Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

For

Master of Technology (Computer Science Engineering)

Semester- II

(Effective from the session: 2021-22)

Department of Computer Science & Engineering

Faculty of Engineering
Shri Rawatpura Sarkar University, Raipur

Master of Technology (Computer Science & Engineering)
Semester-II

Master of Technology (Computer Science & Engineering)
Semester - II
2021-22
Examination Scheme
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S.No	Course Code	Th/Pr	Subject	Type of Course	Teaching hours per week			TC	Examination Scheme				Total Marks
									Theory		Practical		
					L	T	P		EX	IN	EX	IN	
1	**EMT04201**	Th	Artificial Intelligence and Applications	Core	4	-	-	4	70	30	-	-	100
2	**EMT04202**	Th	Research Methodology for Engineers	Core	4	-	-	4	70	30	-	-	100
3	**EMT04203**	Th	Cloud Computing	Core	4	-	-	4	70	30	-	-	100
4	**EMT04204**	Th	Machine Learning	Core	4	-	-	4	70	30	-	-	100
5	**EMT04205**	Th	**Elective –I**	Core	4	-	-	4	70	30	-	-	100
6	**EMT04291**	Pr	Artificial Intelligence Lab	Core	-	-	4	2	-	-	35	15	50
7	**EMT04292**	Pr	Machine Learnig Lab	Core	-	-	4	2	-	-	35	15	50
Total Contact hr. per week: 26			**Total Credit: 24**						**Grand Total Marks:**				**600**

Elective- I			
Sr. No	**Board of Study**	**Subject Code**	**Subject Name**
1	Information Technology	**EMT04205A**	Blockchain Technology
2	Computer Science & Engineering	**EMT04205B**	Software Metrics & Quality Assurance
3	Artificial Intelligence & Machine Learning	**EMT04205C**	Data Science

Course Title	**Artificial Intelligence and Applications**				
Course Code	**EMT04201**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	Students must have basic knowledge of Data Structure and Algorithms.				
Course Objectives	• Acquire advanced Data Analysis skills. • Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural Networks and other machine learning models. • Create AI/ML solutions for various business problems. • Apply AI/ML methods, techniques and tools immediatel.				

Course Contents	**UNIT I: Overview & Search Techniques** Introduction to AI, Problem Solving, State space search, Blind search: Depth first search, Breadth first search, Informed search: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Constraint satisfaction. Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance. **UNIT II: Knowledge Representation (KR)** Introduction to KR, Knowledge agent, Predicate logic, WFF, Inference rule & theorem proving forward chaining, backward chaining, resolution; Propositional knowledge, Boolean circuit agents. Rule Based Systems, Forward reasoning: Conflict resolution, backward reasoning: Use of Backtracking, Structured KR: Semantic Net - slots, inheritance, Frames-exceptions and defaults attached predicates, Conceptual Dependency formalism and other knowledge representations. **UNIT III: Handling uncertainty & Learning:** Source of uncertainty, Probabilistic inference, Bayes' theorem, Limitation of naïve Bayesian system, Bayesian Belief Network (BBN), Inference with BBN, Dempster-Shafer Theory, Fuzzy Logic, Fuzzy function, Fuzzy measure, Truth maintenance systems. Learning: Concept of learning, Learning model, learning decision tree, Paradigms of machine learning, Supervised & Unsupervised learning, Example of learning, Learning by induction, Learning using Neural Networks. **UNIT IV: Natural Language Processing (NLP) & Planning:** Overview of NLP tasks, Parsing, Machine translation, Components of Planning System, Planning agent, State-Goal & Action Representation, Forward planning, backward chaining, Planning example: partial-order planner, Block world. **UNIT V : Expert System & AI languages:** Need & Justification for expert systems- cognitive problems, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition, Case studies of expert system. Ai language: Prolog syntax, Programming with prolog, backtracking in prolog, Lisp syntax, Lisp programming.

