



माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA



Deemed to be University
(Declared under Distinct Category by Ministry of Education, Government of India)
NAAC ACCREDITED WITH A++ GRADE

DEPARTMENT OF INFORMATION TECHNOLOGY

OPTIMIZATION METHODS IN ENGINEERING

160731

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To provide basic understanding of constraints optimization.
- To understand the fundamental theory and concepts of single and multivariable optimization.
- To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Unit-I

Introduction to Optimization: Optimal Problem Formulation, Design Variables, Constraints, Objective Function, Variable Bounds, Engineering Optimization Problems, Classification of Optimization Algorithms.

Unit-II

Single-Variable Optimization Algorithm: Bracketing methods, Region elimination methods; Interval halving method, Fibonacci search method, Point-estimation method; Successive quadratic estimation method. Gradient-based methods: Newton-Raphson method, Bisection method, Secant method.

Unit-III

Multivariable Optimization Algorithm: Optimality criteria, Unidirectional search, Direct search methods: Evolutionary optimization method, Simplex search method, Hooke-Jeeves pattern search method.

Unit-IV

Constrained Optimization Algorithm: Kuhn Tucker Condition, Rosen's Gradient projection method, Penalty function method.

Unit-V

Evolutionary Optimization Algorithms and its applications: Genetic Algorithm, Differential Evolution and Particle Swarm Optimization, Application of optimization techniques in engineering design problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

RECOMMENDED BOOKS

- S. S. Rao, Engineering Optimization- Theory and Practice, New Age International, 1996.
- Kalyanmoy Deb, Optimization for Engineering Design, Algorithms and Examples, Prentice Hall, 1995.
- Kalyanmoy Deb, Multiobjective Optimization Using Evolutionary Algorithms, Wiley.
- Introduction to Soft Computing Neuro-Fuzzy and Genetic Algorithms, Samir Roy and Udit Chakraborty, Pearson
- Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa , Wiley
- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications- S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI

COURSE OUTCOMES

After completion of the course, students would be able to:

- CO1. define the basic of optimization algorithms.
- CO2. classify the concept of evolutionary optimization techniques.
- CO3. make use of single and multivariable optimization.
- CO4. apply the concepts of optimization in engineering design problems.
- CO5. compare various evolutionary optimization techniques.
- CO6. adapt optimization techniques for real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

PATTERN RECOGNITION
 160732

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVE

- To analyse the usability of image processing application.
- To choose appropriate ML algorithms for specific application.
- To understand the implementation of python in the real-world application.

Unit-I

Introduction to pattern Recognition: Overview of Pattern Recognition, Applications of Pattern Recognition, Pattern Recognition Techniques, Challenges in Pattern Recognition.

Unit-II

Data Pre-processing Types of Data, Data Acquisition Techniques, Data Pre-processing Techniques, Image Enhancement Techniques, Feature Selection and Extraction Techniques, Feature Scaling and Transformation, Feature Extraction.

Unit-III

Introduction to Deep Learning, Neural Networks and Convolutional Neural Networks, Deep Learning, Transfer Learning, Feature Fusion Techniques, Hyper-parameter Optimization, Ensemble Methods in Pattern Recognition.

Unit-IV

Implementation: Overview of Object Detection and Segmentation, Feature-Based Object Detection, Deep Learning-Based Object Detection, Image Segmentation Techniques.

Unit-V

Application: Introduction to Time Series Analysis, Applications of Time Series Analysis in Real-world application, Time Series Analysis Techniques, Time Series Analysis.

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RECOMMENDED BOOKS

- Pattern Recognition and Machine Learning by Christopher Bishop.
- Deep Learning by Ian Goodfellow, Yoshua Bengio Aaron Courville, 2016.
- Deep Learning with Python by Francois Chollet.

COURSE OUTCOMES

After completion of the course, students would be able to:

- CO1. explain the basic principle of image processing
- CO2. apply the advance pattern recognition algorithms on images
- CO3. analyse the potential of basic image processing
- CO4. compare different pattern recognition algorithms on different domain
- CO5. develop the real world application of pattern recognition
- CO6. design basic programming structure for image processing using python

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DEPARTMENT OF INFORMATION TECHNOLOGY

MOBILE COMPUTING

160733

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To introduce the basic concepts and principles in mobile computing.
- To provide a computer systems perspective on the converging areas of wireless networking, mobile devices, and network protocols.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.

Unit-I

Review of Personal Communication Services (PCS): Basic Concepts of Cellular Systems, Global System for Mobile Communication (GSM), Protocols, Handover, Data Services, and Multiple Division Techniques.

Unit-II

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 Standard, Mobile IP.

Unit-III

Wireless Application Protocol (WAP): Mobile Internet Standard. WAP Gateway and Protocols, Wireless Markup Languages (WML).

Unit-IV

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of Services in 3G.

Unit-V

Wireless Local Loop (WLL): Introduction to WLL Architecture, WLL Technologies. Global Mobile Satellite Systems: Case Studies of IRIDIUM and GLOBALSTAR Systems. Bluetooth Technology, Wi-Fi and Wi-Max.

