PUNE VIDYARTHI GRIHA'S

COLLEGE OF ENGINEERING AND TECHNOLOGY, PUNE-9

(AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSIT, PUNE)

DEPARTMENT OF INFORMATION TECHNOLOGY

CURRICULUM BOOK

ACADEMIC YEAR: 2019-20

FOR THE PROGRAMME

B.E.INFORMATION TECHNOLOGY

PUNE VIDYARTHI GRIHA'S

COLLEGE OF ENGINEERING AND TECHNOLOGY

VISION

TO ACHIEVE EXCELLENCE IN ENGINEERING EDUCATION

MISSION

- **To satisfy all stakeholders**
- **To develop ethical, highly motivated engineering professionals with good human values, requisite skills and competencies**
- **To adopt innovative teaching mechanisms**
- **To promote research culture**
- **To contribute to country's economic development**
- **To be responsive to changes in technology, socio-economic and environmental conditions**

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To Empower Students to Face the Technological Challenges of 21st Century by Imparting Quality Education in the Field of Information Technology

MISSION

1) **To impart knowledge through innovative teaching-learning process to cater the needs of industries and higher education.**
2) **To inculcate good human values, professional competencies and create awareness about global technologies in the field of Computer Engineering.**
3) **To respond to rapid changes in the field of Information Technology.**

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Possess strong fundamental concepts in Engineering Science and Technology to address future technological challenges of Information Technology.

PEO2: Possess knowledge and skills in the field of Information Technology for engineering problems with innovative approaches.

PEO3: Possess behavioral aspects for research, entrepreneurship and higher studies in the field of Computer Science and Information Technology.

PEO4: Have commitment to ethical practices in the field of Information Technology and, societal contributions through communities and life-long learning.

PEO5: Possess better interpersonal and presentation skills to cope up with the rapid changes in the field of Information Technology at global level.

PROGRAMME OUTCOMES

The Program Outcomes of the Department of Information Technology are:

PO1) An ability to apply knowledge of computing, engineering mathematics, statistics, science, and engineering and technology.

PO2) An ability to identify and analyze the problem, provide a systematic solution by conducting experiments, interpreting the data and drawing substantial conclusion.

PO3) An ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints.

PO4) An ability to identify, formulate, and provide systematic solutions to complex engineering problems and validate the solution.

PO5) An ability to apply appropriate resources, skills, modern engineering tools and technologies necessary for practice as a IT professional.

PO6) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems with necessary constraints and assumptions.

PO7) An ability to analyze the local and global impact of computing on individuals, organizations and society.

PO8) An ability to understand professional, ethical, legal, security and social issues and responsibilities.

PO9) An ability to function effectively as an individual or as a team member to accomplish a desired goal(s) in multidisciplinary environment.

PO10) An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of open electives, professional organizations and extra-curricular activities.

PO11) An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.

PO12) An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

PO13) An ability to apply design and development principles in the construction of software systems of varying complexity.

PROGRAMME SPECIFIC OUTCOMES

At the Completion Graduates will be competently -

PSO1. Analyze and develop effective and efficient software solution in the field of data base management system ,web technology ,networking etc. by applying the core concepts of Information Technology.

PSO2. Work in teams in various roles to manage IT projects with the help of project management techniques.

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Final Year

Curriculum Book

Syllabus Structure of Savitribai Phule Pune University, Pune

Semester I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	In-Sem. Paper	End Sem Paper	TW	PR	OR		
414453	Information and Cyber Security	3	--	--	30	--	--	--	70	100	3
414454	Machine Learning and Applications	4	--	--	30	--	--	--	70	100	4
414455	Software Design and Modeling	3	--	--	30	--	--	--	70	100	3
414456	Elective-I	3	--	--	30	--	--	--	70	100	3
414457	Elective -II	3	--	--	30	--	--	--	70	100	3
414458	Computer Laboratory-VII	--	4	--	--	50	50	--	--	100	2
414459	Computer Laboratory-VIII	--	4	--	--	50	--	50	--	100	2
414460	Project Phase-I	--	--	2	--	--	--	50	--	50	2
414461	Audit Course-V	--	--	--	--	--	--	--	--	Grade	
	Total	**16**	**8**	**2**	**150**	**100**	**50**	**100**	**350**	**750**	**22**
	Total of Part-I	**26 Hours**				**750**					

Abbreviations: TW: Term Work **TH:** Theory **OR:** Oral **PR**: Practical **Sem**: Semester
Computer Laboratory-VII (Information and Cyber Security+ Machine Learning and Application)
Computer Laboratory-VIII (Software Design and Modeling)

Elective I		Elective II	
414456 A	1. Wireless Communications	414457A	1. Software Defined Networks
414456B	2. Natural Language Processing	414457B	2. Soft Computing
414456C	3. Usability Engineering	414457C	3. Software Testing and Quality Assurance
414456D	4. Multicore and Concurrent Systems	414457D	4. Compiler Construction
414456E	5. Business Analytics and Intelligence	1. 414457E	5. Gamification

Semester II

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	In-Sem Paper	End- Sem .Paper	TW	PR	OR		
414462	Distributed Computing System	3	--	--	30	--	--	--	70	100	3
414463	Ubiquitous Computing	3	--	--	30	--	--	--	70	100	3
414464	Elective-III	3	2	--	30	25	--	25	70	150	4
414465	Elective-IV	3	--	--	30	--	--	--	70	100	3
414466	Computer Laboratory-IX	--	4	--	--	50	50	--	--	100	2
414467	Computer Laboratory-X	--	2	--	--	25	--	25	--	50	1
414468	Project Work	--	--	6	--	50	--	100	--	150	6
414469	Audit Course-VI	--	--	--	--	--	--	--	--	Grade	
	Total	**12**	**8**	**6**	**120**	**150**	**50**	**150**	**280**	**750**	**22**
	Total of Part-II	**26 Hours**			**750**						

Abbreviations: TW: Term Work TH: Theory OR: Oral PR: Practical Sem: Semester
Computer Laboratory-IX (Distributed Computing System)
Computer Laboratory-X (Ubiquitous Computing)

Elective III		Elective IV	
414464A	1. Internet of Things (IoT)	414465A	1. Rural Technologies and Community Development
414464B	2. Information storage and retrieval	414465B	2. Parallel Computing
414464C	3. Multimedia Techniques	414465C	3. Computer Vision
414464D	4. Internet and Web Programming	414464D	4. Social Media Analytics
414464E	5. Computational Optimization	414465E	5. Open Elective

BE IT(2015Course)

Sem. I

INFORMATION AND CYBER SECURITY

Course Title:	**INFORMATION AND CYBER SECURITY**	**Course Number:414453**	**Credits: 3**
Designation of Course	Professional Core		
Teaching Scheme:3 Hours/Week		**Laboratories:** 4 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
		Term-work	Practical/Oral
	Indirect Methods	Assignments, Class Test	Quiz, Q&A session,
Prerequisites	Data Communication and Computer Networks		
Introduction of Course: This subject contains security issues involved in Network , Computer and Cyber Security			
Course Objectives			
1	Understand computer, network and information security.		
2	To study operating system security and malwares.		
3	To study security issues in internet protocols.		
4	To study network defence tools.		
5	To learn forensics and investigation techniques		
Course Outcomes			
CO1	Use basic cryptographic techniques in application development.		
CO2	Apply methods for authentication, access control, intrusion detection and prevention.		
CO3	To apply the scientific method to digital forensics and perform forensic investigations.		
CO4	To develop computer forensics awareness.		
CO5	Ability to use computer forensics tools.		
Course Contents			
Unit-I	**SECURITY BASICS**		
	Information Security Concepts, Security Threats and Vulnerabilities, Security Architectures and Operational Models, Types of Security attacks, Goals of Security, Malicious code, Intrusion detection system (IDS): Need, Types, Limitations and Challenges, security and privacy.		
Unit-II	**SYMMETRIC AND ASYMMETRIC KEY CRYPTOGRAPHY**		
	Introduction, Classical Encryption Techniques, Block Ciphers and Data Encryption standards, Advanced Encryption standard, Public Key Cryptography and RSA, Chinese Remainder Theorem, Diffie-Hellman, Elgamal Curve Arithmetic, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.		
	Practical		
	Write program in C++ or Java to implement RSA algorithm for key generation and cipher verification		
	Develop and program in C++ or Java based on number theory such as Chinese remainder		
Unit-III	**DATA INTEGRITY ALGORITHMS AND SECURITY REQUIREMENTS**		
	Cryptographic Hash Functions, requirements and security, SHA-1, SHA-3, Digital Signatures, X.509 Certificate, Kerberos, IP Security: Architecture Protocols IPv4, IPv6, AH, EPS,		