Course Outcomes	• Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. • Demonstrate proficiency in applying scientific methods to models of machine learning.
Text Books	1. Artificial Intelligence by Elaine Rich and Kevin Knight, Tata MeGraw Hill. 2. Introduction to Artificial Intelligence and Expert Systems by Dan W.Patterson, Prentice Hall of India.
Reference Books	1. Principles of Artificial Intelligence by Nils J.Nilsson, Narosa Publishing house. 2. Programming in PROLOG by Clocksin & C.S. Melish, Narosa Publishing house. 3. Rule based Expert Systems-A practical Introduction by M. Sasikumar, S.Ramani, et. al., Narosa Publishing House

Course Title	**Research Methodology for Engineers**				
Course Code	**EMT04202**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites					

Course Objectives	• To identify and apply appropriate research methodology in order to plan, conduct and evaluate basic research.
Course Contents	**UNIT I: BASICS OF RESEARCH** Basics of Research, Types and Methods of Research, Research problem, Hypothesis, Research plan, Research design, Significance of Research, Sampling techniques, Data collection, Quantitative and Qualitative Data, Tools for Data Collection; Research Problem, Hypothesis- Meaning & Characteristics, Research Design. **UNIT II: REPORT AND MANUSCRIPT WRITING** Interpretation and Report writing: Meaning of Interpretation, Significance of Report writing, Different steps in writing report, Layout of the Research Report, Types of Reports, Mechanics of writing a Research report; Preparation of Manuscript for Publication of Research Paper, Reference writing styles, Bibliography, Writing a Review of Paper, Writing Synopsis & Thesis. **UNIT III: STATISTICAL ANALYSIS** Statistical Analysis - Measures of Central Tendency, Measures of Dispersion, Measures of Association/Relationship - Regression and Correlation Analysis, Hypothesis testing, significance testing, Student's 't' test, ANOVA, Parametric and Non-parametric test; Introduction to Statistical Software: SPSS, Features for Statistical Data Analysis. **UNIT IV: BASICS OF COMPUTER** Introduction to MS Excel, Using Formulas and Functions, , Generating Charts/Graphs, Introduction to MS Word, Features and Functions, Writing Report in MS Word, Introduction to Open Office or Latex, Creating Presentation in MS Power Point, Use of Advanced Research Techniques; Basics of Internet, FTP, e-mail, worldwide web (www), navigating the www, search engines. **UNIT V: IPR** Introduction to Intellectual Property; Types of Intellectual Property; Importance of IPR; Patents, Trademarks, Copyright and Related rights, Industrial Design; Traditional knowledge; Geographical indications; History of Indian Patent System and Law; Types of Patent; Patentable and Non-Patentable items.
Course Outcomes	• Enable scholars to distinguish between the scientific method and common sense knowledge while laying the foundation for research skills at higher levels.
Text Books	1.

Reference Books	1. Research Methodology: An Introduction by CR Kothari, New Age publication. 2. Research Methodology: Methods and Techniques by C. R. Kothari, New Age International Publishers, ISBN:81-224-1522-9. 3. Research Methodology for Business: A Skill Based Approach by Kumar, Shekaran (2009), New York, John Wiley Publishers. 4. Statistical Methods for Research Workers by Fisher R. A., Cosmo Publications, New Delhi ISBN:81-307-0128-6. 5. Methodology of Research in Social Sciences by O. R. Krishnaswamy and M. Rangnatham Himalaya publication House, 2005, ISBN: 8184880936. 6. Research Methodology-A Step-by-Step Guide for Beginners, Kumar, Ranjit. (2nd.ed), Pearson Education. 7. Research Methodology: Concepts and cases by Chawla and Sondhi, Vikas Publication.

Master of Technology (Computer Science & Engineering)
Semester - II
2021-22

Course Title	**Cloud Computing**				
Course Code	**EMT04203**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	Students must know the basic concepts of Cloud Technology.				
Course Objectives	• Cloud computing represents a latest in the long history computing mainframe, Personal computing networked computing and expected to revolutionize the business is done. • This course covers the theoretical and practical aspects of cloud computing. At the end of the course, student will be able to appreciate the cloud computing paradigm, recognize its various forms and able to implement some cloud computing features.				

