First year syllabus under Autonomy

Shri Vile Parle Kelavani Mandal's

MITHIBAI COLLEGE OF ARTS, CHAUHAN INSTITUTE OF SCIENCE & AMRUTBEN JIVANLAL COLLEGE OF COMMERCE AND ECONOMICS

Affiliated to the

UNIVERSITY OF MUMBAI

Program : B.Sc

Course : Computer Science

Credit Based Semester and Grading System (CBCS) with effect from the academic year 2018-19

T.Y.B.Sc. Computer Science Syllabus

Academic year 2018-2019

Course Code	Course Title	Credits	Lectures/Week
USCS501	Artificial Intelligence	3	3
USCS502	Software Testing and Quality Assurance	3	3
USCS503	Information and Network Security	3	3
USCS504	Optimization Techniques	3	3
USCS505	Web Services	3	3
USCSP501	Practical of USCS501& USCS502	2	6
USCSP502	Practical of USCS503 & USCS504	2	6
USCSP503	Project Implementation	1	3
USCSP504	Practical of Skill Enhancement : USCS505	1	3

Course Code	Course Title	Credits	Lectures/Week
USCS601	Wireless Sensor Networks and Mobile Communication	3	3
USCS602	Cyber Forensics	3	3
USCS603	Information Retrieval	3	3
USCS604	Deep learning applications	3	3
USCS605	Ethical Hacking	3	3
USCSP601	Practical of USCS601	2	6
USCSP602	Practical of USCS602	2	6
USCSP603	Project Implementation	1	3
USCSP604	Practical of Skill Enhancement : USCS605	1	3

Semester I – Theory

Course: USCS501	TOPICS (Credits : 03 Lectures/Week:03) Artificial Intelligence		
	Objectives: Artificial Intelligence (AI) and accompanying tools and techniques bring transformational changes in the world. Machines capability to match, and sometimes even surpass human capability, make AI a hot topic in Computer Science. This course aims to introduce the learner to this interesting area. **Expected Learning Outcomes**: After completion of this course, learner should get a clear understanding of AI and different search algorithms used for solving problems. The learner should also get acquainted with different learning algorithms and models used in machine learning.		
Unit I	What Is AI: Foundations, History and State of the Art of AI. Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents. Problem Solving by searching: Problem-Solving Agents, Example Problems, 15L Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.	**5** **10**	**15 L**
Unit II	First Order Predicate Logic -Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information	**15**	**15 L**
Unit III	Game Playing: Overview and Example Domain, Min-max Search, Adding Alpha-BetaCutoffs.The EM Algorithm. Reinforcement learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning.	10 05	15 L
	Textbook(s): 1) Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig,3rd Edition, Pearson, 2010. **Additional Reference(s):** 1) Artificial Intelligence: Foundations of Computational Agents, David L Poole,Alan K. Mackworth, 2nd Edition, Cambridge University Press ,2017. 2) Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017 3) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2013		

Course:	TOPICS (Credits : 03 Lectures/Week:03) Software Testing and Quality	

USCS502	**Assurance**	
Objectives: To provide learner with knowledge in Software Testing techniques. To understand how testing methods can be used as an effective tools in providing quality assurance concerning for software. To provide skills to design test case plan for testing software Expected Learning Outcomes: Understand various software testing methods and strategies. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.		
Unit I	Software Testing and Introduction to quality : Introduction, Nature of errors, an example for Testing, Definition of Quality , QA, QC, QM and SQA , Software Development Life Cycle, Software Quality Factors Verification and Validation : Definition of V &V , Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough Software Testing Techniques : Testing Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testing and its types	**15 L**
Unit II	**Counting Principles , Languages and Finite State Machine** Software Testing Strategies : Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing Software Metrics : Concept and Developing Metrics, Different types of Metrics, Complexity metrics Defect Management: Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.	**15 L**
Unit III	Software Quality Assurance : Quality Concepts, Quality Movement, Background Issues, SQA activities, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, , SQA Plan , Six sigma, Informal Reviews Quality Improvement : Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts Quality Costs : Defining Quality Costs, Types of Quality Costs, Quality Cost Measurement, Utilizing Quality Costs for Decision-Making	15 L

Textbook(s):

1. Software Engineering for Students, A Programming Approach, Douglas Bell, 4 th Edition,, Pearson Education, 2005
2. Software Engineering – A Practitioners Approach, Roger S. Pressman, 5 th Edition, Tata McGraw Hill, 2001
3. Quality Management, Donna C. S. Summers, 5 th Edition, Prentice-Hall, 2010.
4. Total Quality Management, Dale H. Besterfield, 3 rd Edition, Prentice Hall, 2003.