	ISAKMP, Web Security: SSL, HTTPS, Mail Security: PGP, S/MIME
	Practical
	Write a program in C++, C# or Java to implement SHA-1 algorithm using Libraries (API).
	Implement web security with Open SSL tool kit
Unit-IV	**LEGAL, ETHICAL, AND PROFESSIONAL ISSUES IN INFORMATION SECURITY, RISK MANAGEMENT**
	Overview, Risk identification, Risk Assessment, Risk Control Strategies, Quantitative vs. Qualitative Risk Control Practices. Risk Management. Laws and Ethics in Information Security, Codes of Ethics, Protecting programs and data.
Unit- V	**INTRODUCTION TO CYBER LAWS**
	Introduction, Definition and origin, Cybercrime and Information security, Classification of Cybercrimes, The legal perspectives- Indian perspective, Global perspective, Categories of Cybercrime, Types of Attacks, a Social Engineering, Cyber stalking, Cloud Computing and Cybercrime.
Unit-VI	**TOOLS AND METHODS USED IN CYBERCRIME**
	Introduction, Proxy servers and Anonymizers, Phishing, Password Cracking, Key-loggers and Spywares, Types of Virus, Worms, Dos and DDoS, SQL injection, Cybercrime and Legal perspectives, Cyber laws- Indian context, The Indian IT Act-Challenges, Amendments, Challenges to Indian Law and cybercrime Scenario in India, Indian IT Act and Digital Signatures. study of any two network security scanners: Nmap, Metasploit, OpenVAS, Aircrack, Snort, Wireshark, Nikito, Samurai, Safe 3 etc.

Text Books	**Author**	**Title of Book**	**Publication**
T1	BruiceSchneier	"Applied Cryptography- Protocols, Algorithms and Source code in C",	2nd Edition, Wiely India Pvt Ltd, ISBN 978-81-265-1368-0
T2	Nina Godbole, SunitBelapure,	"Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives"	Wiely India Pvt.Ltd.,ISBN- 978-81-265-2179-1
T3	Bernard Menezes,	"Network Security and Cryptography",	Cengage Learning, ISBN-978-81-315-1349-1
T4	Dr. V.K. Pachghare,	Cryptography and Information security,	PHI, Second edition, ISBN- 978-81-203-5082-3
Reference Books			
R1	Nina Godbole	" Information Systems Security",	Wiley India Pvt. Ltd, ISBN -978-81-265-1692-6
R2	Willaim Stallings	"Computer Security : Principles and Practices"	Pearson Ed. ISBN :978-81-317-3351-6
R3	Mark Merkow,	" Information Security-Principles and Practices", Pearson Ed. 978-81-317-1288-	Pearson Ed. 978-81-317-1288-7

		7	
R4	CK Shyamalaet el	"Cryptography and Security",	Wiley India Pvt. Ltd, ISBN 978-81-265-2285-9
R5	BerouzForouzan,	"Cryptography and Network Security",	2 edition, TMH, ISBN :9780070702080
Self-Learning Facilities	Books, PPTs		
Web Resources	http://ecomputernotes.com/fundamental/information-technology/		
Assignments			
1	1. Write program in C++ or Java to implement RSA algorithm for key generation and cipher verification		
2	Develop and program in C++ or Java based on number theory such as Chinese remainder or Extended Euclidean algorithm. (Or any other to illustrate number theory for security)		
3	Write a program in C++, C# or Java to implement SHA-1 algorithm using Libraries (API).		
4	Implement web security with Open SSL tool kit		

MACHINE LEARNING AND APPLICATION

Course Title:	**Machine Learning and Application**	**Course Number:414454**	**Credits: 4**
Designation of Course	Professional Core		
Teaching Scheme: 4 Hrs/Week		**Laboratories:**4 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-Semester Examination: 30 Marks	Theory/End Semester Examination: 70Marks
		Term-work50 Marks	Practical/Oral50 Marks
	Indirect Methods		
Prerequisites	1. Linear Algebra and Calculus, Probability Basics.		
Introduction of Course			
Course Objectives			
1.	Understanding Human Learning Aspects.		
2.	Understanding primitives and methods in learning process by computer.		
3.	Understanding nature of problems solved with Machine Learning.		
Course Outcomes By the end of the course, students should be able to			
CO1	Model the learning primitives.		
CO2	Build the learning model		
CO3	Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics		
Course Contents			
Unit-I	**INTRODUCTION TO MACHINE LEARNING**		
	Introduction: What is Machine Learning, Examples of Machine Learning applications, Training versus Testing, Positive and Negative Class, Cross-validation. Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection, Introduction to Principal Component Analysis.		
	Practical		
	Study of platform for Implementation of Assignments Download the open source software of your interest. Document the distinct features and functionality of the software platform. You may choose WEKA and R and Python		
	Principal Component Analysis-Finding Principal Components, Variance and Standard Deviation calculations of principal components.(Using R)		
Unit-II	**CLASSIFICATION**		
	Binary and Multiclass Classification: Assessing Classification Performance, Handling more than two classes, Multiclass Classification-One vs One, One vs Rest Linear Models: Perceptron ,Support Vector Machines (SVM), Soft Margin SVM, Kernel methods for non-linearity		
	Practical		
	Implement SVM for performing classification and find its accuracy on the given data. (UsingPython)		

Unit-III	**REGRESSION AND GENERALIZATION**		
	Regression: Assessing performance of Regression – Error measures, Overfitting and Underfitting, Catalysts for Overfitting, VC Dimensions Linear Models: Least Square method, Univariate Regression, Multivariate Linear Regression, Regularized Regression - Ridge Regression and Lasso Theory of Generalization: Bias and Variance Dilemma, Training and Testing Curves Case Study of Polynomial Curve Fitting.		
	Practical		
	Supervised Learning - Regression (Using R) Generate a proper 2-D data set of N points. Split the data set into Training Data setand Test Data set. i) Perform linear regression analysis with Least Squares Method. ii) Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error. iii) Verify the Effect of Data Set Size and Bias-Variance Tradeoff. iv) Apply Cross Validation andplot the graphs for errors. v) Apply Subset Selection Method and plot the graphs for errors. vi)Describe your findings in each case		
Unit-IV	**LOGIC BASED AND ALGEBRAIC MODELS**		
	Distance Based Models: Neighbors and Examples, Nearest Neighbor Classification, Distance based clustering algorithms - K-means and K-medoids, Hierarchical clustering. Rule Based Models: Rule learning for subgroup discovery, Association rules mining – Apriori Algorithm, Confidence and Support parameters. Tree Based Models: Decision Trees, Minority Class, Impurity Measures – Gini Index and Entropy, Best Split.		
	Practical		
	Implement K-Means algorithm for clustering to create a Cluster on the given data.(Using Python)		
	Create Association Rules for the Market Basket Analysis for the given Threshold. (Using R)		
Unit- V	**PROBABILISTIC MODELS**		
	Conditional Probability, Joint Probability, Probability Density Function, Normal Distribution and its Geometric Interpretation, Naïve Bayes Classifier, Discriminative Learning with Maximum Likelihood. Probabilistic Models with Hidden variables: Expectation-Maximization methods, Gaussian Mixtures		
	Practical		
	On the given data perform the performance measurements using Simple Naïve Bayes algorithm such as Accuracy, Error rate, precision, Recall, TPR,FPR,TNR,FPR etc. (Using Weka API through JAVA)		
Unit-VI	**TRENDS IN MACHINE LEARNING**		
	Ensemble Learning: Combining Multiple Models, Bagging, Randomization, Boosting, Stacking Reinforcement Learning: Exploration, Exploitation, Rewards, Penalties Deep Learning: The Neuron, Expressing Linear Perceptron as Neurons, Feed Forward Neural Networks, Linear Neurons and their Limitations, Sigmoid, Tanh and ReLU Neurons		
	Practical		
	Creating & Visualizing Neural Network for the given data. (Using Python)		
Text Books	**Author**	**Title of Book**	**Publication**
T1	EthemAlpaydin	Introduction to Machine Learning,	PHI 2nd Edition-2013.

