Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

For

Master of Science in CS

Semester-III

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
DEPARTMENT OF COMPUTER SCIENCE

Master of Science – 3rd Semester

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

Sr. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	SMS04301	Artificial Intelligence	3	1	-	4	30	70	100	3 Hr.
2	SMS04302	R Programming Language	3	1	-	4	30	70	100	3 Hr.
3	SMS04303	Data Mining	3	1	-	4	30	70	100	3 Hr.
4	SMS04304	Internet of Thing	3	1	-	4	30	70	100	3 Hr.
5	SMS04351	**Elective-I**	3	1	-	4	30	70	100	3 Hr.
6	SMS04391	Artificial Intelligence Lab	-	-	4	2	15	35	50	3 Hr.
7	SMS04392	R Programming Language Lab	-	-	4	2	15	35	50	3 Hr.
8.	SMS04393	Mini Project	-	-	8	4	30	70	100	3 Hr.
Total Contact hr. per week: 32						**28**	**210**	**490**	**700**	

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DEPARTMENT OF COMPUTER SCIENCE

Table – I

Open Elective – I

Sr. No	Subject Code	Subject Name
1	SMS04351A	Cyber Law & Ethics
2	SMS04351B	Digital Watermarking
3	SMS04351C	Legal Issues & Policies in Industries
4	SMS04351D	Business Analytics
5	SMS04351E	Digital Marketing

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
DEPARTMENT OF COMPUTER SCIENCE

Course Title	Artificial Intelligence
Course Code	SMS04301
Semester	**M.Sc CS – 3rd Semester**

Course Credits	L	T	P	TC	
	4	**-**	**-**	**4**	

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	**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. **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.
Course Outcomes	**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

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
DEPARTMENT OF COMPUTER SCIENCE

Course Title	R Programming Language
Course Code	SMS04302
Semester	**M.Sc CS – 3rd Semester**
Course Credits	<table><tr><td>**L**</td><td>**T**</td><td>**P**</td><td>**TC**</td></tr><tr><td>**4**</td><td>**-**</td><td>**-**</td><td>**4**</td></tr></table>
Prerequisites	Students must know the concept of data interpret, statistics and patterns.
Course Objectives	After completing the course, students will learn Exposure to theory as well as practical knowledge through R used in data analytics. Fundamental basics of statistics used in analyzing the data 1. How to find the pattern in the given dataset 2. How to interpret the data graphically 3. How to apply different types of algorithms for the given dataset
Course Contents	**UNIT – I: Introduction to Data analytics, Basic Statistics and Distribution** **Introduction to Data analytics**: Overview of Big-data, Need of Data Analytics, Applications of Data Analytics, Datasets, tools for data analytics **Basic-Statistics**: Mean, Median, mode, Standard Deviation, Variance, Correlation. **Distribution:** normal, binomial. **UNIT-II: Introduction to R and R Data Structures** **Introduction to R:** R overview and history, Basic features of R, Installing R, packages in R, Getting started: Window section of R-Studio, first interaction, command line versus scripts, comments. Variables in R: Naming variables, assigning values to variables, finding variables, removing variables, and operators. **R Data Structures:** Vectors, Character Strings, Matrices, Lists, Data Frames, and Classes. **UNIT-III: Input of Data, Functions and Decision making structure** **Input of Data:** input of data from terminal, input of data through R-objects. **Output Functions:** print () function, cat () function. **In-Built functions in R:** Mathematical functions, String functions. **User defined functions** ñ function without arguments, function with arguments. **Decision making structure:** simple if statement, if-else statement, switches statement. **Loops:** while loop, for loop, Repeat loop.

