)	3	4		
	Complementary Elective II - 2C02STA (Statistics)	3	4		
III	General Awareness Course I – 3A11CSC Programming in C++	3	3	16	25
	General Awareness Course II – 3A12CSC Database Management System	3	3		
	Core Course IV – 3B04CSC Data Structures	4	4		
	Core Course VI – 4B06CSC Lab II: Data Structures Using C++**	0	3		
	Core Course VII – 4B07CSC Lab III: Database Management System**	0	2		
	Complementary Elective I-3C03MAT-CS (Mathematics)	3	5		
	Complementary Elective II- 3C03STA (Statistics)	3	5		

IV	General Awareness Course III – 4A13CSC Digital Electronics	3	3	21	25
	General Awareness Course IV – 4A14CSC Operating Systems	3	3		
	Core Course V – 4B05CSC Software Engineering	4	4		
	Core Course VI – 4B06CSC Lab II: Data Structures Using C++**	3	3		
	Core Course VII – 4B07CSC Lab III: Database Management System**	2	2		
	Complementary Elective I-4C04MAT-CS (Mathematics)	3	5		
	Complementary Elective II- 4C04STA (Statistics)	3	5		
V	Core Course VIII – 5B08CSC Web Technology	4	4	17	25
	Core Course IX – 5B09CSC Java Programming	4	4		
	Core Course X – 5B10CSC Computation Using Python	3	3		
	Core Course XI–5B11CSC-D Artificial Intelligence	4	4		
	Core Course XVI – 6B16CSC Lab IV: Java Programming***	0	4		
	Core Course XVII – 6B17CSC Lab V: Web Technology and Python Programming***	0	4		
	General Elective Course	2	2		
VI	Core Course XII – 6B12CSC Computer Networks	4	4	26	25
	Core Course XIII – 6B13CSC Compiler Design	4	4		
	Core Course XIV – 6B14CSC Computer Organization	3	3		
	Core Course XV–6B15CSC-D Machine Learning	4	4		
	Core Course XVI – 6B16CSC Lab IV: Java Programming***	3	2		
	Core Course XVII – 6B17CSC Lab V: Web Technology and Python Programming***	3	2		
	Core Course XVIII – 6B18CSC Project	5	6		
Total				120	150

Total Marks of the Programme – 1750 Marks (Eng-200 Marks, Additional Common Course 100 Marks, Core 1050 Marks, First Complementary Elective 200 Marks and Second Complementary Elective -200 Marks)

*External examination will be conducted at the end of second semester

**External examination will be conducted at the end of fourth semester

***External examination will be conducted at the end of sixth semester

First Complementary Elective: Mathematics

Second Complementary Elective: Statistics

PART A

B.SC. COMPUTER SCIENCE WITH AI & ML CORE COURSES WORK AND CREDIT DISTRIBUTION

(2023 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HRS	MARKS (INTERNAL + EXTERNAL)
1B01CSC	INTRODUCTION TO C PROGRAMMING	1	1	2	3	10+40
2B03CSC	LAB I: C PROGRAMMING	1	2	0	-	-
2B02CSC	ADVANCED C PROGRAMMING	2	1	2	3	10+40
2B03CSC	LAB I: C PROGRAMMING	2	2	2	3	5+20
3A11CSC	PROGRAMMING IN C++	3	3	3	3	10+40
3A12CSC	DATABASE MANAGEMENT SYSTEM	3	3	3	3	10+40
3B04CSC	DATA STRUCTURES	3	4	4	3	10+40
4B06CSC	LAB II: DATA STRUCTURES USING C++	3	3	0	-	-
4B07CSC	LAB III: DATABASE MANAGEMENT SYSTEM	3	2	0	-	-
4A13CSC	DIGITAL ELECTRONICS	4	3	3	3	10+40
4A14CSC	OPERATING SYSTEMS	4	3	3	3	10+40
4B05CSC	SOFTWARE ENGINEERING	4	4	4	3	10+40
4B06CSC	LAB II: DATA STRUCTURES USING C++	4	3	3	3	5+20
4B07CSC	LAB III: DATABASE MANAGEMENT SYSTEM	4	2	2	3	5+20
5B08CSC	WEB TECHNOLOGY	5	4	4	3	10+40
5B09CSC	JAVA PROGRAMMING	5	4	4	3	10+40
5B10CSC	COMPUTATION USING PYTHON	5	3	3	3	10+40
5B11CSC	DISCIPLINE SPECIFIC ELECTIVE I- Artificial Intelligence	5	4	4	3	10+40
5D--CSC	GENERIC ELECTIVE COURSE	5	2	2	2	5+20
6B16CSC	LAB IV: JAVA PROGRAMMING	5	4	0	-	-
6B17CSC	LAB V: WEB TECHNOLOGY& PYTHON PROGRAMMING	5	4	0	-	-
6B12CSC	DATA COMMUNICATION AND COMPUTER NETWORKING	6	4	4	3	10+40