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RECOMMENDED BOOKS

- Principles of wireless networks: a unified approach, Pahlavan, Kaveh, Upper Saddle River, N.J.: Prentice Hall PTR.
- Mobile communications, J. Schiller, Pearson Education.
- Wireless and Mobile Networks Architecture, by Yi —Bing Lin, John Wiley & Sons. Mobile & Personnel Communication Systems and Services, Raj Pandya, Prentice Hall India.
- Wireless Communication- Principles and Practices, Theodore S. Rappaport, Pearson Education.
- The Wireless Application Protocol, Singhal & Bridgman, Pearson Education.

COURSE OUTCOMES

After completion of the course students would be able to:

- CO1. explain the basic concepts of mobile telecommunications system.
- CO2. demonstrate the infrastructure to develop mobile communications system.
- CO3. classify the different generations and technology for mobile communications.
- CO4. examine the working of different protocols of wireless mobile communication technology.
- CO5. determine the importance of each technology suitable for different situation of mobile and wireless communications.
- CO6. develop protocols for adhoc and infrastructure based wireless networks.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFT COMPUTING

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To provide the students the basic understanding of soft computational techniques like neural networks and fuzzy logic, program the related algorithms and design the related systems.
- To understand the theory and concepts of neuro-modelling, different neural paradigms and related applications.
- To understand the basics of evolutionary computing paradigms like genetic algorithm and its application to engineering optimization problems.

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

Artificial Neural Networks- Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real life problems.

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

Fuzzy logic- Introduction to Fuzzy logic, Fuzzy sets and membership functions Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, de-fuzzification techniques, Fuzzy Inference System, realistic applications of Fuzzy logic.

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Unit V

Introduction to Optimization Problem, Concept & types of optimization problems, defining an optimization problem, traditional approaches for solving optimization problem, limitations of traditional approaches, applications and examples.

RECOMMENDED BOOKS

- Principles of Soft Computing, S.N. Sivanandam & S.N. Deepa, John Wiley & Sons, 2007.
- Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhizer (Springer).
- Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley), 2005.
- Neural Networks and Learning Machines Simon Haykin (PHI), 3rd edition.

COURSE OUTCOMES

At the completion of course, student will able to:

- CO1. define basic concepts of neural networks and fuzzy systems.
- CO2. classify solutions by applying various soft computing approaches for a given problem.
- CO3. identify soft computing methods to resolve realistic problems in varieties of application domains.
- CO4. analyze artificial neural networks alongwith its applications.
- CO5. categorize the basic computational methods as hard or soft.
- CO6. determine appropriate soft computing models for solving various real world problems.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SOFTWARE TESTING

910204

L	T	P	Total Credits
3	-	-	3

COURSE OBJECTIVES

- To know about an introduction to software testing, focusing on the principles, techniques, and best practices used in the field.
- To become familiar with the fundamental concepts of software testing and gain practical skills in planning, designing, and executing software tests.
- To cover the various testing methodologies, test case creation, test automation, and defect tracking.

Unit I

Introduction to Software Testing: Importance and goals of software testing, Testing life cycle and its phases, Role of testing in the software development process, Testing principles and fundamentals, V & V Model.

Unit II

Testing Techniques: Black-box and white-box testing, Equivalence partitioning, Boundary value analysis, Decision table testing, State transition testing, Use case testing, Error guessing and exploratory testing.

Unit III

Test Case Design: Test case components, Test case design techniques, Test case prioritization, Test data management, Test coverage criteria, Traceability matrix.

Test Planning and Management: Test planning process, Test strategy and test plan development, Test estimation and scheduling, Test environment setup and management, Test metrics and reporting.

Unit IV

Specialized Testing: Unit testing, Integration testing, System testing, Acceptance testing, Regression testing, Performance testing, Security testing, Usability testing, Compatibility testing, localization testing.

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Unit V

Quality Assurance and Best Practices: Quality assurance processes and activities, Code reviews and inspections, Static analysis and code coverage, Test-driven development and agile testing, Emerging trends in software testing.

RECOMMENDED BOOKS

- "Foundations of Software Testing: ISTQB Certification" by Dorothy Graham, Erik van Veenendaal, Isabel Evans, and Rex Black.
- "Software Testing: Concepts and Practices" by Srinivasan Desikan and Gopalaswamy Ramesh.
- "The Art of Software Testing" by Glenford J. Myers, Corey Sandler, and Tom Badgett.
- "Agile Testing: A Practical Guide for Testers and Agile Teams" by Lisa Crispin and Janet Gregory.
- "How Google Tests Software" by James A. Whittaker, Jason Arbon, and Jeff Carollo.

COURSE OUTCOMES

At the completion of course, student will able to-

- CO1. understand the fundamental principles and concepts of software testing.
- CO2. gain practical knowledge of different testing techniques and methodologies.
- CO3. learn to create effective test cases and test plans.
- CO4. develop skills in test execution, analysis, and defect tracking.
- CO5. understand the role of test automation in software testing.
- CO6. apply industry best practices for software testing.

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