T2	Peter Flach	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Cambridge University Press, Edition 2012.
T3	C. M. Bishop.	Pattern Recognition and Machine Learning	Springer 1st Edition-2013
Reference Books			
R1	Parag Kulkarni	Reinforcement Learning and Systemic Machine Learning for Decision Making, IEEE Press, Reprint 2015.	School of EE.
R3	Hastie, Tibshirani, Friedman:	Introduction to Statistical Machine Learning with Applications in R,	Springer, 2nd Edition 2012.
R2	Mark Gardener	Beginning R: The Statistical Programming Language	WROX(Wiley)India, ISBN
R4	Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.	Data Science and Big Data Analytics	EMC Education Services.
Web Resources	NPTEL Lecture Series Introduction to Machine Learning https://nptel.ac.in/courses/106105152/		

SOFTWARE DESIGN AND MODELING

Course Title:	**Software Design and Modeling**	**Course Number:** 414455	**Credits: 3**
Year: 2018-19		**Semester: I**	
Designation of Course		Professional Core	
Teaching Scheme: 3 Hrs/Week		**Tutorial:**	
Course Assessment Methods	**Direct methods**	In-semester Examination: 30 Marks	End Semester Examination: 70 Marks
			Oral/ Term work
	Indirect Methods	Assignments	
Prerequisites	1. Problem Solving & Object-Oriented Programming 2. Software Engineering and Project Management 3. Database Management System		
Course Objectives			
1	To teach the student the fundamental aspects of different object oriented methodologies and unified approach along with Unified Modeling Language (UML), in terms of "how to use" it for the purpose of specifying and developing software.		
2	Explore and analyze use case modeling, domain/ class modeling.		
3	To teach the student Interaction and behaviour modeling.		
4	Aware students with design process in software development.		
5	Orient students with the software design principles and patterns.		
6	Enable students to learn the architectural design guidelines in various type of application development.		
Course Outcomes			
CO1	Understand object oriented methodologies, basics of Unified Modeling Language (UML).		
CO2	Understand analysis process, use case modeling, domain/class modeling		
CO3	Understand interaction and behavior modeling.		
CO4	Understand design process and business, access and view layer class design		
CO5	Get started on study of GRASP principles and GoF design patterns.		
CO6	Get started on study of architectural design principles and guidelines in the various type of application development.		
Course Contents			
Unit-I	**OBJECT ORIENTED METHODOLOGIES, UML**		
	Views of Software Developments: Traditional System Development Methodology and Object Oriented Analysis and Design, Importance Object –Orientation Some of the object Oriented Methodology:- Object Oriented Design –Booch, Object Modeling Techniques – Rumbaugh, Object – Oriented Analysis - Cood Yourdon, Object – Oriented Software Engineering – Ivar Jacobson Unified Approach: Object Oriented Analysis, Object Oriented Design, Iterative Development & Continuous Testing, Modeling Based on UML, Layered Approach, Unified Modeling Language: Introduction to Modeling & UML, MDA, UML Structure, UML Building Blocks, UML Common Mechanisms, Introduction to all UML Diagram Notational Techniques, 4+1 View		
	Practical		
	Write Problem Statement for System / Project.		
Unit-II	**OBJECT ORIENTED ANALYSIS**		

	Object Oriented Analysis Process, Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Cases Identification, Communication, Uses/Include and Extend Associations, Writing a Formal Use Cases, Use Case realizations. Domain / Class Modeling: Approaches For Identifying Classes (Noun-Phase Approach, Common Class Pattern Approach, Class Responsibilities Collaboration Approach, Naming Classes, Class Associations and Identification of Associations, Generalization/Specialization Relationship, Aggregation and Composition Relationships, Attributes and Methods Identification.
	Practical
	1. Prepare Use Case Model
Unit-III	**INTERACTION AND BEHAVIOR MODELING**
	Activity Diagram : Activity and Actions, Initial and Final Activity, Activity Edge, Decision and Merge Points, Fork and Join, Input and Output Pins, Activity Group, Activity Partitions, Constraints on Action, Swim Lanes. Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, Modeling Interactions. Collaboration Diagram: Objects and Links, Messages and stimuli, Active Objects, Communication Diagram, Iteration Expression, Parallel Execution, Guard Expression, Timing Diagram. State Diagram: State Machine, Triggers and Ports, Transitions, Initial and Final State, Composite States, Submachine States.
	Practical
	1. Prepare Activity Model 2. Prepare Sequence Model. 3. Prepare a State Model
Unit-IV	**OBJECT ORIENTED DESIGN**
	Object Oriented Design Process Designing Business Layer : Object Oriented Constraints Language (OCL), Designing Business Classes : The Process, Designing Well Defined Class Visibility, Attribute Refinement, Method Design Using UML Activity Diagram, Packaging and Managing Classes. Designing Access Layer: Object Relational Systems, Object Relation Mapping, Table Class Mapping, Table – Inherited Classes Mapping, Designing the Access Layer Classes: The Process, Designing View Layer: View Layer Classes Design, Identifying View Classes by Analyzing Use Cases, Macro-Level Design Process, and Prototyping the User Interface. Component and Deployment Design using Component and Deployment Diagram.
	Practical
	1. Prepare Analysis Model-Class Mode 2. Prepare a Design Model from Analysis Model
Unit- V	**DESIGN PRINCIPLES AND PATTERNS**
	Introduction to Patterns General Responsibility Assignment Software Patterns (GRASP) : Introduction, Creator , Information Expert, Low coupling, Controller, High Cohesion, Polymorphism , Pure fabrication, Indirection, Protected Variations. Gang of Four (GoF): Introduction, Categories of Patterns (Creational, Structural and Behavioral Patterns), Singleton, Adapter, State, and Strategy.

	Practical		
	1.Identification and Implementation of GRASP pattern 2. Identification and Implementation of GOF pattern		
Unit-VI	**ARCHITECTURAL DESIGN**		
	Overview of software Architecture, Designing Client / Server Software Architectures, Designing Service Oriented Software Architectures, Designing Component Based Software Architectures, Designing Concurrent and Real-Time Software Architectures, Designing Product Line Architectures, Related Case Studies.		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Ali Bahrami	Object Oriented System Development: Using Unified Modeling Language	McGraw-Hill, International Editions 1999,ISBN:0-07-116090-6
T2	Craig Larman	Applying UML and Patterns	Pearson Education, Second Edition,ISBN:978- 0130925695.
T3	Erich Gamma and others	Design Patterns: Reusable elements of object oriented software	Pearson, First Edition,ISBN:9789332555402, 9332555400.
Reference Books			
R1	Martin Fowler	UML Distilled	Pearson, Third Edition, ISBN:978-81-317-1565-9
R2	Dan Pilone, Neil Pitman	UML 2.0 in a Nutshell	O'Reilly.
R3	Roger S. Pressman	Software Engineering: A Practitioner's Approach	McGraw Hill, Seventh Edition,ISBN: 9339212088, 9789339212087
R4	Hasan Gomma	Software Modeling and Design	Cambridge University Press India.
R5	Jim Arlow , Ila Neustadt	UML 2 and the Unified Process	Pearson, Second Edition, ISBN: 9788131700549
R6	Tom Pender	UML 2 Bible	Wiley India, ISBN: 9788126504527.
Self-Learning Facilities, Web Resources, Research papers for reference	Nil		
Contents beyond Syllabus			
Additional Experiments			
Bridging Courses			
Tutorials			
Presentations			

BUSINESS ANALYTICS AND INTELLIGENCE

Course Title:	**Business Analytics and Intelligence**	**Course Number:414456E**	**Credits: 3**
Designation of Course	Elective-I		
Teaching Scheme:3Hrs/Week		**Laboratories:**	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Business Analytics and Intelligence		
Introduction of Course			
Course Objectives			
1	Apply conceptual knowledge on how business intelligence is used within organizations.		
2	Evaluate organization's abilities to create and mobilize corporate knowledge.		
3	Select software tools for knowledge management systems in business organizations		
4	Suggest design systems to provide business intelligence.		
Course Outcomes			
CO1	Comprehend the Information Systems and development approaches of Intelligent Systems.		
CO2	Evaluate and rethink business processes using information systems. 3		
CO3	Propose the Framework for business intelligence.		
CO4	Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence.		
CO5	Align business intelligence with business strategy.		
CO6	Apply the techniques for implementing business intelligence systems.		
Course Contents			
Unit-I	**Decision Making and Decision Support Systems 7 Hrs**		
	The role of computerized support for decision making and its importance. Types of decisions managers face, and the process through which they make decisions. Decision making styles, the four stages of Simon's decision making process, and common strategies and approaches of decision makers. The role of Decision Support Systems (DSS), its main components, the various DSS types and classification, and how DSS have changed over time. How DSS supports each phase of decision making and summarize the evolution of DSS applications, and on how they have changed over time.		
Unit-II	**Business Intelligence Concepts and Platform Capabilities 7Hrs**		
	Definition of business intelligence (BI), BI architecture, and its components, and relation with DSS. The main components of BI platforms, their capabilities, and the competitive landscape of BI platforms. The building blocks of business reports, the types of business reports, and the components and structure of business reporting systems. Role of Mathematical model in BI, Factors Responsible for successful BI Project, Obstacle to Business Intelligence in an Organization Different types of OLAP and their applications, and the differences between OLAP and OLTP.		

