Shri Rawatpura Sarkar University, Raipur

Teaching &Examination Scheme & Syllabus

For

M. Sc. (CS)

Semester-IV

(Effective from the session: 2022-23)

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

Scheme of Teaching and Examination

Master of Science – IV th 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	SMS04401	Soft Computing	3	1	-	4	30	70	100	3 Hr.
2	SMS04402	Machine Learning	3	1	-	4	30	70	100	3 Hr.
3	SMS04451	**Elective – II**	3	1	-	4	30	70	100	3 Hr.
4	SMS04491	Major Project	-	-	20	10	75	175	250	3 Hr.
Total Contact hr. per week: 28						**22**	**165**	**385**	**550**	

Table –I
Discipline Elective – II

Sr.No.	Subject Code	Subject Name
1	SMS04451A	Nature Inspired Computing Methods
2	SMS04451B	Next Generation Network

Master of Science (Computer Science)
Semester-IV
2022-23

<table>
<tr><td>Course Title</td><td colspan="5">Soft Computing</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS04401</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>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">A strong mathematical background, Programming skill in C, C++, Proficiency with algorithm.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To solve single-objective optimization and its applications using Genetic Algorithms.
• To understand the Artificial neural network and its applications.
• To identify, build and validate appropriate soft computing skills.
• To learn fuzzy logic and applications in engineering.
• To apply the soft computing techniques for solving the problem of engineering.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Introduction to Soft Computing:
Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques.
UNIT- II
Fuzzy logic:
Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Some applications of Fuzzy logic.
UNIT- III
Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc. Solving single-objective optimization problems using GAs.
UNIT- IV
Artificial Neural Networks: Biological neurons and its working,</td></tr>
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	Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real-life problems. **UNIT -V** **Hybrid Systems:** Fuzzy Neural systems, Genetic Fuzzy systems, Genetic Neural system.
Course Outcomes	• Students will able to understand fuzzy logic. • Students will able to understand Genatic Algorithms. • Students will able to understand ANN. • Students will able to understand Hybrid Systems. • Students will able to understand the differences of soft computing & hard computing.
Text Books	1. Genetic Algorithms in Search, Optimization and Machine Learning, David E. Goldberg, Pearson Education, 2002. 2. Fuzzy Logic for Embedded Systems Applications, Ahmed M. Ibrahim, Elsevier Press, 2004.
Reference Books	1. Neural Networks and Learning Machines, (3rd Edn.), Simon Haykin, PHI Learning, 2011. 2. H.J. Zimmermann, Fuzzy set theory and its applications., III Edition, Kluwer Academic Publishers, London.

Master of Science (Computer Science)
Semester-IV
2022-23

<table>
<tr><td>Course Title</td><td colspan="5">Machine Learning</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS04402</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>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">A strong mathematical background, undergraduate level course in Linear Algebra.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• Introduce the concept of learning patterns from data.
• Develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.
• To become a skilled Machine learning.
• To use specialist software tools for data storage.
• To be able to apply the concepts of Artificial Intelligence and Machine Learning with practical knowledge.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Introduction:
Idea of Machines learning from data, Classification of problem – Regression and Classification, Supervised and Unsupervised learning.
UNIT- II
Linear Regression:
Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Multivariable model representation, Multivariable cost function, Gradient Decent in practice, Normal Equation and non-invertibility.
UNIT- III
Logistic Regression:
Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting, Regularization.
UNIT- IV
Support Vector Machines:
Optimization Objective, Large Margin Classifiers, Kernels, SVM</td></tr>
</table>

	practical considerations. **UNIT -V** **Unsupervised learning:** Unsupervised learning introduction, k-Means Algorithm, Optimization objective, Random Initialization, Choosing number of clusters.
Course Outcomes	• Acquire fundamental knowledge of learning theory. • Design and evaluate various machine learning algorithms. • Using Python programming for various machine learning problems Students will able to understand Hybrid Systems. • Use machine learning methods for multivariate data analysis in various scientific fields. • Choose and apply appropriate Machine Learning Techniques for analysis, forecasting, categorization and clustering of the data.
Text Books	1. Machine Learning, Tom M. Mitchell. 2. Building Machine Learning Systems with Python, Richert & Coelho.
Reference Books	1. C.M. Bishop: Pattern Recognition and Machine learning, Springer. 2. Tom Mitchell: Machine Learning, McGraw Hill.

Master of Science (Computer Science)
Semester-IV
2022-23

Elective – II

<table>
<tr><td>Course Title</td><td colspan="5">Nature Inspired Computing Methods</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS04451A</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>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">A strong mathematical background, Programming skill in C, C++, Proficiency with algorithm.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To understand the fundamentals of nature inspired techniques which influence computing.
• Study the Swarm Intelligence and Immuno computing techniques and familiarize the DNA Computing.
• To identify, build and validate appropriate soft computing skills.
• To learn fuzzy logic and applications in engineering.
• To apply the nature inspired computing techniques for solving the problem of engineering.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT- I
Introduction:
From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,AdaptationFeedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.
UNIT- II
Computing Inspired by Nature:
Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms , Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming.
UNIT- III
SWARM INTELLIGENCE:
Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation</td></tr>
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	of Knowledge , Particle Swarm Optimization (PSO). **UNIT- IV** **IMMUNOCOMPUTING:** Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation InteractionImmune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm, Artificial Immune Networks. **UNIT -V** **COMPUTING WITH NEW NATURAL MATERIALS:** DNA Computing: Motivation, DNA Molecule , Adleman's experiment , Test tube programming language, Universal DNA Computers , PAM Model , Splicing Systems , Lipton's Solution to SAT Problem , Scope of DNA Computing , From Classical to DNA Computing.
Course Outcomes	• Students will able to understand the concepts of Natural systems and its applications. • Students will able to understand the basics Natural systems. • Students will able to understand basic Natural systems functions(operations). • Students will able to understand natural design considerations. • Students will able to understand integration of Hardware and software in Natural applications.
Text Books	1. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications" 2. Chapman & Hall/ CRC, Taylor and Francis Group, 2007.
Reference Books	1. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008. 2. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.