6B13CSC	COMPILER DESIGN	6	4	4	3	10+40
6B14CSC	COMPUTER ORGANIZATION	6	3	3	3	10+40
6B15CSC	DISCIPLINE SPECIFIC ELECTIVE II- Machine Learning	6	4	4	3	10+40
6B16CSC	LAB IV: JAVA PROGRAMMING	6	2	3	3	5+20
6B17CSC	LAB V: WEB TECHNOLOGY& PYTHON PROGRAMMING	6	2	3	3	5+20
6B18CSC	PROJECT*	6	6	5	-	20+80
*AN INDUSTRIAL VISIT (STUDY TOUR) IS RECOMMENDED FOR THE PROJECT WORK						

TOTAL MARKS OF CORE COURSES 1050

LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSES

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HRS
5B11CSC-D	Artificial Intelligence	5	4	4	3
6B15CSC-D	Machine Learning	6	4	4	3

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	80%
INTERNAL	20%

CONTINUOUS EVALUATION FOR THEORY

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT1: TEST	80%	MINIMUM OF 2 TESTS SHOULD BE CONDUCTED. MARKS FOR THE TEST COMPONENT SHOULD BE CALCULATED AS THE AVERAGE OF THE MARKS OBTAINED IN THE TESTS CONDUCTED.

COMPONENT 2: ASSIGNMENT/ SEMINAR/VIVA	20%	ANY ONE COMPONENT

PATTERN OF QUESTION PAPER FOR END SEMESTER EVALUATION

Part A	**Short Answer**	**6 Questions x 1 Mark = 6 Marks**
	Answer all questions	6 Questions x 1 Mark = 6 Marks
Part B	**Short Essay**	**8 Questions x 2 Marks = 16 Marks**
	Answer any 6 questions	6 Questions x 2 Marks = 12 Marks
Part C	**Essay**	**6 Questions x 3 Marks = 18 Marks**
	Answer any 4 questions	4 Questions x 3 Marks = 12 Marks
Part D	**Long Essay**	**4 Questions x 5 Marks = 20 Marks**
	Answer any 2 questions	2 Questions x 5 Marks = 10 Marks
Total Marks Including Choice: 60		
Maximum Marks for the Course: 40		

CORE COURSE 5B11CSC-D ARTIFICIAL INTELLIGENCE

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
5	5B11CSC-D	4	4	3

CO1: To introduce the concept of Artificial Intelligence.
CO2: To get an idea about problem solving.
CO3: To acquire knowledge about complex environments.
CO4: To familiarize knowledge representation and reasoning in AI.

Unit I (Introduction)

An introduction to Artificial Intelligence (AI) – history – foundations – terminology - application. Information and data, number systems, data encoding. Technologies and platforms for AI. Intelligent Agents – Agents and Environments, ethical considerations.

(18 Hrs)

Unit II (Problem Solving)

Boolean algebra problem decomposition, abstraction, greedy method, divide and conquer. Heuristic functions- Algorithmic thinking and flowcharting, data organization, factoring and recursion techniques. Natural Language Processing (NLP) - Part-of-Speech (POS) tagging, Sequence processing with Recurrent Neural Networks (RNN).

(18 Hrs)

Unit III (Search in Complex environments)

Game playing: Minimax and alpha-beta procedures, LISP and PROLOG. Knowledge representation: procedural and declarative approaches, production system formalism, predicate logic, semantic nets, conceptual dependency, frames and scripts, CSPs, Backtracking search Structure of CSP problems.

