ANNEXURE-XVI

Central University of Jammu

Rahya-Suchani (Bagla), District: Samba – 181143, Jammu (J&K)

No. CUJ/ACAD/CSIT-M.TECH/2017/06 31st January, 2018

NOTIFICATION 04 of 2018

It is hereby notified that on the recommendations of the Board of Studies, Department of Computer Science and IT, the Vice Chancellor, in anticipation of the approval of the Academic Council, has approved the Course Scheme and Syllabus of **2nd semester** of **M. Tech. (Computer Science)** for the examinations to be held from **May, 2018** onwards. The approved credits of Course Scheme and syllabus are as under:

Semester-2nd

Course Code	Course Title	Credit	Total Marks
	CORE COURSES		
PGMTH2C003T	Grid & Cloud Computing	4	100
PGMTH2C004L	Computing Lab-2 (Based on Core Courses)	6	150
PGMTH2C005T	Research Methodology	4	100
PGMTH2C006T	Digital Image Processing	4	100
	ELECTIVE COURSE-II (Any one)		
PGMTH2E002T	Advanced Computer Architecture	4	100
PGMTH2E003T	Simulation and Modelling		
PGMTH2E006T	SMAC and Internet Things		
PGMTH2E007T	Soft Computing Techniques		
PGMTH2E008T	Machine Learning		
	FOUNDATION ELECTIVE –I (SKILL BASED) (Any one)		
PGMTH2F003T	Software Testing Techniques	2	50
PGMTH2F004T	Database Application Development		
PGMTH2F005T	Scientific Computing		
Total		**24**	**600**

02/01/18
Deputy Registrar
(Admin-HR)

Encl: Syllabus of 2nd semester (11 pages)

To:
Head, Dept. of CSIT

Copy to:
OSD (Examination)

PGMTH2C04ST 148

COURSE TITLE: Research Methodology **COURSE No:**

Continuous Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100

DURATION OF EXAM: 3 HOURS **Lectures:** 4 hours per week

UNIT I

Research Basics: Concept, need, types.Scientific Research, Research and Theory, Conceptual and Theoretical Models, Meaning and Scope, Objectivity, Limitations of Research, Ethics of Research, Research Methods and Methodology, Criteria of Good Research, Problems encountered by Researchers.

UNIT II

Reviewing of Literature: Need, sources, Purposes and Scope of Review, Steps in conducting Review. Planning of Research: Research Process, Research Design/Plan.

Measurement of Scales: Nominal, ordinal, interval, ratio scales. Design and development of measuring instruments: tests, questionnaires, checklists, observations, schedules etc., Interview method and Focus Group discussion, Observation Method, Case Study method, selecting a standardised test

UNIT III

Sampling techniques: Concepts of population and sample, Census and Sample survey, Determining size of sample, Steps in Sample Design, Types of sampling,Characteristics of a good sample.

Handling Data: Importance of Data, Data Sources, Types of Data, Usage and applicationsof different types of data, Methods of Collecting primary and secondary data, Data Preparation - Processing of Data, Editing, Classification and Coding, Transcription, Tabulation.

UNIT IV

Qualitative and Quantitative analysis techniques, Hypothesis Testing (For Proportion and Means), Test of Significance,Chi-square test, T-test.

Correlation and regression analysis: Simple regression analysis, Multiple Correlation and regression, Partial Correlation.

Analysis of variance: ANOVA, Basic Principle, ANOVA Technique

UNIT V

Analysis of data through SPSS/MATLAB/PsiLab: Introduction, Basic steps of data analysis, software environment,declaring variables, running an analysis, viewing results, Plotting of graphs. Significance of Report writing, Types of Reports, Planning of Report Writing, Research Report Format, Data and Data Analysis reporting in a Thesis, Citation styles for references

REFERENCES:

1. C. R. Kothari, "Research Methodology: Methods and Techniques", New Age International 2004
2. Ranjit Kumar,"Research Methodology: A Step-by-Step Guide for Beginners", SAGE
3. P. Sam Daniel, Aroma G. Sam , "Research Methodology",Kalpaz Publications ISBN: 9788178359007
4. Naresh K. Malhotra, Satyabhushan Dash, "Marketing Research- An Applied Orientation", Sixth Edition
5. D K Bhattacharyya, "Research Methodology",Excel Books, ISBN: 9788174464972

PGMTH22096T

COURSE No:

Course title: Digital Image Processing

Internal Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100
DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

Unit-1
Overview of Digital Image Processing, Origin, Applications of Image processing, Types and representation of digital Images, Fundamental steps and component of image processing system, Introduction to Human Visual System, Elements of matrix theory, Digital Imaging Hardware & Software, Sampling & Quantization, Interpolation and correlation, Basic Image operations: Arithmetic, logical, geometrical operations,

Unit-2
Image quality factors, Basic image pre-processing (contrast enhancement, simple noise reduction, colour balancing), spatial transformation Gray Level liner and non-linear transformation, Histogram Processing, Fourier transform, Hadamard and Walsh transformation. Image enhancement in spatial and frequency domain: Basics, smoothing and sharpening domain filters.

Unit-3
Image Segmentation & Analysis, Implementation Feature extraction: Edges, Lines & corners detection, Texture & shape measures. Segmentation & thresholding, region extraction, edge (Canny) & region based approach, use of motion in segmentation. Feature extraction Edges, Lines & corners detection.