Unit-III	**Data Visualization and Dashboard Design 7 Hours**		
	The top job responsibilities of BI analysts by focusing on creating data visualizations and dashboards. The importance of data visualization and different types of data that can be visually represented. The types of basic and composite charts. This will help you to determine which visualization is most effective to display data for a given data set, and to identify best practices for designing data visualizations. Common characteristics of dashboard, the types of dashboards, and the list attributes of metrics usually included in dashboards. The guidelines for designing dashboard and the common pitfalls of dashboard design.		
Unit-IV	**Business Performance Management Systems 7 Hours**		
	This module focuses on how BI is used for Business Performance Management (BPM). The main components of BPM as well as the four phases of BPM cycle and how organizations typically deploy BPM. The purpose of Performance Measurement System and how organizations need to define the key performance indicators (KPIs) for their performance management system. Four balanced scorecards perspectives and the differences between dashboards and scorecards. The benefits of using balanced scorecard versus using Six Sigma in a performance measurement system.		
Unit- V	**Role of Business Intelligence and Analytics in Business 7 Hours**		
	The role of visual and business analytics (BA) in BI and how various forms of BA are supported in practice. ERP and Business Intelligence, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications, BI Applications in Fraud Detection, BI Applications in Retail Industry		
Unit-VI	**BI Maturity, Strategy and Modern Trends in BI 7 Hours**		
	BI maturity and strategy. Different levels of BI maturity, the factors that impact BI maturity within an organization, and the main challenges and the potential solutions for a pervasive BI maturity within an organization. The critical success factors for implementing a BI strategy, BI framework, and BI implementation targets. Open Source BI. Big Data systems. Social BI systems, Geographic BI systems. Customer Experience based BI.		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Sabherwal, R. and Becerra-Fernandez	Business Intelligence: Practices, Technologies and Management.	John Wiley
T2	Turban, E. and Volonino	Information Technology for Management: Improving Strategic and Operational Performance	8th edition Wiley
Reference Books			
R1	Avison, D. and Fitzgerald, G.	Information Systems development: Methodologies, techniques and tools.	4th ed. McGraw-Hill
Self-Learning Facilities	NPTEL Lecture Series		
Web Resources			

Research papers for reference	Author	Title of Paper	Journal/Transaction
1	Anderson-Lehman, R., Watson, H.J., Wixom, B.H., & Hoffer, J.A	Continental Airlines Flies High with Real-Time Business Intelligence	MIS Quarterly Executive, 3, 4, pp 163-176
2	Gangadharan, G.R., & Swami, N.,	Business Intelligence Systems: Design and Implementation Strategies	Proceedings of the 2nd International conference on Technology Interfaces, June 7-10, Cavtat, Croatia, pp 139-144
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SOFT COMPUTING

Course Title:	**Elective-II Soft Computing**	**Course Number: 414457B:**	**Credits: 3**
Designation of Course	Elective II		
Teaching Scheme: 3 Hours/Week		**Laboratories:**	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
	Indirect Methods	Assignments, Class Test	
Prerequisites	1. Linear Algebra and Calculus. 2. Probability Theory.		
Introduction of Course: This subject contains soft computing techniques and methods to tackle real world problems			
Course Objectives			
1	Identifying Soft computing techniques and their roles in problem solving.		
2	Generate an ability to build neural networks for solving real life problems.		
3	Conceptualize fuzzy logic and its implementation for various real world applications.		
4	Apply evolutionary algorithms and Fuzzy logic to solve the problems.		
5	Design soft computing systems by hybridizing various other techniques.		
Course Outcomes			
CO1	Tackle problems of interdisciplinary nature.		
CO2	Find an alternate solution, which may offer more adaptability, resilience and optimization.		
CO3	Gain knowledge of soft computing domain which opens up a whole new career option.		
CO4	Tackle real world research problems.		
Course Contents			
Unit-I	**INTRODUCTION**		
	Basic concepts of Soft Computing, Historical Developments and Definitions, Soft Computing Characteristics and Problem Solving– Strengths and Weaknesses, Constitutes of Soft Computing : Neural Computing, Fuzzy Logic and Computing, Evolutionary Computing and Genetic Algorithms, Probabilistic Reasoning.		
Unit-II	**NEURAL NETWORKS OVERVIEW**		
	Fundamentals: Biological Neurons and Model of Artificial Neuron. Neural Network Architectures: Single Layer Network, Multi-Layer Feed Forward Neural Networks, and Feedback Networks. Perceptron Model and Learning in Perceptron, Limitation of Learning in Perceptron, Error Back Propagation learning in Multilayer FFNN. Performance Issues of EBP algorithm for MLFFNN.		
Unit-III	**NEURAL NETWORK ARCHITECTURES**		
	Complex Architectures Learning: Competitive Learning-Self Organizing Maps, Hebbian Learning-Hopfield Networks, Boltzmann Machines, Adaptive Resonance Theory (ART) Networks, Bayesian Neural Networks, Deep Learning Architecture of Neural Networks, Applications of Neural Networks.		

Unit-IV	**FUZZY LOGIC AND FUZZY SYSTEMS**		
	Fuzzy Logic, Fuzzy Sets and Operations, Fuzzy Relations, Fuzzy Arithmetic and Fuzzy Measures. Fuzzy to Crisp Conversions: Lambda Cuts for fuzzy sets, Fuzzy Relations, Defuzzification Methods. Fuzzy Rules and Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models – Sugeno Fuzzy Models, Applications of Fuzzy Modeling for Decision Making.		
Unit- V	**GENETIC ALGORITHMS**		
	Introduction, Encoding, Operators of Genetic Algorithm, Basic Genetic Algorithm, Simple GA, Crossover and Mutation, Multi-objective Genetic Algorithm (MOGA). Genetic algorithms in search and optimization, Ant colony optimization (ACO), Particle Swarm Optimization (PSO). Applications of GA for Clustering.		
Unit-VI	**ADVANCES IN SOFT COMPUTING**		
	Soft Computing Paradigms and Hybrid Approaches. Neuro-Fuzzy modeling, Genetic Algorithm Based Backpropagation Network, Fuzzy logic based Backpropagation, Fuzzy Logic Controlled Genetic Algorithms, Simplified Fuzzy ARTMAP.		
Text Books	**Author**	**Title of Book**	**Publication**
T1	S. N. Sivanandam, S. N. Deepa,	Principles of Soft Computing,	Wiley publications,2nd Edition, ISBN: 9788126527410.
T2	J. S. R. Jang, C. T. Sun, E. Mizutani,	Neuro-Fuzzy and Soft Computing- A computational approach to Learning and Machine Intelligence,	PHI,1stEdition, ISBN:978-8131792469.
Reference Books			
R1	David E. Goldberg,	Genetic Algorithms	Pearson Education, 2nd Edition, ISBN: 9788120322431, ISBN: 9780201157673.
R2	Satish Kumar,	Neural Networks - A Classroom Approach,	Tata McGraw Hill,2nd Edition, ISBN:1259006166.
R3	Timothy J. Ross,	Fuzzy Logic with Engineering Applications,	Wiley India, 3rd Edition, ISBN: 9788126531264.
R4	Samir Roy, UditChakroborthy,	Introduction to soft computing - neuro-fuzzy and genetic algorithm	Person Education, 1st Edition.
Self-Learning Facilities	Books, PPTs		
Web Resources	www.csetube.in		