(18 Hrs)

Unit IV (Knowledge Representation and Reasoning)

Logic, Propositional Logic, Theorem, Agents, - Syntax and Semantics - First Order Logic (FOL), Forward Chaining, Backward Chaining, Resolution - The Rete Algorithm, - Description Logic (DL), Structure, Classification, Extensions, Knowledge Based Systems - Languages and Machines: AI languages and systems, special purpose architectures.

(18 Hrs)

Books for study

1. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition. Prentice Hall.

2. David Riley and Kenny Hunt , Computational thinking for modern solver, Chapman & Hall/CRC, 2014

Books for References

1. George F.Luger and William A. Stubblefield, AI: Strcutures and Strategies for Complex problem solving, 2nd edition, Benjamin Cummins Publishers,1997

2. Manning C, Schuetze H. Foundations of Statistical Natural Language Processing, MIT Press

3. Nilsson N.J., Artificial Intelligence - A New Synthesis, Harcourt Asia Pvt. Ltd.

4. R.G. Dromey , "How to solve it by Computer", PHI, 2008

Marks including choice

Unit	I	II	III	IV
Marks	15	15	15	15

CORE COURSE 6B15CSC-D MACHINE LEARNING

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
6	6B15CSC-D	4	4	3

COURSE OUTCOME

CO1: To understand Machine Learning concepts and basic parameter estimation methods.
CO2: Demonstrate supervised learning concepts (regression, linear classification).
CO3: Illustrate the concepts of Multilayer neural network and Support Vector Machine
CO4: Depict unsupervised learning concepts and dimensionality reduction techniques.
CO5: Solve real-life problems using appropriate machine learning models and evaluate the Performance measures

Unit-I: Overview of machine learning
Machine learning paradigms-supervised, semi-supervised, unsupervised, reinforcement learning. Basics of parameter estimation - maximum likelihood estimation (MLE) and maximum aposteriori estimation (MAP). Introduction to Bayesian formulation.

(14 hrs)

Unit-II: Classification Assessment
Classification Performance measures - Precision, Recall, Accuracy, F-Measure, Receiver Operating Characteristic Curve (ROC), Area Under Curve(AUC. Bootstrapping, Cross Validation, Ensemble methods, Bias-Variance decomposition. Case Study: Develop a classifier for face detection.

(14 hrs)

Unit-III: Supervised Learning
Regression - Linear regression with one variable, Linear regression with multiple variables, solution using gradient descent algorithm and matrix method, basic idea of overfitting in regression. Linear Methods for Classification- Logistic regression, Naive Bayes, Decision tree algorithm ID3.

(14 hrs)

Unit-IV: Support Vector Machines (SVM) and Neural Networks (NN)
SVM - Introduction, Maximum Margin Classification, Mathematics behind Maximum Margin Classification, Maximum Margin linear separators, soft margin SVM classifier, non-linear SVM, Kernels for learning non-linear functions, polynomial kernel, Radial Basis Function (RBF). Perceptron, Neural Network - Multilayer feed-forward network, Activation functions (Sigmoid, ReLU, Tanh), Backpropagation algorithm.

(15 hrs)

Unit-V: Unsupervised Learning

Clustering - Similarity measures, Hierarchical Agglomerative Clustering, K-means partitional Clustering, Expectation maximization (EM) for soft clustering. Dimensionality reduction – Principal Component Analysis.

(15 hrs)

Books for study

1. Ethem Alpaydin, Introduction to Machine Learning, 2nd edition, MIT Press 2010. 2.

Mohammed J. Zaki and Wagner Meira, Data Mining and Analysis: Fundamental Concepts and

Algorithms, Cambridge University Press, First South Asia edition, 2016. 3.

Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016 4.

Tom Mitchell, Machine Learning, McGraw-Hill, 1997.

Reference Books

1. Christopher Bishop. Neural Networks for Pattern Recognition, Oxford University Press, 1995.

2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press 2012.

3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements Of Statistical Learning, Second edition Springer 2007.

4. P. Langley, Elements of Machine Learning, Morgan Kaufmann, 1995.

5. C. M. Bishop. *Pattern Recognition and Machine Learning.* First Edition. Springer, 2006. (Second Indian Reprint, 2015).