Additional Reference(s):

1. Software engineering: An Engineering approach, J.F. Peters, W. Pedrycz , John Wiley,2004
2. Software Testing and Quality Assurance Theory and Practice, Kshirsagar Naik, Priyadarshi Tripathy , John Wiley & Sons, Inc. , Publication, 2008
3. Software Engineering and Testing, B. B. Agarwal, S. P. Tayal, M. Gupta, Jones and Bartlett Publishers, 2010

Course: USCS503	TOPICS (Credits : 03 Lectures/Week:03) Information and Network Security	
Objectives: To provide students with knowledge of basic concepts of computer security including network security and cryptography. Expected Learning Outcomes: Understand the principles and practices of cryptographic techniques. Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application. Understand various protocols for network security to protect against the threats in a network		
Unit I	Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm	15 L
Unit II	Key Management: Public-Key Cryptosystems, Key Management, Diffie-Hellman Key Exchange Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC Digital Signatures and Authentication: Digital Signatures, Authentication Protocols, Digital Signature Standard Authentication Applications: Kerberos, X.509 Authentication, Public-Key Infrastructure	15 L
Unit III	Electronic Mail Security: Pretty Good Privacy, S/MIME IP Security: Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction Intrusion: Intruders, Intrusion Techniques, Intrusion Detection Malicious Software: Viruses and Related Threats, Virus Countermeasures, DDOS Firewalls: Firewall Design Principles, Types of Firewalls	15 L
Textbook: 1. Textbook(s): 1) Cryptography and Network Security: Principles and Practice 5th Edition, William Stallings, Pearson,2010 Additional References: 1) Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2013. 2) Cryptography and Network, Behrouz A Fourouzan, Debdeep Mukhopadhyay, 2 nd Edition,TMH,2011		

Unit	Topics	Lectures
Objective		
• understand importance of optimization of industrial process management • apply basic concepts of mathematics to formulate an optimization problem • analyse and appreciate variety of performance measures for various optimization problems		
Unit – I	**Unit I: Introduction:** Need for optimization and historical development classification and formulation of optimization problem, Classical optimization methods. , Calculus based methods, Enumerative schemes, Random search algorithms, Evolutionary algorithms. Linear Programming model: Formulation, objective function, constraints, decision variables, canonical and standard forms, parameters and variables, Graphical method for two variable problems, **Introduction to Simplex Methods**: Simple simplex algorithm and tabular representation, types of solution such as feasible / non feasible, degenerate / non degenerate, optimal / sub optimal, unique / alternate / infinite optimal, bounded / unbounded value and solution and their interpretations from simplex table, cycling phenomena, mutual solution of problems involving upto three iterations. Integer Programming Branch and Bound Algorithm, Cutting plane Algorithm	15
Unit - II	**Advanced Simplex Methods, Dual Simplex Algorithm and Duality:** Artificial Variables, Big – M and Two Phase Simplex Methods, Degeneracy, unbounded solution,Infeasible Solution. Dual Simplex Method.Duality concept, dual problem formulation, dual simplex method, primal sub optimal - dual not feasible, and other primal - dual relations, interpretation of dual variables.Duality Properties, sensitivity analysis for variation of parameter at a time.	15
Unit – III	**Transportation and Assignment models**. As special cases of LP model, Problem formulation and optimality conditions in Vogel's penalty andHungarian methods of solution. Traveling salesman problem as a special case of assignment problem,sensitivity analysis manual solution of problems involving upto three iterations.	15

Textbooks :

- Operation Research-An Introduction: Taha H. A., McMillan Publishing Company, NY 2006
- Introduction to Operation Research: Hillier F., and Lieberman G.J, Holden Day
- Operations Research : P. K. Gupta & Hira, S. Chand 2014
- Operations Research Applications and Algorithms: Waynel L. Winston Thomson 2006
- Mathematical Programming Techniques: Kambo, N.S., McGraw Hill

Course: USCS505	TOPICS (Credits : 03 Lectures/Week:03) Web Services	
	Objectives: To understand the details of web services technologies like SOAP, WSDL, and UDDI. To learn how to implement and deploy web service client and server. To understand the design principles and application of SOAP and REST based web services (JAX-Ws and JAX-RS).To understand WCF service. To design secure web services and QoS of Web Services Expected Learning Outcomes: Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services	
Unit I	Web services basics : What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform	15 L
Unit II	The REST Architectural style : Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services	15 L
Unit III	GraphQL: Introduction, GraphQL is the better REST, Core Concepts - The Schema Definition Language (SDL), Queries & Mutations, Schemas and Types, GraphQL client and server, Connecting with Database via Prisma, GraphQL Tools and Ecosystem, Security.	15 L

Textbook(s):

 1) Web Services: Principles and Technology, Michael P. Papazoglou, Pearson Education Limited, 2008

2) RESTful Java Web Services, Jobinesh Purushothaman, PACKT Publishing,2 nd Edition, 2015 3) 3) https://graphql.org/learn/ and https://www.howtographql.com/

Additional Reference(s):

1) Leonard Richardson and Sam Ruby, RESTful Web Services, O'Reilly, 2007 2) The Java EE 6Tutorial, Oracle, 2013