Software Testing and Quality Assurance

Course Title:	**Software Testing and Quality Assurance**	**Course Number:** 414457C	**Credits:** 3
Designation of Course	Elective II		
Teaching Scheme:3Hrs/Week		**Laboratories:** -	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
	Indirect Methods	Objective Test	
Prerequisites	Software Engineering		
Introduction of Course : Software testing is major and integral part of software development and design.			
Course Objectives			
1	Learn to apply the testing strategies and methodologies in projects.		
2	To understand test management strategies and tools for testing.		
3	A keen awareness on the open problems in software testing and maintenance.		
4	To explain quality assurance and various tools used in quality management.		
5	To learn in detail about various quality assurance models.		
6	To understand the audit and assessment procedures to achieve quality.		
Course Outcomes			
CO1	Test the software by applying testing techniques to deliver a product free from bugs.		
CO2	Investigate the scenario and to select the proper testing technique		
CO3	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.		
CO4	Understand how to detect, classify, prevent and remove defects.		
CO5	Choose appropriate quality assurance models and develop quality.		
CO6	Ability to conduct formal inspections, record and evaluate results of inspections.		
Course Contents			
Unit-I	**SOFTWARE TESTING BASICS**		
	Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.		
	Practical		
Unit-II	**TESTING TECHNIQUES AND LEVELS OF TESTING**		
	Using White Box Approach to Test design - Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing -		

	Usability and Accessibility Testing, Configuration Testing, Compatibility Testing.
	Practical
Unit-III	**SOFTWARE TEST AUTOMATION AND QUALITY METRICS**
	Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss Function, Cost of Quality.
	Practical
Unit-IV	**FUNDAMENTALS OF SOFTWARE QUALITY ASSURANCE**
	SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.
	Practical
Unit- V	**QUALITY ASSURANCE MODELS**
	Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM.
	Practical
Unit-VI	**SOFTWARE QUALITY ASSURANCE TRENDS**
	Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their Affect on Software Quality.
	Practical

Text Books	**Author**	**Title of Book**	**Publication**
T1	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing: Principles and Practices	Pearson.
T2	Daniel Galin,	Software Quality Assurance: From Theory to Implementation	Pearson Addison Wesley.
Reference Books			
R1	Aditya P. Mathur	Foundations of Software Testing,	Pearson.
R2	Paul Ammann, Jeff Offutt	Introduction to Software Testing	Cambridge University Press.
R3	Paul C. Jorgensen	Software Testing: A Craftsman's Approach	Auerbach Publications
R4	William Perry	Effective Methods of	Wiley Publishing

		Software Testing	
R5	Renu Rajani, Pradeep Oak	Software Testing – Effective Methods, Tools and Techniques	Tata McGraw Hill.
R6	Stephen Kan,	Metrics and Models in Software Quality	Addison – Wesley, Second Edition
R7	S.A.Kelkar	Software quality and Testing	PHI Learing, Pvt, Ltd
R8	Watts S Humphrey	Managing the Software Process	Pearson Education Inc
Self-Learning Facilities			
Web Resources			
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
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BE IT (2015Course)

Sem. II

DISTRIBUTED COMPUTING SYSTEMS

Course Title:	**Distributed Computing Systems**	**Course Number:414462**	**Credits: 3**
Designation of Course	Professional Core		
Teaching Scheme: 3 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination: 70 Marks
		Term-work	Practical
	Indirect Methods	Presentations	Objective test
Prerequisites	Operating System, Computer Networks and Web Engineering & Technology.		
Introduction of Course: This course includes introduction to distributed computing systems, communication in distributed systems, algorithms for synchronization among processes and security in distributed environment.			
Course Objectives			
1	To understand the fundamentals and knowledge of the architectures of distributed systems.		
2	To gain knowledge of working components and fault tolerance of distributed systems		
3	To make students aware about security issues and protection mechanism for distributed environment.		
Course Outcomes			
CO1	Understand the principles and desired properties of distributed systems on which the internet and other distributed systems are based.		
CO2	Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.		
CO3	Recognize the inherent difficulties that arise due to distributed-ness of computing resources.		
CO4	Identify the challenges in developing distributed applications.		
Course Contents			
Unit-I	**FUNDAMENTALS AND ARCHITECTURES**		
	Introduction: Characteristics and examples of distributed systems, Design goals, Types of distributed systems, Trends in distributed systems, Focus on Resource Sharing, Challenges. Architectures: Architectural styles, middleware and middleware organization, system architectures, Example architectures. **Case Study: The World Wide Web**		
	Practical		
Unit-II	**COMMUNICATION AND COORDINATION**		
	Communication: Introduction, Layered protocols , Types of communication, Inter-process Communication, Remote Procedure Call (RPC), Message oriented communication, Multicast Communication, Network Virtualization: Overlay Network Coordination: Clock Synchronization, Logical Clocks, Mutual Exclusion, Election algorithms, Distributed event matching, Gossip Based coordination **Case Study: IBM's Websphere Message-Queuing System**		
	Practical		
	Assignment 1 To develop any distributed application through implementing client-server		

	communication programs based on Java Sockets and RMI techniques.
Unit-III	**REPLICATION AND FAULT TOLERANCE**
	Replication: Reasons for replication, Replica management, Failure masking and replication, Consistency protocols, Catching and replication in web,Fault Tolerance: Introduction, Failure models, Fault systems with arbitrary failures, Reliable client server communication, Reliable group communication, Distributed commit, Recovery, Checkpoints. **Case Study: Catching and Replication in Web**
	Practical
	Assignment 2 To develop any distributed application using Message Passing Interface (MPI).
Unit-IV	**DISTRIBUTED FILES AND MULTIMEDIA SYSTEMS**
	Distributed File Systems: Introduction, File System Architecture, Sun Network File System, and HDFS. Name Services: Introduction, Name Services and the Domain Name System, Directory Services. **Case Study- 1**: The Global Name Service, 2. The X.500 Directory Service. Distributed Multimedia Systems: Characteristics of Multimedia Data, Quality of Service Management, Resource management, Stream Adaptation. **Case Study: BitTorrent and End System Multicast.**
	Practical
	Assignment 4 To develop any distributed algorithm for leader election.
Unit- V	**DISTRIBUTED WEB BASED SYSTEM**
	Architecture of Traditional Web-Based Systems, Apache Web Server, Web Server Clusters, Communication by Hypertext Transfer Protocol, Synchronization, Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications, Fault Tolerance in distributed web based systems, Security Concerns. **Case Study: HyperText Transfer Protocol (HTTP)**
	Practical
	Assignment 5 To create a simple web service and write any distributed application to consume the web service.
	Assignment 6 To develop any distributed application using Messaging System in Publish-Subscribe paradigm.
	Assignment 7 To develop Microservices framework based distributed application.
Unit-VI	**SECURITY IN DISTRIBUTED SYSTEMS**
	Introduction to Security: Security Threats, Policies, and Mechanisms, Design Issues, Cryptography. **Secure Channels**: Authentication, Message Integrity and Confidentiality, Secure Group Communication, **Access Control**: General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service (DOS). **Security Management**: Key Management, Secure Group Management, Authorization Management. **Emerging Trends In Distributed Systems**: Grid Computing, Service Oriented Architectures (SOA).

