A

COURSE FILE

ON

"MACHINE LEARNING"

IV B-Tech II Semester (JNTUH-R18)

Department of

COMPUTER SCIENCE & ENGINEERING

CMR ENGINEERING COLLEGE

KANDLAKOYA (V), MEDCHAL (M), R.R.DIST.

CONTENTS OF COURSE FILE:

1. Department vision & mission
2. List of PEOs, POs, PSOs
3. List of Cos (action verbs as per blooms)
4. Syllabus copy and suggested or reference books
5. Session plan/ lesson plan
6. Session execution log
7. Lecture notes
8. Assignment Questions (samples)
9. Mid exam question papers (samples)
10. Scheme of evaluation
11. Mapping of Cos with Pos and PSOs
12. Attainment of Cos, Pos and PSOs (Excel sheet)
13. University question papers or question bank.
14. Power point presentations (PPTs)
15. Websites or URLs e- Resources

Submitted By

M.SWATHI

1. DEPARTMENT VISION & MISSION

Vision:

To produce globally competent and industry ready graduates in Computer Science & Engineering by imparting quality education with a know-how of cutting edge technology and holistic personality.

Mission:

M1. To offer high quality education in Computer Science & Engineering in order to build core competence for the students by laying solid foundation in Applied Mathematics, and program framework with a focus on concept building.
M2. The department promotes excellence in teaching, research, and collaborative activities to prepare students for professional career or higher studies.
M3. Creating intellectual environment for developing logical skills and problem solving strategies, thus to develop, able and proficient computer engineer to compete in the current global scenario.

2. LIST OF PEOs AND POs

2.1 Program Educational Objectives (PEO):

PEO 1: Excel in professional career and higher education by acquiring knowledge of mathematical computing and engineering principles.
PEO 2: To provide an intellectual environment for analyzing and designing computing systems for technical needs.
PEO 3: Exhibit professionalism to adapt current trends using lifelong learning with legal and ethical responsibilities.
PEO 4: To produce responsible graduates with effective communication skills and multidisciplinary practices to serve society and preserve the environment.

2.2 .Program Outcomes (PO):

Engineering Graduates will be able to satisfy these NBA graduate attributes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

2.3 Program Specific Outcomes (PSOs):

13. **PSO1: Professional Skills and Foundations of Software development:** Ability to analyze, design and develop applications by adopting the dynamic nature of Software developments.
14. **PSO2: Applications of Computing and Research Ability:** Ability to use knowledge in cutting edge technologies in identifying research gaps and to render solutions with innovative ideas.

3. COURSE OUTCOMES

CO1• Ability to understand the basic concept of Machine Learning and its application.
CO2• Ability to learn the Artificial Neural Networks concepts with various techniques.
CO3• Ability to analyze and solve problems using Bayesian and other algorithms
CO4• Ability to understand about Genetic Algorithm, Reinforcement Learning techniques.
CO5• Ability to apply the various techniques for the analysis and prediction of data using methods.

4. SYLLABUS COPY

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning..

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.
Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.
Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT – III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.
Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.
Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT – IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.
Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1-Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.
Analytical Learning-2- Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.
Combining Inductive and Analytical Learning– Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOK:

1. Machine Learning – **Tom M. Mitchell**, - MGH, **Publisher**: McGraw-Hill Science/Engineering/Math; (March 1, 1997), **ISBN**: 0070428077.

REFERENCES BOOKS:

1. Machine Learning: An Algorithmic Perspective, **Stephen Marshland**, Second Edition, 2015 by **Taylor & Francis Group**, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business No claim to original U.S. Government works Version Date: 20140826 **ISBN**-13: 978-1-4665-8333-7 (eBook - PDF).

5. SESSION PLAN/LESSON PLAN

S.NO	Topic (JNTU syllabus)	Sub-Topic	NO. OF LECTURES REQUIRED	Suggested Books	Methods
1		Introduction to Machine Learning Problems, Designing learning System	**L1**	**T1**	M1,M2,M4
2		Perspectives and issues in machine learning	**L2**	**T1**	M1,M2,M4
3		Introduction to Concept Learning and Specific Ordering	**L3**	**T1**	M1,M2,M4
4	**UNIT – I**	Concept Learning Tasks, find-S, hypothesis	**L4**	**T1**	M4,M5
5	**Introduction , Concept of**	Concept Learning algorithms, inductive bias concepts	**L5**	**T1**	M1,M2,M4
6	**Learning, Decision Tree**	Introduction to Decision Tree Learning Concept	**L6**	**T1**	M1,M2,M4
7	**Learning**	Representation and Problems of Decision tree learning	**L7**	**T1**	M1,M2,M4
8		Hypothesis Space search in Decision Tree Learning Concept	**L8**	**T1**	M1,M2,M4
9		Inductive Bias in Decision tree Learning Concept	**L9**	**T1**	M1,M2,M4
10		Issues in Decision tree Learning	**L10**	**T1**	M1,M2,M4
11	**Unit – II**	Introduction to Neural Network-1	**L11**	**T1**	M1,M2,M4
12	**Artificial**	Appropriate Problems for Neural	**L12**	**T1**	M1,M2,M4