Unit-4
Image Restoration & Reconstruction: Introduction, Model of Image degradation, Noise Models, Classification of image restoration techniques, Blind-deconvolution techniques, Lucy Richardson Filtering, Wiener Filtering.

Unit-5
Image Compression & Object Recognition: Introduction to Image Compression and its need, Coding Redundancy, Classification of Compression Techniques (Lossy and Lossless - JPEG, RLE, Huffman, Shannon fano), Scalar & Vector Quantization. Introduction to Object Recognition, Object Representation (Signatures, Boundary Skeleton), Simple Boundary Descriptors, Regional descriptors (Texture)

REFERENCES

1. Anil Jain, "Fundamentals Of Digital Image Processing", Anil Jain PHI, ISBN-81-203-0929-4
2. S. Sridhar: Digital Image Processing, Oxford University Press publication, 7th impression 2016.
3. W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. 2006
4. M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
5. Digital Image Processing using MATLAB, R.C. Gonzalez, R.R. Woods(Person), 2nd Edition
6. Introduction to Digital Image Processing with MATLAB, Alasdair McAndrew, Cenage Learning.

PGMTH20003T

COURSE TITLE: Grid and Cloud Computing **COURSE No:**

Continuous Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100
DURATION OF EXAM: 3 HOURS **Lectures:** 4 hours per week

UNIT I: Introduction to Grid Computing: Definition, history of Grid, need for Grid technology, types of Grid, Grid Requirements, Grid Architecture Models, Grid Components Grid: User's perspective, an administrator's perspective and an application developer's perspective, benefits of Grid.

UNIT II: Resource and Service Management: Resource Management on the Grid, Requirements, Resource Management framework, Resource Discovery and Selection. Challenges in Resource Management, Grid Resource Scheduling.

UNIT III: Introduction to Cloud Computing: Cloud Computing definition, Central ideas behind cloud computing, Cloud types: Deployment Models (Public, private, hybrid), desired features of a cloud, Benefits of Cloud computing, Benefits and challenges of cloud computing.

Differences and Similarities among different types of computing: Grid computing, Cloud Computing, Cluster Computing, Utility Computing, Parallel Computing.

UNIT IV: Cloud Architecture: Exploring cloud computing stack
Cloud Service: Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).Application as a Service
Virtualization Techniques: Need for Virtualization, Pros and Cons of Virtualization, Types of Virtualization.
Different Providers and comparison of Services: Amazon Web services,, Microsoft Azure Services.,GoGrid.

UNIT V:
Security in Grid and Cloud:
Grid Security Fundamentals: authentication, access control, data integrity, trust and reputation, Security Threats.
Cloud Security Fundamentals, Cloud computing and Data Security Risks, Cloud computing and identity,Vulnerability assessment tool for cloud.

REFERENCES

1) Ian Foster and Carl Kesselman, "THE GRID2", Elesevier, 2004, second edition.
2) Lizhe Wang ," Grid Computing,Infrastructure, Service and Application",CRC Press,2009
3) Luis Ferreira, Viktors Berstis, "Fundamentals of Grid Computing ", ibm.com/redbooks, 2002.
4) Luis Ferreira, Viktors Berstis, "Introduction to Grid Computing with Globus", ibm.com/redbooks, 2002.
5) Rajkumar Buyya, James Broberg," Cloud Computing: Principles and Paradigms", Wiley, 2011.
6) Kai Hawang, "Distributed and Cloud Computing", Elesevier, 2012.
7) Barrie Sosinsky, "Cloud Computing: Bible,"Wiley Publishing, 2011.
8) Kris Jamsa," Cloud Computing: Saas,Paas,Iaas,Virtualization",Jones & Bartlett learning,2013.
9) John Rittinghouse and James Ransome," Cloud Computing, Implementation, Management and Strategy", CRC Press, 2009.

COURSE TITLE: Advanced Computer Architecture **COURSE No:** PGITTH2600CT

Continuous Assessment=25 Mid-term Exam.=25 End -Term Exam. = 50 Total Marks= 100
DURATION OF EXAM: 3 HOURS Lectures: 4 hours per week

Unit-I

Introduction to Parallel Processing: Parallelism in uniprocessor system; Classification of Instruction Set Architectures, Review of performance measurements Basic parallel processing techniques: instruction level, thread level and process level parallel computer structure, architectural classification Schemes: Flynn's & Feng's Classification.

Unit-II

Instruction level parallelism: Basic concepts of pipelining, Arithmetic pipelines, Instruction pipelines, Hazards in a pipeline: structural, data, and control hazards, Overview of hazard resolution techniques, Vector Pipelining, Dynamic instruction scheduling, Branch prediction techniques, Instruction-level parallelism using software approaches, Superscalar techniques, Speculative execution.

UNIT-III

Memory management and organization: Memory hierarchy, Virtual memory system, memory allocation and management, cache memory management: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses mapping and management techniques, memory replacement policies.

Unit-IV

Thread and process level parallel architecture: Centralized vs. distributed shared memory, Interconnection topologies, Multiprocessor architecture (loosely coupled, tightly coupled), interconnection networks.
MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Symmetric multiprocessors, Cache coherence problem, Synchronization, Memory consistency, Multicore architecture.