	Case Study: Kerberos.		
	Practical		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Maarten van Steen, Andrew S. Tanenbaum	Distributed Systems	PHI, 3rd Edition Version 3.01, ISBN: 978-15-430573-8-6
T2	Andrew S. Tanenbaum, Maarten van Steen	Distributed Systems – Principles and Paradigms	PHI, 2nd Edition, ISBN: 978-0130888938
Reference Books			
R1	George Coulouris , Jean Dollimore, Tim Kindberg, Gordon Blair,	Distributed Systems: Concepts and Design	Pearson, 5th edition, Jean
R2	Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni, Srikanth Sunderrajan,	Distributed System Security: Issues, Processes and solutions	Willey online Library,
R3	Sunita Mahajan, Seema Shah,	Distributed Computing	Oxford University Press, 2nd Edition
Self-Learning Facilities			
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
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UBIQUITOUS COMPUTING

Course Title:	**Ubiquitous Computing**	**Course Number: 414463**	**Credits: 3**
Designation of Course	Professional Core		
Teaching Scheme: 3Hrs/Week		**Laboratories:** -	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
	Indirect Methods	Objective Test	
Prerequisites	Human Computer Interaction, Computer Network Technology		
Introduction of Course : Ubiquitous computing is major and integral part of Computer interaction system.			
Course Objectives			
1	To describe ubiquitous computing, its properties applications and architectural design.		
2	To explain various smart devices and services used in ubiquitous computing.		
3	To teach the role of sensors and actuators in designing real time applications using Ubicomp.		
4	To explore the concept of human computer interaction in the context of Ubicomp .		
5	To explain Ubicomp privacy and challenges to privacy.		
6	To describe Ubicomp network with design issues and Ubicomp management.		
Course Outcomes			
CO1	Demonstrate the knowledge of design of Ubicomp and its applications.		
CO2	Explain smart devices and services used Ubicomp		
CO3	Describe the significance of actuators and controllers in real time application design.		
CO4	Use the concept of HCI to understand the design of automation applications.		
CO5	Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.		
CO6	Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.		
Course Contents			
Unit-I	**INTRODUCTION TO UBIQUITOUS COMPUTING**		
	Concept of Ubiquitous Computing and Advantages, Ubiquitous Computing Applications and Scope, Properties of Ubiquitous Computing, Modelling the Key Ubiquitous Computing Properties. Ubiquitous System Environment Interaction. Architectural Design for UbiCom Systems: Smart DEI Model.		
	Practical		
Unit-II	**UBIQUITOUS COMPUTING SMART DEVICES AND SERVICES**		
	Smart Devices and Service properties, Smart mobile devices and Users, Mobile code, Smart Card Devices and Networks, Service Architecture Models. Service Provision Life-Cycle. Virtual Machines and Operating Systems, OS for Mobile Computers and Communicator Devices.		
	Practical		

Unit-III	**ACTUATION AND CONTROL**		
	Tagging the Physical World, Sensors and Networks, Micro- Electro-Mechanical Systems (MEMS), Embedded Systems and Real-Time Systems. Programmable and PID type control system, Robots.		
	Practical		
Unit-IV	**HUMAN COMPUTER INTERACTION**		
	User Interfaces and Interaction for devices, Abstract user interface through Basic Smart Wearable and Implanted Devices. Human- Centered Design (HCD). **User Models:** Direct and indirect user input and modelling, modelling users' planned tasks and multiple tasks-based computing.		
	Practical		
Unit- V	**UBIQUITOUS COMPUTING PRIVACY**		
	Ubiquitous computing privacy definition, Solove's taxonomy of privacy, legal background, Interpersonal privacy, Ubicomp challenges to privacy: Collection scale, manner and motivation, data types, data accessibility; Case study of privacy solution such as Protecting RFID tags, ways of addressing privacy in Ubicomp.		
	Practical		
Unit-VI	**UBIQUITOUS COMMUNICATION AND MANAGEMENT**		
	Data Networks, Audio Networks, Wireless Data Networks, Ubiquitous Networks, Service oriented networks, network design issues; Configuration and Security management, Service oriented computer and information management, Context awareness.		
	Practical		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Stefan Poslad	Ubiquitous Computing	Wiley
T2	John Krumm	Ubiquitous Computing Fundamentals	--
Reference Books			
R1	Yin-Leng Theng and Henry B. L. Duh	Ubiquitous Computing	IGI, 2nd Edition
R2	Adam Greenfield	Everyware the Drawing age of Ubiquitous Computing	AIGA
R3	Laurence T. Yeng, Evi Syukur and Seng W. Loke	Handbook on Mobile and Ubiquitous Computing,	CRC, 2nd Edition
Self-Learning Facilities			
Web Resources			
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**

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INTERNET OF THINGS

Course Title:	**Internet of Things**	**Course Number:** 414464A	**Credits:** 4
Designation of Course	Elective III		
Teaching Scheme: 3 Hrs/Week		**Laboratories:** 2 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-Sem: 30 Marks	Theory Examination: 70 Marks
		Term-work 25 Marks	Practical – 25 Marks
	Indirect Methods	Presentations	Class test
Prerequisites	Fundamentals of Communication and Computer Network		
	Computer Network Technology		
Introduction of Course:			
Course Objectives			
1	To understand what is Internet of things		
2	Describe architecture, Design, underlying technologies, platforms and cloud interface		
Course Outcomes			
CO1	Explain what is internet of things.		
CO2	Explain architecture and design of IoT.		
CO3	Describe the objects connected in IoT.		
CO4	Understand the underlying Technologies		
CO5	Understand the platforms in IoT.		
CO6	Understand cloud interface to IoT.		
Course Contents			
Unit-I	**INTRODUCTION TO INTERNET OF THINGS**		
	What is the Internet of Things? Internet of Things Definitions and Frameworks : IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities, Physical Design of IoT: IoT Protocols, Logical Design of IoT: Functional block, communication Model, Communication API's, IoT Enabling Technologies: WSN, cloud computing, Big data Analytics, communication Protocols, Embedded systems, IoT levels and Deployment templates: Level 1 to Level 5.		

Unit-II	**IoT NETWORK ARCHITECTURE AND DESIGN**
	The one M2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture, A Simplified IoT Architecture, IoT protocol stack, The Core IoT Functional Stack, IoT Data Management and Compute Stack: Fog Computing, Edge Computing, The Hierarchy of Edge, Fog, and Cloud IoT and M2M: Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT.
Unit-III	**SMART OBJECTS: THE "THINGS" IN IoT**
	Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects: Communications Criteria, IoT Access Technologies: IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e, IEEE 1901.2a, LoRaWAN
Unit-IV	**ADDRESSING TECHNIQUES FOR THE IoT**
	Address Capabilities, IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6, Mobile IPV6 technologies for the IoT: Protocol Details, IPv6 over low-power WPAN (6LoWPAN).
Unit- V	**IoT PLATFORMS**
	What is an IoT Device, Exemplary Devices: Raspberry Pi, Raspberry Pi Interfaces, Other IoT Devices: pcDuino, Beagle Bone Black, CubieBoard, ARDUINO.
Unit-VI	**IoT PHYSICAL SERVERS AND CLOUD OFFEREINGS**
	Introduction to cloud storage models and communication API's, WAMP-AutoBahn for IoT, Python web application framework, Designing a RESTful web API, AMAZON web services for IoT, SkyNet IoT messaging platform, IoT case studies: Home Automation, Cities, Environment.

Text Books	**Author**	**Title of Book**	**Publication**
T1	Arshdeep Bahga, Vijay Madisetti	Internet of Things: A Hands-On Approach	Paperback 2015 978-0996025515
T2	David Hanes, Gonzalo Salgueiro, Patrick Grossetete Cisco Press	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	Paperback – 16 Aug 2017 978-1- 58714-456- 1

T3	Daniel Minoli	Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications	Willy Publications
Reference Books			
R1	Agus Kurniawan Packt	Smart Internet of things projects	The Internet of Things Key Olivier Willy Publication 2nd Edition
R2	Hersent	Applications and protocols	Willy Publications
Self-Learning Facilities	Reference and Text Books.		
Web Resources	e-Books		
Additional Experiments	1. Execution of all instruction sets of 8086.		
	2. Addition of byte and word array.		
	3. Block Transfer		
Assignments			
1	Study of Raspberry-Pi, Beagle board, Arduino		
2	Study of different operating systems for Raspberry-Pi/Beagle board/Arduino. Understanding the process of OS installation on Raspberry-Pi/Beagle board/Arduino.		
3	Open source prototype platform- Raspberry-Pi/Beagle board/Arduino -Simple program digital read/write using LED and Switch -Analog read/write using sensor and actuators.		
4	Upload data from environmental sensor to cloud server (You can use any public cloud IBM Watson IoT cloud or Google or AWS etc.).		
5	Introduction to MQTT/ CoAP and sending sensor data to cloud using Raspberry-Pi/Beagle board/Arduino.		
6	Design a web interface to control connected LEDs remotely using Raspberry-Pi/Beagle board/Arduino.		
7	Install, configure XMPP server and deployed an application on Raspberry Pi/Beagle board/Arduino. Write client applications to get services from the server application.		
8	Install, configure APACHE server and deployed an application on Raspberry Pi/Beagle board/Arduino. Write client applications to get services from the server application.		