	Neural Networks-1, Artificial Neural Networks-2, Evaluation Hypotheses	Networks, perceptions			
13		Concept of Multi Layer Network	**L13**	**T1**	M4,M5
14		Concept of Back-propagation Algorithm.	**L14**	**T1**	M1,M2,M4
15		Remarks on Back-Propagation algorithm with Examples	**L15**	**T1**	M1,M2,M4
16		Concept of Face Recognition and advance topics in Artificial Neural networks	**L16**	**T1**	M1,M2,M4
17		Concept of Evaluation hypothesis Accuracy, basic Sampling theory	**L17**	**T1**	M1,M2,M4
18		Approach for Confidence intervals Concepts	**L18**	**T1**	M1,M2,M4
19		Concept of Error of two hypotheses	**L19**	**T1**	M3,M5,M4
20		Concept of Comparing Learning algorithms	**L20**	**T1**	M6,M7,M8
21	**Unit - III** **Bayesian Learning, Computational learning theory, Instance-Based Learning**	Introduction to Bayes Theorem and Concept Learning	**L21**	**T1**	M9.M4
22		Introduction to Maximum Likelihood and least squared error hypotheses.	**L22**	**T1**	M2,M4
23		Concept of Maximum likelihood hypotheses for predicting probabilities and minimum description length principle.	**L23**	**T1**	M4,M5
24		Introduction of Bayes optimal classifier	**L24**	**T1**	M1,M2,M4
25		Gibs algorithm, Naïve Bayes classifier.	**L25,L26**	**T1**	M1,M2,M4
26		Describing with an example: learning to classify text, Bayesian belief networks, the EM algorithm.	**L27,L28**	**T1**	M1,M2,M4
27		Introduction and probably learning an approximately correct hypothesis.	**L29**	**T1**	M1,M2,M4
28		Sample complexity for finite hypothesis space.	**L30**	**T1**	M1,M2,M4
29		Sample complexity for infinite hypothesis spaces, the mistake bound model of learning.	**L31**	**T1**	M1,M2,M4
30		Introduction and k-nearest neighbour algorithm.	**L32**	**T1**	M1,M2,M4
31		Locally weighted regression, radial basis functions.	**L33**		M1,M2,M4
32		Case-based reasoning, remarks on lazy and eager learning.	**L34**		M4,M5
33		Motivation and Genetic algorithms, an illustrative example.	**L35,L36**	**T1**	M1,M2,M4
34		Concept of Hypothesis space search, genetic programming.	**L37**	**T1**	M1,M2,M4
35		Models of evolution and	**L38**	**T1**	M1,M2,M4

		learning.			
36		Parallelizing genetic algorithms.	**L39**	**T1**	M1,M2,M4
37	**Unit – IV** **Genetic Algorithms, Learning Sets of Rules, Reinforcement Learning.**	Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules.	**L40**	**T1**	M1,M2,M4
38		Learning sets of First-Order rules: FOIL, Induction as inverted deduction.	**L41**	**T1**	M3,M5,M4
39		Inverting resolution.	**L42**	**T1**	M6,M7,M8
40		Introduction, the learning task, Q–learning.	**L43**	**T1**	M9.M4
41		Non-deterministic, rewards and actions, temporal difference learning.	**L44,L45**	**T1**	M2,M4
42		Generalizing from examples, relationship to dynamic programming.	**L46,L47**	**T1**	M1,M2,M4
43	**Unit – V** **Analytical Learning-1, Analytical Learning-2, Combining Inductive and Analytical Learning.**	Introduction.	**L48**	**T1**	M1,M2,M4
44		Learning with perfect domain theories: PROLOG-EBG.	**L49**	**T1**	M3,M5,M4
45		Remarks on explanation-based learning, explanation-based learning of search control knowledge.	**L50**	**T1**	M6,M7,M8
46		Using prior knowledge to alter the search objective.	**L51**	**T1**	M9.M4
47		Using prior knowledge to augment search operators.	**L52**	**T1**	M2,M4
48		Motivation	**L53**	**T1**	M6,M7,M8
49		Inductive-analytical approaches to learning.	**L54**	**T1**	M9.M4
50		Using prior knowledge to initialize the hypothesis.	**L55**	**T1**	M2,M4