Unit-Modern Processors: Pentium Processor: IA 32 and P6 micro architectures, Embedded CPU architecture: ARM Processor, Workstation /Server CPU architectures: MIPS Architecture, Mixed Core CPU Architectures.

REFERERCES

1. K Hwang, Advanced Computer Architecture, Tata McGraw-Hill Education, 2003
2. David E. Culler, Jaswinder Pal Singh, Anoop Gupta, Morgan Kaufman, Parallel Computer Architecture, A Hardware / Software Approach –, 1999.
3. Dezso Sima, Terence Fountain, Peter Kacsuk,, Advanced Computer Architectures- A Design space approach Pearson Education 1997.
4. H.S. Stone, High-performance Computer Architecture, 3rd edition, Addison-Wesley, 1993.
5. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Third Edition, Morgan Kaufmann, May 2002.

PGMTH2500337 37

COURSE TITLE: Simulation And Modelling **COURSE No:**

Continuous Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100

DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

Unit I

System Concepts : definition of system, inputs, entities, attributes and activities, state of system, outputs, functions/relationships, feedback, subsystem

Introduction to Simulation, need for simulation, model of system, types of models, major steps of simulation model, types of simulation, advantages of simulation, areas of simulation

Simulation of discrete system, fixed time step vs. next event models, Monte Carlo simulation, determination of value of π

Simulation of continuous system, description of continuous model using differential equations, chemical reactor system, selection of integration formula, other examples of continuous system simulation, water reservoir system.

Unit II

Random Numbers : Desirable attributes of random numbers, methods of random number generation, testing of randomness and random numbers : *chi-square method, Poker's Test*

Non uniform random numbers, methods of generation of non-uniform random numbers, inverse transformation, rejection method, Box and Mueller technique, Random numbers of : *uniform distribution, exponential distribution, Poisson distribution, normal distribution, gamma distribution, Erlang distribution*

Unit III

Queuing Theory : introduction, terminologies of queuing system, empirical queuing models, classification of empirical queueing models

Simulation of queueing system using high level languages : introduction, single-server queueing system with single queue, Two Server queueing with common queue, single-server queueing system with Balking and Reneging, single-server model with single queue and with bulk arrivals

Unit IV

Simulation of *PERT*, network model of project, critical path computation, uncertainties in the activity durations, normal PERT calculations, simulation of activity network, comparison of normal PERT calculation and PERT calculation through simulations.

Simulation of inventory system, elements of inventory theory, more complex inventory models, examples of simulation of inventory system : with respect to *service level* considerations and *minimum cost* considerations

Unit V

General Purpose Simulation System (GPSS): introduction, GPSS blocks, Matrix SAVEVALUES, Simula language, SIMSCRIPT III language, SIMAN language, SLAM II, Arena simulation software, ProModel simulation software

REFERERCES

1. Gorden, G. : System Simulation, Parentice Hall, 1978
2. R. Panneerselvam, P. Senthilkumar : System Simulation, Modelling and Languages
3. Payer T. A. : Introduction to Simulation, McGraw-Hill, 1982
4. Reitman, J. : Computer Simulation Application, Wiley, 1971
5. Spriet, W.A. : Computer-aided Modeling and Simulation, Academic Press, 1982
6. Barnes, B. : Modelling and Performance measurement of Computer Systems, 1982
7. Deo, N. : Systems Simulation with Digital Computer, Prentice Hall, New Delhi, 1979
8. Banks J., Carson II J.S., Nelson B.L. : Discrete-Event system Simulation, Prentice Hall, New Delhi, 1996

COURSE No. (CSMTH28007T) 38

COURSE TITLE: Soft Computing Techniques

Internal Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100

DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

Unit – I

Soft Computing: Introduction, soft computing vs. hard computing, various types of soft computing techniques, Applications of soft computing techniques, Artificial Intelligence: Introduction, Types of production systems, characteristics of production systems. Search techniques: breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies.

Unit – II

Neural Networks : Introduction, Structure and function of a neuron, Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural networks, Difference between ANN and human brain, Characteristics and applications of ANN, Learning rules, Thresholds and activation functions, Single layer network, Perceptron and its training algorithm, Linear Separability, XOR problem, ADALINE, MADALINE, .

Unit – III

Introduction to multilayer layer Perceptron, Back propagation neural(BPN) networks, Counter propagation network, Hopfield/ Recurrent network, Associative memory, Hopfield v/s Boltzman machine, competitive learning, Kohonen's self organizing networks, Adaptive Resonance Theory(ART).

Unit – IV

Introduction to Fuzzy Logic: Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations, Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: FIS, Fuzzification and de-Fuzzification.

Unit – V

Genetic algorithms(GA): Basic concepts, Conventional Vs. GA, Simple, GA working, encoding, fitness function, reproduction, Genetic Programming(GP), Selection, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Reproduction, Crossover, and mutation, Mapping objective functions to fitness form, Fitness scaling.

REFERENCES

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, Principles of SoftComputing, Wiley Publications
3. Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
4. Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
5. Kosko: Neural Network & Fuzzy System, PHI Publication
6. Klir & Yuan ,Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.

PMTTH 2600 8T 32

COURSE TITLE: Machine Learning **COURSE No.**

Internal Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100
DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

UNIT I:
Introduction to Machine Learning, Supervised Machine Learning, Unsupervised Machine Learning, Reinforcement Learning, Recommender Systems, Content Based recommendation, Collaborative filtering, Application of Machine Learning.