INTERNET AND WEB PROGRAMMING

Course Title:	**Internet and Web Programming**	**Course Number:414464D**	**Credits: 4**
Designation of Course	Elective III		
Teaching Scheme:3Hrs/Week		**Laboratories:** 2Hrs/Week	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination:70 Marks
		Term-work	Oral
	Indirect Methods	Assignments, Presentations	Seminars, Quiz, Q&A session, Group Discussion
Prerequisites	Internet and Web Programming.		
Introduction of Course			
Course Objectives			
1	To understand Internet and Web Programming basic concepts.		
2	To develop client side web programming skills.		
3	To develop server side web programming skills.		
4	To understand Web Services and Content Management System.		
5	To understand mobile web development and develop mobile web development skills.		
6	To understand web security and cyber ethics.		
Course Outcomes			
CO1	Demonstrate static website using basic tools.		
CO2	Develop client side programming skills.		
CO3	Develop server side programming skills.		
CO4	Understand web services and handle content management tools.		
CO5	Develop mobile website using mobile web development tools.		
CO6	Understand aspects of web security and cyber ethics.		
Course Contents			
Unit-I	**INTERNET AND WEB PROGRAMMING ESSENTIALS**		
	The Internet, Introduction Basic Internet Protocol, The World Wide Web, Introduction to Web Programming, Web Clients, Web Servers, Browser and Search Engines. Markup Languages : Introduction to HTML, Static and dynamic HTML, Structure of HTML documents, HTML Elements, Linking in HTML, Anchor Attributes, Image Maps, Meta Information, Image Preliminaries, Layouts, Backgrounds, Colors and Text, Fonts, Tables, Frames and layers, Audio and Video Support with HTML Database integration, , Forms Control, Form Elements, Applying Styles, values, selectors, class, ids, inheritance, layout, backgrounds, borders, margin, padding, lists, fonts, text formatting, positioning. HTML5. Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors, Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.		
	Practical		
	1.1 Using HTML5 layout tags develop informative page with sections which include various images, links to other pages for navigation, make use of all possible		

	formatting (for example font, color etc.). 1.2 Apply CSS properties Border, margins, Padding, Navigation, dropdown list to page created in first assignment.1
Unit-II	**CLIENT SIDE PROGRAMMING**
	JavaScript: Overview of JavaScript, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Introduction to AJAX, Working of AJAX, AJAX processing steps, coding AJAX script. Introduction to Angular JS.
	Practical
	2.Design an online registration form for any application and validate it using JQuery. 6. Create an application for bill payment using Angular JS.
Unit-III	**SERVER SIDE PROGRAMMING**
	Introduction to Server Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet, elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP. PHP: Introduction to PHP, Features, PHP script, PHP syntax, conditions & Loops, Functions, String manipulation, Arrays & Functions, Form handling, Cookies & Sessions, using MySQL with PHP.
	Practical
	3.Design Login Application using PHP and add essence of Ajax in it. 5. Create JSP login page and validate it. Make use of Servlets.
Unit-IV	**WEB SERVICES AND CONTENT MANAGEMENT SYSTEMS**
	Introduction to Web Services, Web Services Architecture, XML Messaging, SOAP, WSDL, UDDI, REST, Java Web Services, Amazon Web Services, DevOps, Introduction to Content Management System (CMS), Wordpress / Joomla, Advanced Technology: Bootstrap, JSF, Spring.
	Practical
	4.Create any Java Web Service and integrate it with any suitable application. 7. Develop website using any CMS tool which falls into one of the categories blog, social networking, News updates, Wikipedia, E-commerce store. Website must include home page, and at least 3.
Unit- V	**MOBILE WEB DEVELOPMENT**
	What is Mobile Web? Understanding Mobile Devices, Mobile Data Usage, Mobiles and Desktops, Building an HTML page, Getting jQuery Mobile, Implementing jQuery Mobile, Working with data attributes, Working with jQuery Mobile Pages, Enhancing Pages with Headers, Footers, and Toolbars; Working with Lists, Building a Simple Mobile Website, Working with Forms and jQuery Mobile, Creating Modal Dialogs and Widgets, Creating Grids, Panels, and Other Widgets; jQuery Mobile Configuration, Utilities, and JavaScript Methods; Working with Events.
	Practical
	.
Unit-VI	**WEB SECURITY AND CYBER ETHICS**
	Overview of Web Security: Need of Web Security, Breach of Web Security, What need to be Secure on Web? Can Web be secure? Aspects of Web Security, Purpose of Web

	Security, A Security Equation, Defining Security Equation, Common Threats on Web, User level Security, Server Level Security, Cyber ethics, Issues in Cyber ethics.		
	Practical		
Text Books	**Author**	**Title of Book**	**Publication**
T1	Kogent Learning Solutions Inc,Web Technologies	HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook	DreamTech Press
T2	Raymond Camden, Andy Matthews	jQuery Mobile Web Development Essentials	Packt Publishing, Second Edition
T3	Ethan Cerami	Web Services Essentials	O'Reilly Media, First Edition
T4	Shweta Bhasin	Web Security Basics	Premier Press, First Edition
Reference Books			
R1	Dr.Hiren Joshi	Web Technology and Application Development	DreamTech, First
R2	Santosh Kumar K., DT Editorial Services	Black Book, JDBC 4.2, Servlet 3.1 & JSP 2.3	Dreamtech Press, Second Edition
R3	Steven M. Schafer	HTML, XHTML and CSS	Wiley India Edition, Fourth Edition
R4	B. V. Kumar, S. Sangeetha, S.V. Subrahmanya	J2EE Architecture, an illustrative gateway to enterprise solutions	Tata McGraw Hill Publishing Company, Second Edition
R5	Ivan Bayross	Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP	BPB Publications,4th Edition
R6	Brain Fling	Mobile Design and Development	O'REILLY, First Edition
Self-Learning Facilities	NPTEL Lecture Series		
Web Resources			
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
1			
2			
Contents beyond Syllabus			
Additional Experiments			
Bridging Courses			
Assignments			
1			
2			
Tutorials			
Presentations			

RURAL TECHNOLOGIES AND COMMUNITY DEVELOPMENT

Course Title:	**Rural Technologies and Community Development**	**Course Number: 414465A**	**Credits: 3**
Designation of Course	Professional Elective IV		
Teaching Scheme: 3 Hrs/Week		**Laboratories:**3 Hrs/Week	
Course Assessment Methods	**Direct methods**	In-sem Examination: 30 Marks	Theory/End Semester Examination: 70 Marks
	Indirect Methods	Assignments, Presentations, Class Test,GD	
Introduction of Course This course introduces Concept , Meaning and definition of Rural Development . Also steps for effective and positive development in Rural areas are studied.			
Course Objectives			
1	Understand theories and practices in the rural development model		
2	Learn and analyse rural life and rural economy.		
3	Understand different measures in rural development		
4	Learn different technologies used in upliftment of rural life.		
5	To participate in visits and case studies for better understanding for rural development and its impact on overall economy.		
Course Outcomes By the end of the course, students should be able to			
CO1	Understand rural development model		
CO2	Learn different measures in rural development and its impact on overall economy		
CO3	Understand and learn importance of technologies in rural and community development		
CO4	Understand challenges and opportunities in rural development		
Course Contents			
Unit-I	**INTRODUCTION :RURAL DEVELOPMENT** - Concepts and connotations, Basic Elements, Growth Vs. Development, Why rural development, Rising expectations and development, Development and Change, Human beings as cause and consequences of development. **RURAL ECONOMY OF INDIA** - Introduction, size and structure, The characteristics of rural sector, The role of agricultural sub-sector, The role of non-agricultural sub-sector, Challenges and opportunities.		