Course Contents	**UNIT I :** Introduction to Cloud Computing, The Emergence of Cloud Computing, Cloud-Based Service Offerings, Benefits of using a Cloud Model, Key Characteristics of Cloud Computing, Understanding- Public & Private cloud environments, The Evolution of Cloud Computing – Hardware & Internet Software Evolution. **UNIT II :** Cloud Security Challenges, Software-as-a-Service, Security Management People, Security Governance, Security Portfolio Management, Security Architecture Design, Identity Access Management (IAM), Data Security. **UNIT III :** Cloud as: Communication-as-a-Service (CAAS), Infrastructure-as-a-Service (IAAS), Monitoring-as-aService (MAAS), Platform-as-a-Service (PAAS), Software-as-a-Service (SAAS). **UNIT IV :** The MSP Model, Evolution from the MSP Model to Cloud Computing and Software-as-a-Service, TheCloud Data Center, Basic Approach to a Data Center-Based SOA, Open Source Software, Service- Oriented Architectures as a Step Toward Cloud Computing. **UNIT V :** Virtualization concepts & Smartphone: virtualization benefits, Hardware virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization, Network Virtualization, Virtualization Security Recommendations, Introduction to Various Virtualization OS VMware , KVM, Virtual Machine Security, Smartphone, Mobile Operating Systems for Smartphone's (iPhone, Windows Mobile), Google(Android) Blackberry, Ubuntu Mobile Internet.
Course Outcomes	• Students will be able to perform cloud oriented analysis. • Students will be able to model cloud candidate derived from existing business documentation. • Students will be able to design the composition of a cloud services. • Students will be able to design application services for technology abstraction.

Text Books	1. Toby Velte, Anthony Vote and Robert Elsenpeter, "Cloud Computing: A Practical Approach", McGraw Hill, 2002
Reference Books	1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructures in the Cloud", O'Reilly Media, 2003. 2. Tim Matherm, SubraKumaraswamy and ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly Media, 2005.

Course Title	**Machine Learning**				
Course Code	**EMT04204**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	This course covers fundamental concepts and methods of computational data analysis, including pattern classification, prediction, visualization, and recent topics in deep learning. The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work. The underlying theme in the course is statistical inference as it provides the foundation for most of the methods covered.				

Course Objectives	• To understand pattern classification algorithms to classify multivariate data. • To understand the Implementation of genetic algorithms. • To gain knowledge about Q-Learning. • To create new machine learning techniques.
Course Contents	**UNIT I:** **Introduction to Machine Learning** : Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory -Turning Data into Probabilities – The Bias-Variance Tradeoff. **UNIT II:** **NEURAL NETWORKS AND GENETIC ALGORITHMS:** Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning. **UNIT III:** **BAYESIAN AND COMPUTATIONAL LEARNING:** Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **UNIT IV:** **INSTANT BASED LEARNING:** K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning. **UNIT V :** Reinforcement Learning – Representation Learning – Neural Networks – Active Learning -Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines -Deep Learning.

Course Outcomes	**Upon completion of the course, the students will be able to:** • Differentiate between supervised, unsupervised, semi-supervised machine learning approaches. • Apply specific supervised or unsupervised machine learning algorithm for a particular problem. • Analyse and suggest the appropriate machine learning approach for the various types of problem. • Design and make modifications to existing machine learning algorithms to suit an individual application
Text Books	1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010. 2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995
Reference Books	1. Ethem Alpaydin, (2004) "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press. 2. T. astie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer(2nd ed.), 2009

Master of Technology (Computer Science & Engineering)
Semester - II
2021-22

<table>
<tr><td>Course Title</td><td colspan="5">Blockchain Technology</td></tr>
<tr><td>Course Code</td><td colspan="5">EMT04205A</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">This course is intended to study the basics of Blockchain technology.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• learner will explore various aspects of Blockchain technology like application in various domains.
• By implementing learner will have idea about private and public Blockchain, and smart contract.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT I : Introduction of Cryptography and Blockchain:
What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions And Blocks, P2P Systems, Keys As Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

UNIT II : BitCoin and Cryptocurrency:
What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain And Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency.

UNIT III : Introduction to Ethereum:
What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Metamask Setup, Ethereum Accounts, Receiving Ether’s What's a Transaction?, Smart Contracts.

UNIT IV : Introduction to Hyperledger:
What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer.

UNIT V : Blockchain Applications:
Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.</td></tr>
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Course Outcomes	• Understand and explore the working of Blockchain technology (Understanding). • Analyze the working of Smart Contracts (Analyze). • Understand and analyze the working of Hyperledger (Analyze). • Apply the learning of solidity and de-centralized apps on Ethereum (Apply).
Text Books	1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016). 2. Antonopoulos, Mastering Bitcoin.
Reference Books	1. Antonopoulos and G. Wood, Mastering Ethereum. 2. D. Drescher, Blockchain Basics. Apress, 2017.