UNIT II:
Supervised Learning: Linear Regression, Linear Regression Cost function, Gradient Descent algorithm, minimize Linear Regression with Gradient Descent, Feature Scaling, Learning Rate α, Normal Equation for Linear Regression.
Classification: Logistic Regression, Hypothesis Representation, Decision Boundary: Linear and Non-Linear, Cost function for Logistic Regression, minimize Logistic Regression with Gradient Descent (SGD), Multiclass Classification Problems, Overfitting and Underfitting, Regularization.

UNIT III:
Neural Networks overview, Model Representation: Artificial neural network - representation of a neurone, notation, Forward Propagation, NN Cost function, Back Propagation, Multiclass classification.
Advice for applying machine learning techniques: Debugging a learning algorithm, evaluation hypothesis using test set error, model selection, bias vs variance, learning curves.

UNIT IV:
Support Vector Machine: Introduction, SVM cost function, Large margin intuition, Vector inner product, SVM Decision boundary, Kernels: SVM Non-Linear Classifier - Gaussian Kernel.
Spam Classification Example, Precision and Recall.

UNIT V:
Unsupervised Learning: Introduction, k-means algorithm, k-means objective function, how to choose the number of clusters.
Dimensionality Reduction: Motivation behind dimensionality reduction, Principal Component Analysis, PCA Algorithm, Application of PCA.

REFERENCES:
[1] Pattern Recognition and Machine Learning by Christopher Bishop
[2] Machine Learning by Tom M. Mitchell
[3] Pattern Classification by David G. Stork, Peter E. Hart, and Richard O. Duda
[4] Introduction to Machine Learning by Ethem Alpaydin
[5] http://www.holehouse.org/mlclass/
[6] http://cs229.stanford.edu/materials.html
[7] MOOC - https://www.coursera.org/learn/machine-learning

PGMTH 2e006T 3L

COURSE No.

COURSE TITLE: SMAC and Internet of Things

Internal Assessment=25 Mid-term Exam.=25 End –Term Exam. = 50 Total Marks= 100

DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

Unit-1

Introduction to SMAC, Convergence of 4 Disruptive Technologies, ADAPT: Adapting to Change, Digitisation, Crowd Sourcing, Crowd Storming, Collaboration, Co-Creation.
Social Media- Overview of social networking, Online Networking-Media sharing, Marketing, Impact of social media on business, Users Challenges, Future of Social Media, Blogging and Micro blogging; Strategy ,Tactics and Practice

Unit-2

Mobile – Introduction, Mobile Technology-Growth and reach, Mobile applications, Impact of Mobile-Mobility, Mobile Commerce, Mobile Payments, Mobile Wallets.
Analytics – Introduction, Big Data, Characteristics of Big Data, Digital Footprints and its Categories, Big Data Analytics Life Cycle, Data Acquisition and Transformation, Predictive analysis, Emerging trends and Challenges.

Unit-3

Cloud Computing – Overview, Deployment Models and Service Models, Cloud Architecture and Resource Management, Mobile Clouds, Impact of cloud computing on Business, Emerging Trends and challenges, Issues and Challenges in cloud computing. Security issues in Cloud Computing

Unit-4

Internet of Things – Introduction, IoT Emergence and Evolution,IoT Data Management and Analytics, IoT Applications, Security and Privacy, Identity Management and Authentication

Unit-5

IoT Architectures- SOA-Based and API-Oriented, Open IoT Architecture for IoT/Cloud Convergence, IoT Communication Protocols,Device/Cloud Collaboration Framework, FOG Computing – Principles, Architecture and Applications.

REFERENCES:

1. Big-Data Analytics Made easy- Y.Lakshmi Prasad.
2. Bussiness models for the social mobile cloud-Ted Shelton.
3. Cloud Computing,aself teaching introduction -Rajiv Chopra.
4. Internet of Things: Principles and Paradigms, edited by RajkumarBuyya, Amir Vahid Dastjerdi
5. Internet of Things and Data Analytics Handbook, edited by Hwaiyu Geng
6. Social Media Marketing Book,-O'reilly ,Dan Zarrella

35

PGMT-12F003T

Course title: Software Testing Techniques **COURSE No:**

Continuous Assessment=12.5 **Mid-term Exam.** =12.5 **End Term Exam.** = 25
Total **Marks**= 50
DURATION OF EXAM: 2 HOURS **Lectures: 2hours per week**

UNIT I
Introduction to software testing: basics, importance, types of software testing: Functional, Performance, Maintenance, Automation versus Manual Testing, Why Do We Test Software? Seven fundamental principles of Software testing (learn with a case study).

UNIT II
Types of Testing: white box, black box Unit testing, integration, system, alpha testing, beta testing,

Testing Techniques: Structural Versus Functional Techniques, Verification Versus Validation, Static Versus Dynamic, Examples of specific testing techniques.

Software Testing Life Cycle: Test planning, test case development SDLC vs. STLC.