	UNIT-IV: Data Types of R Vectors & Matrices **Data Types of R Vectors:** class of a vector, Elements of a vector, accessing vector elements, functions for vectors, obtaining the Length of a Vector. **Common vector operations:** Arithmetic & logical operations, Vector Indexing, using all () and any () functions, Vectorized operations, NA and NULL values. **Matrices:** creating a matrix, accessing matrix elements, functions for matrices, matrix indexing, filtering on matrices. **Arrays:** creating an array, accessing elements of an array, functions for array. **UNIT-V: Lists, Import and Export of data and Data Visualization techniques** **Lists:** creating a list, accessing list elements, functions for list, General list operations, list indexing, adding and deleting list elements .**Import and Export of data:** Import and export of data in excel file:reading from excel format, write to excel format. **Data Visualization Techniques:** Introduction, pie chart, bar chart, scatter and box plots.
Course Outcomes	1. Data-Visualization tools and techniques offer executives and other knowledge workers new approaches 2. Data visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context.
Text Books	1. Data Analytics with R, WILEY Publishing , Dr.Bharti Motwani. 2. The Art of R Programming by Norman Matlof, No starch press, SAN FRANSISCO,2011. 3. Data Analytics using R, McGrawHill Publications, Seema Acharya
Reference Books	1. Rumset D. J. (2010): Statistical Essentials for Dummies. Hoboken: Wiley Publishing 2. R for Data Science: Import, Tidy, Transform, Visualize, and Model Databy adley ickham , O'Reilly

Course Title	Data Mining				
Course Code	SMS04303				
Semester	**M.Sc CS – 3rd Semester**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	To introduce students to the basic concepts and techniques of Data Mining.				
Course Objectives	• To develop skills of using recent data mining software for solving practical problems. • To gain experience of doing independent study and research.				
Course Contents	**UNIT-1: Introduction to Data Mining**: What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, and Applications. **Data Warehouse and OLAP:** Data Warehouse and DBMS, Multidimensional data model, OLAP operations, Example: loan data set. **UNIT-2 : Data preprocessing :** Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization. **Data mining knowledge representation :** Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques, Experiments with Weka – visualization **UNIT-3: Attribute-oriented analysis:** Attribute generalization, Attribute relevance, Class comparison, Statistical measures, Experiments with Weka - using filters and statistics.				

	Data mining algorithms: Association rules, Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis, Experiments with Weka - mining association rules.
	UNIT-4: Data mining algorithms: Classification, Basic learning/mining tasks, Inferring rudimentary rules: 1R algorithm, Decision trees, Covering rules, Experiments with Weka - decision trees, rules
	Data mining algorithms: Prediction, The prediction task, Statistical (Bayesian) classification, Bayesian networks
	UNIT -5: Advanced techniques, Data Mining software and applications: Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing), Bayesian approach to classifying text, Web mining: classifying web pages, extracting knowledge from the web, Data Mining software and applications.
Course Outcomes	• Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data.
Text Books	• Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005, ISBN: 0-12-088407-0.
Reference Books	• Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier. • Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

Course Title	Internet of Things
Course Code	SMS04304
Semester	**M.Sc CS – 3rd Semester**

Course Credits	L	T	P	TC	
	4	**-**	**-**	**4**	

Prerequisites	Students must know basic concept of about internet, network
Course Objectives	• To understand Concepts, design and characteristics of IoT. • To understand Architecture of IoT. • To understand basic protocols of IoTs. • To understand challenges and applications of IoTs • To develop IoT applications using Tools.
Course Contents	**UNIT-1 : Introduction to IoT :** Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. **UNIT-2 : IoT & M2M :** Machine to Machine, Difference between IoT and M2M, Software define Network. **UNIT-3: Network & Communication Aspects :** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination. **UNIT-4: Challenges and Applications of IoT :** Design challenges, Development challenges, Security challenges, Other challenges. Home automation, Industry applications, Surveillance applications, Other IoT applications.