Unit-II	**RURAL DEVELOPMENT - MEASURES AND PARADIGMS** **MEASURES OF DEVELOPMENT** - Introduction, Measures of level of rural development, Measures of income distribution, Measures of development simplified, Concepts and measures of rural poverty. **PARADIGMS OF RURAL DEVELOPMENT** - Introduction, The modernization theory, The dependency theory of Marxist School, Rosenstein- Rodan's theory of 'Big Push', Lewis' model of economic development, The human capital model of development, The Gandhian Concept of Rural Development theories from other social sciences.
Unit-III	**TECHNOLOGIES FOR RURAL DEVELOPMENT** **Using Water Resources** -The water cycle, Drinking Water, Water quality testing, Water filtering ,Extraction from Groundwater ,Pumps Rope and washer pump ,Manuel pumps, Treadle pump, Irrigation for agriculture, Channel systems, Sprinkler systems, Drip systems Water diversion ,Water storage **Building Infrastructures and Creating Energy** - Basic energy uses , Energy Sources - Firewood, Solar Energy, Hydroelectricity, Hydromechanical, Wind Energy, Energy Storage,Connecting to the Electrical Network, Environmental Considerations **Use of ICT in Rural and agricultural development** - Education, Healthcare, Agriculture, Business, Resource Mapping, Digital and Social Media Marketing Decision Support Systems for soil conservation and farm management Waste Management and Sanitation.
Unit-IV	**COMMUNITY DEVELOPMENT** **DEVELOPING COMMUNITIES** -Introduction, Service Learning and community development, Theory and practice of community development, Community development issues. The diverse meaning of community development, The knowledge base of community development, International community development.
Unit- V	**COMMUNITY DEVELOPMENT - RURAL ENTREPRENEURSHIP** Different forms of Rural Entrepreneurship, Significance , Business planning for a new venture: the concept of planning paradigm, Forms of business enterprises-Sole proprietorship, partnership and corporations, Product and Process development, Marketing analysis and competitive analysis, strategies; Financial resources; debt financing, banks and financial institutions and other non-bank financial sources; Government programmes : direct loan assistance and subsidies; Industrial and legal issues for rural enterprises.
Unit-VI	**CASE STUDIES AND FIELD VISIT** Role of Micro-Finance institutions in rural development, Use of ICT in Rural development, Watershed Management - Water-Cup Competition by Paani Foundation, Community Safe Water Solutions, Visit to a 'Woman Self help group' nearby and study of its functioning and its role in development. Visit to model villages in nearby region - Ralegan-Siddhi, Dist - Ahemadnagar, Hiware Bazar Dist - Ahemadnagar, Tikekarwadi - Dist. - Pune, BuchekarwadiDist- Pune etc.

Text Books	**Author**	**Title of Book**	**Publication**

T1	Katar Singh	"Rural Development: Principles, Policies and Management"	Sage Publications.
T2	Edited by J W Robinson,	"Introduction to Community Development - Theory, Practice and Service Learning",	Sage Publications.
T3	G. N. Tiwari,	Solar Energy:Fundamentals, Design, Modeling and Applications,	Narosa, 2002.
T4	H. Nandan, Third Edition, ,	"Fundamentals of Entrepreneurship"	PHL Learning Pvt. Ltd.
T5	First Edition, S B Gupta, S Chand	"Monetary Economics-Institutions, Theory and Policy" ,	Publications, ISBN – 9788121904346.
Reference Books			
R1		"KURUKSHETRA" - A Journal on Rural Development.	
R2	R. Y. Goswami, Frank Kreith	"Energy conversion",	CRC Press, 2007.
R3	H. P. Garg and S. Prakash,	"Solar Energy: Fundamental and Application" ,	Tata McGraw Hill, 1997.
R4	TSRD 2014 , edited by Jai Prakash Shukla,	"Technologies for Sustainable Rural Development: Having Potential of Socio Economic. Upliftment" ,	Allied Publishers Pvt. Ltd.
Self-Learning Facilities	Books,ppts, NPTEL Videos		
Web Resources	https://www.ifad.org/en/web/latest/story/asset/40270074 http://shodhganga.inflibnet.ac.in/bitstream/10603/164886/12/12_chapter%204.pdf		
Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
1	R.B.Bhagat	Rural and Urban Sanitation in India	"KURUKSHETRA" - A Journal on Rural Development.
Assignments			
1	Briefly explain Rural Economy of India		
2	Explain in detail Paradigms of rural development		
3	Which are the technologies applicable for Rural development		
4	Explain Theory and Practices for Community Development in Rural areas		

5	List Different forms of Rural entrepreneurship
6	How Watershed management works in Rural development
Tutorials	
Presentations	

SOCIAL MEDIA ANALYTICS

Course Title:	**Social Media Analytics**	**Course Number:414464D**	**Credits: 3**
Designation of Course	Elective		
Teaching Scheme: 3 Hrs/Week		**Laboratories:**	
Course Assessment Methods	**Direct methods**	In-Semester Examination: 30 Marks	Theory/End Semester Examination: 70Marks
		Term-work Marks	Practical/Oral
	Indirect Methods	Assignments,	Seminars, Quiz, Q&A session,
Prerequisites	2. Basic knowledge of Graphs. 3. Data mining. 4. Data Analysis.		
Introduction of Course			
Course Objectives			
4.	1. To understand foundations of Social Media Analytics.		
5.	2. To Visualize and understand the data mining aspects in social networks.		
6.	3. To solve mining problems by different algorithms.		
7.	4. To understand network measures for social data.		
8.	5. To understand behavioral part of web applications for Analysis.		
9.	6. To analyze the data available on any social media applications.		
Course Outcomes			
CO1	1. Understand the basics of Social Media Analytics.		
CO2	2. Explain the significance of Data mining in Social media.		
CO3	3. Demonstrate the algorithms used for text mining.		
CO4	4. Apply network measures for social media data.		
CO5	5. Explain Behavior Analytics techniques used for social media data.		
CO6	6. Apply social media analytics for Face book and Twitter kind of applications.		
Course Contents			
Unit-I	**ANALYTICS IN SOCIAL MEDIA AND TYPES OF ANALYTICS TOOLS**		
	The foundation for analytics, Social media data sources, Defining social media data, data sources in social media channels, Estimated Data sources and Factual Data Sources, Public and Private data, data gathering in social media analytics.		
Unit-II	**VISUALIZING SOCIAL NETWORKS**		
	Introduction, A Taxonomy of Visualization, The convergence of Visualization, Interaction and Analytics. Data mining in Social Media: Introduction, Motivations for Data mining in Social Media, Data mining methods for Social Media, Related Efforts.		
Unit-III	**TEXT MINING IN SOCIAL NETWORKS**		
	Introduction, Keyword search, Classification Algorithms, Clustering Algorithms-Greedy Clustering, Hierarchical clustering, k-means clustering, Transfer Learning in heterogeneous Networks, Sampling of online social networks, Comparison of different algorithms used for		

	mining, tools for text mining.
Unit-IV	**NETWORK MEASURES**
	Centrality: Degree Centrality , Eigenvector Centrality, Katz Centrality , PageRank, Betweenness Centrality, Closeness Centrality ,Group Centrality ,Transitivity and Reciprocity, Balance and Status, Similarity: Structural Equivalence, Regular Equivalence
Unit- V	**BEHAVIOR ANALYTICS**
	Individual Behavior: Individual Behavior Analysis, Individual Behavior Modeling, Individual Behavior Prediction Collective Behavior: Collective Behavior Analysis, Collective Behavior Modeling, Collective Behavior Prediction
Unit-VI	**CASE STUDY**
	Mining Twitter: Overview, Exploring Twitter's API, Analyzing 140 Characters Mining Facebook: Overview, Exploring Facebook's Social Graph API's, Analyzing Social Graph Connections.

Text Books	**Author**	**Title of Book**	**Publication**
T1	Reza Zafarani Mohammad Ali AbbasiHuan Liu	Social Media Mining,	Cambridge University Press, ISBN: 10: 1107018854.
T2	Charu C. Aggarwal	Social Network Data Analytics,	Springer, ISBN: 978-1-4419-8461-6.
Reference Books	Matthew A. Russell	Mining the Social Web, , 2 nd Edition	O'Reilly, ISBN:10: 1449367615.
	AlecxGoncalves	Social Media	

Research papers for reference	**Author**	**Title of Paper**	**Journal/Transaction**
	Lin Guo Feng Shao ChavdarBotevJayavelShanmugasundaram	XRANK: Ranked Keyword Search over XML Documents	Proceedings of the 2003 ACM SIGMOD international conference on Management of data
	Andrey Balmin,VagelisHristidis,YannisPapakonstantinou	ObjectRank: Authority-Based Keyword Search in Databases	Proceedings of the 30th VLDB Conference, Toronto, Canada, 2004