UNIT III
Test Case Development: Test Scenarios, Test cases, Test plan: Create Write and importance, Test logistic, **Software** Testing TOOLS & their Types: test management tools, test execution tools, performance measurement tools.
Case study: Telecom Domain Application with Sample Test cases. HealthCare Domain Testing with Sample Test Cases

REFERENCES:

- John Watkins, Simon Mills, Testing IT: An Off-the-Shelf Software Testing Process, 2nd edition, 2011, Cambridge University Press, ISBN 978-0521148016
- James Whittaker, Jason Arbon, Jeff Carollo, How Google Tests Software, 2012, Addison-Wesley, ISBN 978-0321803023
- Jez Humble, David Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, 2010, Addison-Wesley, 978-0321601919
- https://www.guru99.com/software-testing.html

PGMTH2F60-17

Course title: DATABASE APPLICATION DEVELOPMENT **COURSE No:**

Continuous Assessment=12.5 Mid-term Exam.=12.5 End Term Exam. = 25 Total Marks= 50
DURATION OF EXAM: 2 HOURS **Lectures: Two hours per week**

Unit-I

Overview of Relational Database systems: Relational database model, properties of relations, Logical database modelling: ER modelling, EER model, Database system architecture. Installing Database package and Creating a Database, Database design using oracle 10/11g, Database interface, Planning Database Applications—Approaches, Risks, and Standards.

Unit-II

Oracle SQL and SQL* plus: Data types in SQL ,Concept of Keys, Structured query language (SQL) , SQL components, Data types in SQL, DDL Command, DML commands, SQL operators, DISTINCT, BETWEEN/IN, ORDER BY clause, GROUP / HAVING clause, SQL Functions, Concept of Sub query, JOIN operations. Integrity Constraints: NULL, PRIMARY KEY , UNIQUE KEY , FOREIGN KEY , CHECK value constraint, Default value, DCL commands; Granting/ Revoking privileges to users .

Unit-III

Other database objects: Practical implementation of Index, Sequence, Views, and Synonyms, cursors, PL/SQL: Creating procedures, Triggers, Database export & import in oracle, Performance monitoring. Overview of Object Relational Database, user interface design.

REFERENCES

1. Kevin Loney, Oracle Database 11g : The Complete Reference, Mc Graw Hill
2. Johan Scott, Expert Oracle Application Express Apress 1St Edition , Prism Books Pvt Ltd.
3. Shah Nilesh, Database Systems Using Oracle : A Simplified Guide, Publisher : Phi Learning Pvt. Ltd-New Delhi
4. Ivan Bayross, Oracle Application Developer, BPB Publication Delhi.

33

PGMTH2F00ST

COURSE TITLE: Scientific Computing **COURSE No:** PGTE[illegible]

Continuous Assessment=12.5 Mid-term Exam.=12.5 End Term Exam. = 25 Total Marks= 50

DURATION OF EXAM: 2 HOURS **Lectures: 2hours per week**

UNIT I:

MATLAB/Octave: Overview, MATLAB/Octave expression syntax, Creating Arrays, Mathematical operators with arrays, Using Script and Managing Data: input to a script file, disp, fprintf command, save, load commands, importing and exporting data.

Two-Dimensional Plots: plot, fplot command, plotting multiple graphs in the same plot, formatting a plot, histograms, subplots, multiple figure windows.

UNIT II:

Programming in MATLAB/Octave: Relational and Logical Operators, conditions statement, switch-case statements, loops, user defined functions and function files: Structure of a function file, anonymous and inline functions, function functions, subfunctions, nested functions.

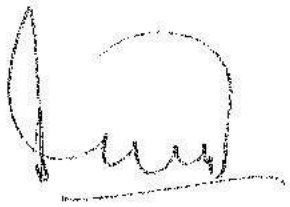
UNIT III:

Polynomials, Curve fitting, Interpolation, Three-Dimensional Plots: Line Plots, Mesh and Surface Plots, Image Handling, Symbolic Math: Symbolic Objects and symbolic expressions, changing the form of an existing symbolic expression.

GUI with MATLAB/Octave: figure, push buttons, static text, pop-up menu, axes components to the UI, Adding Behaviour: Pop-up Menu, Push Button, Callbacks.

REFERENCE BOOKS:

[1] MATLAB: An Introduction with Applications, Wiley; Fourth edition (2012), Amos Gilat
[2] MATLAB: A Practical Introduction to Programming and Problem Solving, Stormy Attaway
[3] GNU Octave Beginner's Guide, Packt Publishing Limited, Jesper Schmidt Hansen
[4] Graphics and GUIs with MATLAB, Chapman and Hall/CRC, O. Thomas Holland, Patrick Marchand
[5] https://in.mathworks.com/help/matlab/creating_guis/about-the-simple-programmatic-gui-example.html
[6] http://www.wi.tu-darmstadt.de/media/vwl1/downloads/team_2/eschenhof/LinearAlgebranew.pdf
[7] https://in.mathworks.com/help/matlab/creating_guis/about-the-simple-programmatic-gui-example.html



Central University of Jammu

Rahya-Suchani (Bagla), District: Samba – 181143, Jammu (J&K)

No. 4-7/MCA/CUJ/REG/2013/ 498 Date: 14Sep17

NOTIFICATION

It is hereby notified that on the recommendations of the Board of Studies, Department of Computer Science and IT, the Vice Chancellor, in anticipation of the approval of the Academic Council, has approved the Course work Scheme and Syllabus for Ph.D programme in Computer Science and IT. The approved Course Scheme and syllabus are as under:

Dec. 2017, Dec. 2018 and Dec. 2019

Course Code	Course Title	Credit	Total Marks
	CORE COURSES		
PHCSA1C001T	Research Methodology	4	100
PHCSA1C002T	Simulation and Modelling	4	100
	ELECTIVE COURSES (Any two)		
PHCSA1E001T	Image Processing and Pattern Recognition	4 credit each	100 each
PHCSA1E002T	Computer Networks and Security		
PHCSA1E003T	Advance Database Management		
PHCSA1E004T	Grid and Cloud Computing		
PHCSA1E005T	Soft Computing		
PHCSA1E006T	Information Assurance		
PHCSA1E007T	Advanced Software Engineering		
	Total	16	400

Registrar

Encl: Ph.D Syllabus

13

COURSE TITLE: Research Methodology **COURSE NO: PCSA\C001T**
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT I

Research, Objectives and Characteristics of Research, Meaning and Significance, Types of Research, Research approaches, Method vs Methodology, Scientific Research, Research Process, Criteria of Good Research, Problems encountered by researchers.

UNIT II

Review of Literature, Need for Reviewing Literature, Planning of Review work, Note Taking, Planning of Research, The planning Process, Selection of a Problem for Research, Formulation of the Selected Problems, Hypothesis Formation, Measurement, Various types of Research Designs

UNIT III

Handling Data: Introduction to data and its types, Sources of Data, Methods of Collecting, Tools for data collection, Data Preparation process-checking, editing, coding , Classification, tabulation, graphical representation, cleaning and adjusting. Problem handling in data-missing values and outliers

Sampling: Concepts of Statistical Population, Sample, Sample Size, Sample Design, Characteristics of a good sample, Types of sampling, Sampling and Non-Sampling Error.

UNIT IV

Statistical Analysis of Data, Statistical Analysis, Measures of Central Tendency, Measures of Dispersion, Measures of Association/Relationship, Measures of skewness, Hypothesis Testing (For Proportion and Means), Test of significance, Chi-Square Test

UNIT V

Introduction to Statistical Software: SPSS/ MATLAB/ PsiLAB/Octave or any other free ware tools, Graphical Representation of data and its inferences

Report writing:Types of Reports, Research Report Format, Report Writing & Documentation, Presenting Data and Data Analysis in a thesis, Writing of Report, Referencing

REFERENCES

1) C.R. Kothari, "Research Methodology", Second Revised Edition
2) Naresh k. Malhotra, Satyabhushan Dash, "Marketing Research – An Applied Orientation", Sixth Edition
3) Ranjit Kumar, "Research Methodology- A step by step Guide for Beginners", 2nd ed..
4) Wayne L. Winston, "Microsoft Excel Data Analysis and Business Modeling", Microsoft Press.
5) Holt, Rinehart and Winston Inc, Best, John, W and Kahn, " JamesIntroduction to Research in Education", New York: V (2001), Research inEducation, New Delhi, Prentice Hall.

12

COURSE TITLE: Simulation & Modelling **COURSE No.: ~~PCSI02~~ PHCSA1C0025**
DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**
MAX MARKS-100

UNIT-I

System and system environment, components of system, discrete and continuous System, static and dynamic systems, model of a system, steps required in deriving a model of a system. Verification and validation of simulation model.

Introduction to the simulation, why and when simulation is an appropriate tool, advantages and disadvantages of Simulation, Areas of application, general steps followed in simulation experiment.

UNIT-II

Simulation of continuous system, description of continuous model using differential equations, chemical reactor system, integration vs. simulation, selection of integration formula, other examples of continuous system simulation, water reservoir system.

Discrete system simulation, fixed time step vs. next event models, use of random numbers, generation of uniform and non uniform random numbers, test of randomness, Monte-Carlo vs. stochastic simulation.

UNIT-III

Simulation of queuing system, elements of queueing theory, Poisson arrival pattern, negative exponential service time, simulation of *single server* queue, *two severs* queue and *more general* queues.

UNIT-IV

Simulation of *PERT,* network model of project, critical path computation, uncertainties in the activity durations, normal PERT calculations, simulation of activity network, comparison of normal PERT calculation and PERT calculation through simulations.

Simulation of inventory system, elements of inventory theory, more complex inventory models, examples of simulation of inventory system : with respect to *service level* considerations and *minimum cost* considerations, generation of *Erlang* distributed variates.

UNIT-V

General Purpose Simulation System (GPSS): introduction, GPSS block preliminaries, GENERATE Block, QUEUE and DEPART block, TERMINATE block, SEIZE and RELEASE blocks, ADVANCE block, Table of definitions, ENTER, LEAVE and STORAGE blocks, PRINT block, Random Transfer of transcations, conditional transfer of transactions PRIORITY block, SELECT block, SELECT block with MIN and MAX mode, Equivalence Declaration Card, residence time and transmit time of transaction, TABLE entity

REFERENCES

1) Gorden, G, " System Simulation", Parentice Hall, 1978
2) Payer T. A., "Introduction to Simulation", McGraw-Hill, 1982
3) Reitman, J, "Computer Simulation Application", Wiley, 1971
4) Spriet, W.A, " Computer-aided Modeling and Simulation", Academic Press, 1982
5) Barnes, B, " Modelling and Performance measurement of Computer Systems", 1982
6) Deo, N, "Systems Simulation with Digital Computer, Prentice Hall", New Delhi, 1979
7) Banks J, "Carson II J.S., Nelson B.L. : Discrete-Event system Simulation", Prentice Hall, New Delhi, 1996

COURSE TITLE: Image Processing & Pattern Recognition **COURSE No: ~~PE-101~~** PHCSA1E001T

Duration of Exam: 3 Hours **Lectures: 4 hours per week**

MAX MARKS-100

UNIT-I

Digital Image Processing, Basic image pre-processing (contrast enhancement, simple noise reduction, color balancing), Spatial transformation Gray Level liner and non-linear transformation, Histogram Processing, Hadamard and Walsh transformation. Image enhancement in spatial and frequency domain: Basics, smoothing and sharpening domain filters, Sampling & Quantization.