METHODS OF TEACHING:

M1 : Lecture Method	**M4 : Presentation /PPT**	**M7 : Assignment**
M2 : Demo Method	**M5 : Lab/Practical**	**M8 : Industry Visit**
M3 : Guest Lecture	**M6 : Tutorial**	**M9 : Project Based**

NOTE:

1. Any Subject in a Semester is suppose to be completed in 50 to 60 periods.
2. Each Period is of 50 minutes.
3. Each unit duration & completion should be mentioned in the Remarks Column.

4. List of Suggested books can be marked with Codes like T1, T2, R1, R2 etc.

INDIVIDUAL TIME TABLE

	I	II	III		IV	V	VI	VII
MON	ML-D							ML-D
TUE						ML-D	ML-D	
WED					ML-D	ML-D	ML-D	
THU								
FRI								
SAT								

6. Session Execution Log:

S no	Units	No. Classes	Remarks
1	I	10	COMPLETED
2	II	10	COMPLETED
3	III	14	COMPLETED
4	IV	13	COMPLETED
5	V	8	COMPLETED

7. Lecture Notes – (hand written)

8. ASSIGNMENT QUESTIONS ALONG SAMPLE ASSIGNMENT SCRIPTS

CMR ENGINEERING COLLEGE

(Accredited by NBA, Approved by AICTE, Affiliated to JNTU, Hyderabad)
KANDLAKOYA (V), MEDCHAL ROAD, HYDERABAD-501401.
Ph: 08418 200037, 92470 22662, Fax: 08418 200240, www.cmrec.org.

Department of Computer Science & Engineering

Year: ECE , IV YEAR II-SEM **MID EXAMINATIONS-1**
Subject: Machine Learning **Branch: ECE**

MACHINE LEARNING
Assignment Questions

1. What is the difference between Supervised learning and unsupervised learning?
2. What is Well posed learning problem. Discuss any three well posed learning problems describing their task performance and experience?
3. Explain Bayes Theorem with an example?
4. What are the requirements of clustering algorithms
5. Compare Classification with a regression with an example

CMR ENGINEERING COLLEGE
Kandlakoya (V), Medchal Road, Hyderabad – 501401

IVB.TECH. II SEM MID-2 ASSIGNMENT QUESTIONS SUBJECT: ML

1. With a suitable example discuss a radial basis function network?
2. Describe the representation of hypothesis and genetic algorithms used in this?
3. Explain an algorithm for regression a set of literals through a single horn clause?
4. Define genetic algorithm?
5. Describe k-nearest neighbor algorithm.? Why is it called instance based learning?

9. MID EXAM QUESTION PAPER ALONG SAMPLE ANSWER SCRIPTS

CMR ENGINEERING COLLEGE

(Accredited by NBA, Approved by AICTE, Affiliated to JNTU, Hyderabad)
KANDLAKOYA (V), MEDCHAL ROAD, HYDERABAD-501401.
Ph: 08418 200037, 92470 22662, Fax: 08418 200240, www.cmrec.org.

Department of Computer Science & Engineering

IV.B.TECH II SEM - I MID EXAMINATIONS

Subject: MACHINE LEARNING **BRANCH: CSE** **Time: 1hr** **Marks: 20X1=20 M**

Year: ECE, IV YEAR II-SEM **MID EXAMINATIONS-1**
Subject: Machine Learning **Branch: ECE**

Part –A **Total = 10 Marks**
Answer any 2 Questions: **Marks: 2X5=10M**

6. What is the difference between Supervised learning and unsupervised learning? [CO1]
7. What is Well posed learning problem.Discuss any three well posed learning problems describing their task:performance and experience? [CO2]
8. Explain Bayes Theorem with an example? [CO2]
9. What are the requirements of clustering algorithms [CO2]

10. Mid-1 Scheme of evaluation

1	difference between Supervised learning and unsupervised learning	5	5
2	Well posed learning problem	2	5
	three well posed learning problems describing their task	3	
3	Bayes Theorem with an example	5	5
4	requirements of clustering algorithms	5	5

CMR ENGINEERING COLLEGE

(Accredited by NBA, Approved by AICTE, Affiliated to JNTU, Hyderabad)
KANDLAKOYA (V), MEDCHAL ROAD, HYDERABAD-501401.
Ph: 08418 200037, 92470 22662, Fax: 08418 200240, www.cmrec.org.