Master of Science (Computer Science)
Semester-IV
2022-23

Elective – II

Course Title	**Next Generation Network**				
Course Code	**SMS04451B**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	To learn Wireless technologies and Ad-hoc Network.				
Course Objectives	• learner will explore various aspects of Next Generation Network: Application & Protocol like application in various aspects. • By implementing learner will able to rectify nextgen network related problems. • To identify, build and validate appropriate soft computing skills. • To learn networks and it's applications in engineering. • To apply the networking techniques for solving the problem of engineering.				
Course Contents	**UNIT- I** **Basic history of Mobile Computing:** Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing. **UNIT- II** **Overview of Wireless n/w. and Technologies:** Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid),Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6 Wireless network topologies, Cell fundamentals and topologies, Global system for mobile communication, Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM, PLMN interface, GSM addresses and identifiers, network aspects in GSM,GSM frequency allocation, authentication and security, Short message services, Mobile				

	computing over SMS,SMS, value added services through SMS, accessing the SMS bearer, Security in wireless networks. **UNIT- III** **General packet radio service(GPRS):** GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, Applications of GPRS, Billing and charging in GPRS. **UNIT- IV** **Infrastructure and ad-hoc network System Architecture**: Protocol Architecture, Medium Access Control layer, MAC Management, Wireless LAN advantages, IEEE 802.11a, 802.11b standards ,Wireless LAN architecture, Mobility in Wireless LAN, Deploying Wireless LAN, Mobile ad hoc networks and sensor networks, wireless LAN security. **UNIT -V** **Wireless Application Protocol(WAP):** MMS, GPRS application CDMA and 3G Spread-spectrum Technology, FHSS, DSSS, CDMA versus GSM, Wireless data, third generation networks, applications in 3G Wireless LAN, WiFi v/s 3G Voice over Internet protocol and convergence, Voice over IP,H.323 framework for voice over IP, SIP, comparison between H.323 ad SIP, Real time protocols, convergence technologies, call routing, call routing, voice over IP applications, IMS, Mobile VoIP, Security issues in mobile Information security, security techniques and algorithms, security framework for mobile environment.
Course Outcomes	• Students will able to understand and explore the working of Wireless communication devices (Understanding). • Students will able to understand analyze the working of Ad-hoc Network. • Students will able to understand infrastructure of adhoc network. • Students will able to understand WAP. • Students will able to understand GPRS.
Text Books	• Principle of wireless Networks by Kaveh Pahlavan and Prashant Krishnamurthy, Pearson 2002. • Wireless Communications and Networks, 3G and beyond, ITI Saha Misra, TMH.
Reference Books	1. Mobile Communications, Jochen Schiller, Pearson

Master of Science (Computer Science)
Semester-IV
2022-23

<table>
<tr><td>Course Title</td><td colspan="5">Major Project</td></tr>
<tr><td>Course Code</td><td colspan="5">SMS04491</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"></td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To build effective in technical skills
2. To build effective in organiztion skills
3. To work in new technologies.
4. To build effective presentation skills
5. To develop writing reports and proposals</td></tr>
<tr><td>Course Contents</td><td colspan="5">Guideline for Allocation of project:
1. Information regarding broad area must be made available to the students well in advance (may be during previoussemester).
2. Information must cover following parameters.
a. Broad area: Subject or expertise/application area.
b. Required skills: Knowledge of subject(s), software, tools & other characteristics.
c. Type of project: Hardware, software, design, survey, study based etc.
d. Guide available: Name of Guide (S) from Department & Institute.
e. Other related information depending upon specific branch & institute.
3. It is also recommended to give proper counseling to pick up suitable project.
4. Students must get chance to select projects as per their choice or decided mutually between students and Department faculty (HoD) concern.
5. One project group must contain maximum four students, however students can do project individually but it shouldbe approved by department.
6. Compiled list of projects must be submitted to the University within 25 days of start of semester.</td></tr>
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	7. Compiled list may contain following parameters. **Monitoring of project:** 1. It is recommended to give projects as per the specializations of existing faculty of the department instead of outsideperson/agency. 2. Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies. 3. Regular review by guide is recommended to ensure development & contribution of students. **Internal Evaluation & Submission of project:** 1. Evaluation of project would be as per the examination scheme of the University, which is based on internal as wellas external evaluation. 2. Internal assessment requires submission of project report for getting approved by the concern authority and however printing and binding would be as per the conventional format. 3. Evaluation will be based on live demonstration / presentation and Viva. 4. Final submission of project is expected as, 5. Submission of a copy to the University, 6. One copy to the Institution central library, 7. One copy to the department. **External Evaluation:** External assessment of project would be like conduction of practical exams of University, and must be executed asper the norms of practical exams.
Course Outcomes	At the end of the course, the student will be able to: 1. Understand that how to improve your writing skills and level of readability 2. Learn about what to write in each section 3. Understand the skills needed when writing a Title 4. Ensure the good quality of paper at very first-time submission 5. Understand the skills needed when writing any related work.
Text Books	

Reference Books	