UNIT-II

Image Processing filters, Image Segmentation & Analysis, Implementation Feature extraction: Edges, Lines & corners detection, Texture & shape measures. Segmentation & thresholding, region extraction, edge (Canny) & region based approach, use of motion in segmentation. Feature extraction Edges, Lines & corners detection, Texture & shape measures.

UNIT-III

Image Restoration & Reconstruction: Introduction, Model of Image degradation, Noise Models, Classification of image restoration techniques, Blind-deconvolution techniques, Lucy Richardson Filtering, Wiener Filtering. Image Compression & Object Recognition: Introduction to Image Compression and its need, Coding Redundancy, Classification of Compression Techniques (Lossy and Lossless - JPEG, RLE, Huffman, Shannon fano), Scalar & Vector Quantization.

UNIT-IV

Basics of pattern recognition: Features, Feature Vectors and Classifiers, Supervised versus Unsupervised Pattern Recognition, Comparison of Supervised and unsupervised Pattern Recognition, Feature Vectors and Classifiers. Bayesian decision theory: Classifiers, Linear Discriminant Functions and Decision Hyper planes, Perceptron, Least Squares Methods, Mean Square Estimation Revisited.

UNIT-V

Parameter estimation methods, Non-parametric techniques for density estimation, Context-dependent classification, Sequential Pattern classification, Context-dependent classification Discrete hidden Markov models, Continuous density hidden Markov models, Dimension reduction methods: Fisher Discriminant analysis, Principal component analysis(FDA, PCA).

REFERENCES

1) Digital Image Processing using MATLAB, R.C. Gonzalez, R.R. Woods(Person), 2nd Edition.
2) M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3) Anil Jain,"Fundamentals Of Digital Image Processing", Anil Jain PHI, ISBN-81-203-929-4
4) W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. 2006.
5) Introduction to Digital Image Processing with MATLAB, Alasdair McAndrew, Cenage Learning.
6) S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009

PHCSAIE0021

COURSE TITLE: Computer Networks & Security **COURSE No:** ~~PE102~~
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT I

Introduction to Networks: OSI & TCP/IP models ,Internet, Network Topologies WAN, LAN, MAN. Physical Layer :analog and digital data signals and conversions, Transmission modes-parallel and serial,packet and circuit switching. Data Link layer-code redundancy ,link layer addressing (ARP),RARP,Design issues.

UNIT-II

Network Layer: Virtual circuit and Datagram subnets,Routing algorithm- shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. Dynamic routing – Broadcast routing. Rotary for mobility. Congestion Control Algorithms, QoS.

UNIT–III

Transport Layer: Transport Services, Connection management, TCP and UDP protocols; ATM AAL Layer Protocol. Application Layer – Domain name system, SNMP, Electronic Mail; World WEB,HTTP, FTP.

Unit IV

Network Security: Need & Importance of Security in Networks, OSI security architecture, Security Attacks, Security services & Mechanisms, Security Model.
Threats & Vulnerabilities: Types of threats, Unauthorized Access, Impersonation, Denial of Service, Client side and server side vulnerabilities. Malicious Softwares, Viruses & Anti-viruses.Strategies & Processes, Importance of Security Policies and Audits.

UNIT-V

Web Security: Threats, Secure Naming, IPSec, SSL/TLS, Security features, Server privileges, Security configuration setting for browsers. Email Security: PGP, PEM, S/MIME. Public Key Infrastructure, Digital Certificates, Certificate Authorities.

REFERENCES

1) Forouzan , "Data Communications and Networks",Mc GrawHill Indian Edition
2) Tannenbaum , "Computer Networks", Pearson Publishing.
3) Michael G. Solomon and David Kim, Jones & Bartlett Learning, "Fundamentals of communications and Networking"
4) William Stalling , "Data and computer communications", Pearsons Publishing
5) William Stallings , "Network Security Essentials" , Applications and Standards, Pearson.
6) William Stallings , "Cryptography and Network Security: Principles and Practice", Pearson Publishing.

COURSE TITLE: Advanced Database Management **COURSE No: ~~PE 503~~ PHCSA1E0C**

DURATION OF EXAM: 3 HOURS **Lectures: 4 hours per week**

MAX MARKS-100

UNIT-I

Overview: Data models, Database schema, Three-level Schema architecture, Data Independence. Database languages; DDL, DMI., DCL.

Relational Database design concepts: The ER model revisited, Enhanced ER model: Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints, Relational model concepts, Relational database design: Functional Dependencies, Normalization, Relational Algebra, Relational Calculus

UNIT-II

Transaction Processing & Concurrency control: Transactions concept, ACID Properties, concurrent execution problems, isolation, testing for Serializability, Concurrency control Techniques: lock based, time-stamp based, validation based protocols, multi-version schemes, deadlock handling. Database security, Database recovery, Backup techniques.