Course Title	**Software Metrics & Quality Assurance**				
Course Code	**EMT04204A**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	To gain basic knowledge about metrics, measurement theory and related terminologies.				
Course Objectives	• To learn measure the quality level of internal and external attributes of the software product. • To introduce the basics of software reliability and to illustrate how to perform planning, executing and testing for software reliability. • To explore various metrics and models of software reliability. • To compare various models of software reliability based on its application.				

Course Contents	**UNIT-I : What Is Software Quality:Quality:** Popular Views, Quality Professional Views, Software Quality, Total Quality Management, and Summary. Fundamentals Of Measurement Theory: Definition, Operational Definition, And Measurement, Level Of Measurement, Some Basic Measures, Reliability And Validity, Measurement Errors, Be Careful With Correlation, Criteria For Causality, Summary. Software Quality Metrics Overview: Product Quality Metrics, In Process Quality Metrics, Metrics for Software Maintenance, Examples for Metrics Programs, Collecting software Engineering Data. **UNIT-II : Applying The Seven Basic Quality Tools In Software Development:** Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause, and Effect Diagram. The Rayleigh Model: Reliability Models, the Rayleigh Model Basic Assumptions, Implementation, Reliability and Predictive Validity. **UNIT-III : Complexity Metrics and Models:** Lines of Code, Halstead's Software Science, Cyclomatic Complexity Syntactic Metrics, An Example of Module Design Metrics in Practice .Metric And Lessons Learned for Object Oriented Projects: Object Oriented Concepts And Constructs, Design And Complexity Metrics, Productivity Metrics, Quality And Quality Management Metrics, Lessons Learned For object oriented Projects. **UNIT-IV : Availability Metrics:** Definition and Measurement of System Availability, Reliability Availability and Defect Rate, Collecting Customer Outage Data For Quality Improvement, In Process Metrics For Outage And Availability. Conducting Software Project Assessment: Audit Ad Assessment, Software Process Maturity Assessment And Software Project Assessment, Software Process Assessment A Proponed Software Project Assessment Method. **UNIT-V : Dos And Don'ts Of Software Process Improvement :** Measuring Process Maturity, Measuring Process Capability, Staged Versus Continuous Debating Religion, Measuring Levels Is Not Enough, Establishing The Alignment Principle ,Take Time Getting Faster, Keep it Simple Or Face Decomplexification, Measuring The Value Of Process Improvement ,Measuring Process Compliance , Celebrate The Journey Not Just The Destination. Using Function Point Metrics to Measure Software Process Improvement: Software Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels.

Course Outcomes	• Identify and apply various software metrics, which determines the quality level of software • Identify and evaluate the quality level of internal and external attributes of the software product • Compare and Pick out the right reliability model for evaluating the software • Design new metrics and reliability models for evaluating the quality level of the software based on the requirement.
Text Books	1. Norman E-Fentor and Share Lawrence Pflieger." Software Metrics". International Thomson Computer Press, 1997. 2. Stephen H Khan: Metrics and Models in Software Quality Engineering, Pearson 2nd edition 2013.
Reference Books	1. S.A. Kelkar, "Software quality and Testing, PHI Learning, Pvt., Ltd., New Delhi 2012. 2. Watts S Humphrey, "Managing the Software Process", Pearson Education Inc, 2008. 3. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.

Course Title	**Data Science**				
Course Code	**EMT04205C**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	To make students understand the fundamentals of data science				
Course Objectives	• To introduce python-based programming toolkit for developing basic models 3. • To make student understand mathematics behind data analysis. • To impart fundamentals of machine learning algorithms. • To design and develop DS models for real time applications				

Course Contents	**UNIT-I : Data science in a big data world:** Why Data Science, Benefits and uses of data science; Facets of data, The data science process: Setting up goal, retrieving data, data preparation, data exploration, data modelling, Presentation and automation. **UNIT-II : Introduction to Programming:** Sequence data: string, list, dictionary, array and tuple. Tools for Data Science, Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK , Visualizing Data: Bar Charts, Line Charts, Scatter plots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. **UNIT-III : Mathematical Foundations Mathematical Foundations Linear Algebra:** Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference. **UNIT-IV : Machine Learning :** Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks Learning And Generalization, Overview of Deep Learning. **UNIT-V :** Application of Data Science Complete development of an application using data science techniques like Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.: Exploratory data analysis, data visualization on data set, Prediction, analysis and accuracy of the system.
Course Outcomes	• Student must be Able to understand the building blocks of Big Data. • Student must be able to articulate the programming aspects of cloud computing(map Reduce etc). • Student must be able to understand the specialized aspects of big data with the help of different big data applications

Text Books	1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media. 2. Davy Cielen, Arno, D,B Meysmen, Mohamed Ali "Introducing Data Science", Manning
Reference Books	1. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi. 2. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi. 3. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi. 4. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.