Department of Computer Science & Engineering

IV.B.TECH II SEM - II MID EXAMINATIONS

Subject: MACHINE LEARNING **BRANCH: CSE** **Time: 1hr** **Marks: 20X1=20 M**

Year: ECE, IV YEAR II-SEM **MID EXAMINATIONS-2**
Subject: Machine Learning **Branch: ECE**

Part –A **Total = 10 Marks**
Answer any 2 Questions: **Marks: 2X5=10M**

1. With a suitable example discuss a radial basis function network. [CO3]
2. Describe the representation of hypotheses and genetic algorithms used in this. [CO4]
3. Explain an algorithm for regressing a set of literals through a single horn clause. [CO5]
4. Define genetic algorithm. [CO4]
5. How rules are post-pruned? Explain with an example[CO5]

11.Mapping of Course Objectives, Course Outcomes with PEOs and Pos

	Program Outcome(PO):												
PEOS		1	2	3	4	5	6	7	8	9	10	11	12
	I	x	x	x	x								
	II	x	x	x	x	x						x	
	III		x	x	x	x							
							x		x				
								x		x			
											x		

Course Outcomes	Relationship of Course outcomes to Program Outcomes (PO AVG)													
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PS O2
CO1	3	3	2	3	-	-	-	3	2	-	-	2	-	2
CO2	2	3	3	3	2	-	-	2	3	-	-	3	1	3
CO3	3	3	3	3	2	1	-	3	2	2	3	2	-	2
CO4	3	2	2	2	3	-	-	2	2	2	1	2	2	3
CO5	3	3	3	3	3	-	-	2	3	1	2	3	2	3

12. ATTAINMENT OF CO's, PO's AND PSO's (EXCEL SHEET):

Relationship of Course outcomes to Program Outcomes (PO AVG)													
PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2

ASSESSMENT OF POs THROUGH THE COURSE			
PO	CO	Value	AVG PO (mid)
PO1	CO1		
	CO3		
	CO4		
	CO5		
	CO6		
PO2	CO1		
	CO2		
	CO3		
	CO4		
	CO5		
PO3	CO1		
	CO2		
	CO3		
	CO4		
	CO5		
	CO6		
PO4	CO2		
	CO3		
	CO6		
PO5	CO5		
PO12	CO2		
PSO1	CO2		
	CO3		
PSO2	CO1		
	CO2		
	CO3		
	CO4		
	CO6		

13. University Question Papers or Question Bank.

Question Model papers-JNTUH ML-2021.zip

14. PPTs AND PRESENTATION

15. Websites or URLs e- Resources

1) https://nptel.ac.in/courses/106/106/106106139/
2) https://nptel.ac.in/courses/106/105/106105152/
3) https://aws.amazon.com/training/learn-about/machine-learning/
4) https://www.coursera.org/learn/machine-learning?ranMID=40328&ranEAID=OyHlmBp2G0c&ranSiteID=OyHlmBp2G0c-cz6ad8GRJACggXck8c1Z.g&siteID=OyHlmBp2G0c-cz6ad8GRJACggXck8c1Z.g&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=OyHlmBp2G0c
5) https://matlabacademy.mathworks.com/?s_tid=gn_trg_cosp
6) https://www.edx.org/course/machine-learning?source=aw&awc=6798_1615460556_1400acc8805550b9f6981da90913e481&utm_source=aw&utm_medium=affiliate_partner&utm_content=text-link&utm_term=315645_LearnDataSci
7) https://www.futurelearn.com/courses/big-data-machine-learning
8) https://course18.fast.ai/ml
9) https://www.udacity.com/course/intro-to-machine-learning--ud120
10) https://ai.google/
11) https://www.geeksforgeeks.org/how-to-start-learning-machine-learning/#:~:text=Machine%20Learning%20involves%20the%20use,human%20hand%20holding!!!)
12) https://machinelearningmastery.com/start-here/
13) https://elitedatascience.com/learn-machine-learning
14) https://www.udemy.com/course/machine-learning-and-ai-with-hands-on-projects/?utm_source=adwords&utm_medium=udemyads&utm_campaign=MachineLearning_v.PROF_la.EN_cc.INDIA_ti.6594&utm_content=deal4584&utm_term=_._ag_81684916782_._ad_437560508873_._kw_._de_c_._dm_._pl_._ti_dsa-774930044809_._li_9040231_._pd_._&matchtype=b&gclid=Cj0KCQiAnKeCBhDPARIsAFDTLTI46ef6uRtJpZ13OeMw9j4LvB4FbrfYoQgztu9wTAOnFMqBC33mpi8aAp3xEALw_wcB