Marks including choice

Unit	I	II	III	IV	V
Marks	12	12	12	12	12

MODEL QUESTION PAPER

5B11CSC-D ARTIFICIAL INTELLIGENCE

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer
Answer all questions (6 x 1 = 6 Marks)

1. Define Intelligence and Artificial intelligence.
2. What is the Turing test?
3. Define state space.
4. What is tautology?
5. What are the components of LISP Programming?
6. Define Procedural knowledge.

Part B: Short Essay
Answer any 6 questions (6 x 2 = 12 Marks)

7. Write down the applications of AI.
8. Discuss the history and evolution of artificial intelligence.
9. Explain the steps involved in problem-solving in AI.
10. Write about Boolean algebra problem decomposition.
11. Define deterministic games.
12. Write about the properties of the Mini-Max algorithm
13. Draw and explain the architecture of a knowledge-based agent (KBA).
14. Explain Existential Quantifier:

Part C: Essay
Answer any 4 questions (4x3=12 Marks)

15. Briefly explain the types of AI agents.
16. Discuss the types of constraints in CSP.
17. Explain Forward Chaining and Backward Chaining in AI with examples.
18. What is meant by NLP? Write 4 types of NLP.
19. What is the divide and conquer approach in artificial intelligence? Explain with an example.
20. Write about recursion techniques and their applications.

Part D: Long Essay
Answer any 2 questions (2x5=10 Marks)

21. .Define intelligent agent. Explain various types of intelligent agents with examples.
22. Write briefly about Heuristic functions.
23. Briefly explain the types of algorithms in Adversarial search.
24. What are the different ways of Knowledge Representation in AI? Explain it.

MODEL QUESTION PAPER

6B15CSC-D MACHINE LEARNING

Time: 3 Hours **Max. Marks: 40**

Part A: Short Answer
Answer all questions (6 x 1 = 6 Marks)

1. Define the training phase in supervised learning.
2. What are the applications of classifications?
3. Define entropy.
4. Explain the polynomial kernel.
5. What is single linkage clustering?
6. Define artificial neural networks.

Part B: Short Essay
Answer any 6 questions (6 x 2 = 12 Marks)

7. Briefly explain regression models.
8. Differentiate between classification and regression with an example.
9. What are the advantages of support vector machines?
10. What is a Perceptron? Explain how perceptron works with a neat diagram.
11. Compare K means clustering with Hierarchical Clustering Techniques.
12. What are the benefits of pruning in decision tree induction?
13. Explain different ANN architectures.
14. Explain the ROC curve with the figure.

Part C: Essay
Answer any 4 questions (4 x 3 = 12 Marks)

15. Briefly explain the workings of reinforcement learning.
16. Identify the first splitting attribute for the decision tree by using the ID3 algorithm With the following dataset.

MAJOR	EXPERIENCE	TIE	HIRED
CS	Programming	Pretty	No
CS	Programming	Pretty	No
CS	Management	Pretty	Yes
CS	Management	Ugly	Yes
Business	Programming	Pretty	Yes
Business	Programming	Ugly	Yes
Business	Management	Pretty	No
Business	Management	Pretty	No

17. Define the Naive Bayes classifier.
18. Explain bootstrapping techniques.
19. Calculate the output y of a three-input neuron with bias. The input feature vector is (x1, x2, x3) = (0.8,0.6,0.4) and weight values are [w1, w2, w3, b] = [0.2, 0.1, -0.3, 0.35]. Use binary Sigmoid function as activation function.

20. Explain feature selection and feature extraction methods for dimensionality reduction.

Part D: Long Essay
Answer any 2 questions (2 x 5 = 10 Marks)

21. Discuss the issues involved in decision tree learning
22. Use K Means clustering to cluster the following data into two groups. Assume cluster centroids are m1=2 and m2=4. The distance function used is Euclidean distance. {2, 4, 10, 12, 3, 20, 30, 11, 25 }
23. Explain how a Support Vector Machine can classify linearly separable data.
24. Suppose 10000 patients get tested for flu; out of them, 9000 are healthy and 1000 are sick. For the sick people, the test was positive for 620 and negative for 380. The same test for healthy people was positive for 180 and negative for 8820. Construct a confusion matrix for the data and compute the precision and recall for the data.