Course Title	**Artificial Intelligence Lab**				
Course Code	**EMT04291**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Students must have basic knowledge of Data Structure and Algorithms.				
Course Objectives	• Introduce the basic principles of AI towards problem solving, inference, perception, knowledge representation and learning. • Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural Networks and other machine learning models. • Experiment with a machine learning model for simulation and analysis. • Explore the current scope, potential, limitations, and implications of intelligent systems. • To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.				

Course Contents	**List's of Practical's(Perform any 10)** 1. Write a prolog program to find the rules for parent, child, male, female, son, daughter, brother, sister, uncle, aunt, ancestor given the facts about father and wife only. 2. Write a program to find the length of a given list. 3. Write a program to find the last element of a given list. 4. Write a program to delete the first occurrence and also all occurrences of a particular element in a given list. 5. Write a program to find union and intersection of two given sets represented as lists. 6. Write a program to read a list at a time and write a list at a time using the well defined read & write functions. 7. Write a program given the knowledge base, If x is on the top of y, y supports x. If x is above y and they are touching each other, x is on top of y. A cup is above a book. The cup is touching that book. Convert the following into wff's, clausal form; Is it possible to deduce that `The book supports the cup'. 8. Write a program given the knowledge base, If Town x is connected to Town y by highway z and bikes are allowed on z, you can get to y from x by bike. If Town x is connected to y by z then y is also connected to x by z. If you can get to town q from p and also to town r from town q, you can get to town r from town p. Town A is connected to Town B by Road 1. Town B is connected to Town C by Road 2. Town A is connected to Town C by Road 3. Town D is connected to Town E by Road 4. Town D is connected to Town B by Road 5. Bikes are allowed on roads 3, 4, 5. Bikes are only either allowed on Road 1 or on Road 2 every day. Convert the following into wff's, clausal form and deduce that `One can get to town B from town D'. 9. Solve the classical Water Jug problem of AI. 10. Solve the classical Monkey Banana problem of AI. 11. Solve the classical Crypt arithmetic problems such as DONALD + GERALD = ROBERT of AI. 12. Solve the classical Missionary Cannibals problem of AI. 13. Solve the classical Travelling Salesman Problem of AI. 14. Solve the classical Blocks World Problem of AI.

Course Outcome	**A**fter successful completion of the course, students will be able • Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. • Demonstrate proficiency in applying scientific methods to models of machine learning.
Text Books	1. Artificial Intelligence by Elaine Rich and Kevin Knight, Tata MeGraw Hill. 2. Introduction to Artificial Intelligence and Expert Systems by Dan W.Patterson, Prentice Hall of India.
Reference Books	1. Principles of Artificial Intelligence by Nils J.Nilsson, Narosa Publishing house. 2. Programming in PROLOG by Clocksin & C.S. Melish, Narosa Publishing house. 3. Rule based Expert Systems-A practical Introduction by M. Sasikumar, S.Ramani, et. al., Narosa Publishing House 4. Ivan Bratko : Logic & prolog programming. 5. Carl Townsend : Introduction to Turbo Prolog, BPB, Publication.

Course Title	**Machine Learnig Lab**				
Course Code	**EMT04292**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Students must have basic knowledge of machine learning Algorithms.				
Course Objectives	• To understand the need for machine learning for various problem solving. • To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning. • Experiment with a machine learning model for simulation and analysis.				

Course Contents	**List's of Practical's(Perform any 10)** 1.Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples. 3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample. 4.Build an Artificial Neural Network by implementing the Backpropagationalgorithm and test the same using appropriate data sets. 5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set. 7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API. 8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program. 9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. 10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course Outcome	**A**fter successful completion of the course, students will be able • Differentiate between supervised, unsupervised, semi-supervised machine learning approaches. • Apply specific supervised or unsupervised machine learning algorithm for a particular problem. • Analyse and suggest the appropriate machine learning approach for the various types of problem.
Text Books	1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015.
Reference Books	1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012. 2. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014. 3. Tom Mitchell, "Machine Learning", McGraw-Hill, 2017.