	UNIT -5 : Developing IoTs : Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python.
Course Outcomes	- Students will familiar with the concepts of Internet of Things. - Students will familiar with IoT Architecture - Students will ready to Analyze basic protocols in wireless sensor network - Students will be capable to design IoT applications in different domain and be able to analyze their performance - Capable to implement basic IoT applications on embedded platform
Text Books	- Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach" - Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
Reference Books	Internet of Things with Arduino Cookbook by Macro Schwart Published by Packt Publishing Ltd

Course Title	**Elective – I** (Cyber Law & Ethics)				
Course Code	SMS04351A				
Semester	**M.Sc CS – 3rd Semester**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	The Objectives Of This Course Is To Enable Learner To Understand, Explore, And Acquire A Critical Understanding Cyber Law.				
Course Objectives	Develop Competencies For Dealing With Frauds And Deceptions (Confidence Tricks, Scams) And Other Cyber Crimes For Example, Child Pornography Etc. That Are Taking Place Via The Internet.				
Course Contents	**UNIT-1** **Introduction to Cyber law:** Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access. **UNIT-2** **Information Technology Act:** Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.				

	UNIT-3
	Cyber law and Related Legislation: Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).
	UNIT-4
	Electronic Business and legal issues: Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends
	UNIT -5
	Cyber Ethics: The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.
Course Outcomes	• The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers. • The students will learn the rights and responsibilities as an employee, team member and a global citizen
Text Books	• Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher. • Cyber Ethics 4.0, Christoph Stuckel berger, Pavan Duggal, by Globethic
Reference Books	• Cyber Law, Jonthan Rosenoer, Springer, New York, (1997). • The Information Technology Act, 2005: A Handbook, OUP Sudhir Naib,, New York, (2011)

Course Title	Artificial Intelligence Lab
Course Code	SMS04391
Semester	**M.Sc CS – 3rd Semester**

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 :** 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.
Course Outcomes	**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	• Artificial Intelligence by Elaine Rich and Kevin Knight, Tata MeGraw Hill. • Introduction to Artificial Intelligence and Expert Systems by Dan W.Patterson, Prentice Hall of India.
Reference Books	• Principles of Artificial Intelligence by Nils J.Nilsson, Narosa Publishing house. • Programming in PROLOG by Clocksin & C.S. Melish, Narosa Publishing house. • Rule based Expert Systems-A practical Introduction by M. Sasikumar, S.Ramani, et. al., Narosa Publishing House • Ivan Bratko : Logic & prolog programming. • Carl Town send : Introduction to Turbo Prolog, BPB, Publication. • W.F. Clocksin & Mellish : Programming in PRLOG, Narosa Publication House.

Course Title	R Programming Lab
Course Code	SMS04392
Semester	**M.Sc CS – 3rd Semester**

Course Credits	L	T	P	TC	
	-	**-**	**4**	**2**	

Prerequisites	Students must know basic concept of Excel, factorial, Mean & Mode.
Course Objectives	Students should be able to understand the basic knowledge of R Programming.

Course Contents	**List of Practical's** 1. Write a program in R. To compute the product of two values. 2. Write a program in R. to check whether the given number is even or odd. 3. Write a program in R. Sum of natural numbers. 4. Write a program in R. Find the factorial. 5. Exporting data to Excel, Text File 6. Mean, Median, Standard Deviation, Variance, Correlation in R 7. Correlation in R:Pearson & Spearman with Matrix Example 8. T Test in R 9. Chi-Square Test in R 10. Prediction using linear regression and visualizing the regression graphically
Course Outcomes	• Data-Visualization tools and techniques offer executives and other knowledge workers new approaches • Data visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context.
Text Books	1. The Book of R: A First Course in Programming and Statistics: Tilman M. Davies. 2. R For Dummies, Andrie de Vries, Joris Meys
Reference Books	1. Rumset D. J. (2010): Statistical Essentials for Dummies. Hoboken: Wiley Publishing 2. R for Data Science: Import, Tidy, Transform, Visualize, and Model Databy adley ickham , O'Reilly

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