UNIT-III

Database technologies: Parallel databases, Distributed Database, Client-Server Architecture Object oriented databases, Active database concepts, temporal database concepts, spatial databases, Deductive databases.

Advance trends in Database: Mobile databases, Multimedia Databases, Geographic information systems (GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Mobile databases overview, Big data overview

UNIT-IV

Data Warehousing: Overview And Concepts, Need for data warehousing, Operational Vs Decision Support System, Basic building blocks of data warehouse, Data warehouses and data marts , Architectural types Components, Trends in data warehousing.

UNIT V

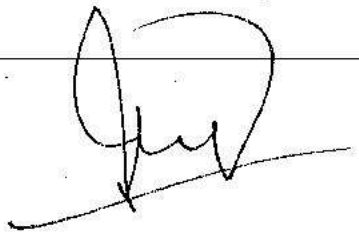
Data Mining: Introduction, Basics of data mining, KDD Process, Issues in data Mining, Database Mining from a database perspective, Information Retrieval, Data mining techniques. Multidimensional Data Mining, OLAP

Web & Spatial Mining: Web Content Mining, Web Structure Mining, Web Usage mining. Spatial mining: Spatial data Overview, Primitives, Generalization & Specialization, Spatial Rules. Data Mining Applications

REFERENCES

1) Elmasri and Navathe, " Fundamentals of Database Systems", [5e], Pearson Education.
2) Korth, Silberchatz, Sudarshan , "Database System Concepts",[5e], McGraw-Hill.
3) Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill.

4) Shaum's Outlines, "Relational Data Base systems", McGraw-Hill.
5) Peter Rob and Coronel, "Database Systems, Design, Implementation and Management", Thomson Learning
6) C.J.Date, Longman, "Introduction to Database Systems", Pearson Education.
7) Thomas Connolly,Carolyn Begg, " Database Systems, [3e]", Pearson Education.
8) Chris Eaton, Dirk deroos et al., "Understanding Big data ", McGraw Hill, 2012.
9) Paulraj Ponnian, "Data Warehousing Fundamentals", John Wiley.
10) M.H. Dunham, "Data Mining Introductory and Advanced Topics", PearsonEducation.



COURSE TITLE: Grid and Cloud Computing **COURSE No: ~~PE104~~ PHCSA16004**
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT I: Introduction to Grid Computing: Definition, history of Grid, need for Grid technology, types of Grid, Grid Requirements, Grid Architecture Models, Grid Components Grid: User's perspective, an administrator's perspective and an application developer's perspective, benefits of Grid.
Grid Middleware: Definition, Types, Importance of Middleware in Grid Environment.

UNIT II: Resource and Service Management: Resource Management on the Grid, Requirements, Resource Management framework, Resource Discovery and Selection. Challenges in Resource Management, Grid Resource Scheduling: Concept, Models.

UNIT III:
Introduction to Cloud Computing: Cloud Computing definition, Central ideas behind cloud computing, Cloud types: Deployment Models (Public, private, hybrid), Service Models (IaaS, PaaS, SaaS), desired features of a cloud, Benefits of Cloud computing, Benefits and challenges of cloud computing. Understanding the Cloud architecture: cloud computing stack.

UNIT IV: Virtualization Technology, load balancing and virtualization, types of virtualization. Understanding the Service Oriented Architecture (SOA), Managing and Monitoring SOA,

Concept and need of cloud middleware, cloud middleware functionalities,QoS Issues in Cloud, Data Migration and Streaming in Cloud, Performance Monitoring tools in cloud.

UNIT V:
Security in Grid and Cloud:
Grid Security Fundamentals: authentication, access control, data integrity, Managing trust and reputation, Security Threats, Security technologies, protocols and principles.

Cloud Security Fundamentals, Cloud computing and Data Security Risks, Cloud computing and identity, Cloud Computing Security Architecture, Vulnerability assessment tool for cloud.

REFERENCES

1) Ian Foster and Carl Kesselman, "THE GRID2", Elesevier, 2004, second edition.
2) Lizhe Wang ," Grid Computing,Infrastructure, Service and Application",CRC Press,2009
3) Luis Ferreira, Viktors Berstis, "Fundamentals of Grid Computing ", ibm.com/redbooks, 2002.
4) Luis Ferreira, Viktors Berstis, "Introduction to Grid Computing with Globus", ibm.com/redbooks, 2002.
5) Rajkumar Buyya, James Broberg," Cloud Computing: Principles and Paradigms", Wiley, 2011.
6) Kai Hawang, "Distributed and Cloud Computing", Elesevier, 2012.
7) Barrie Sosinsky, "Cloud Computing: Bible,"Wiley Publishing, 2011.
8) Kris Jamsa," Cloud Computing: Saas,Paas,Iaas,Virtualization",Jones & Bartlett learning,2013.
9) John Rittinghouse and James Ransome," Cloud Computing, Implementation, Management and Strategy", CRC Press, 2009.
10) Thomas Erl, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture"l, Prentice Hall, 2013.
11) Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing"l, Tata McGraw-Hill, 2013.

6

COURSE TITLE: Soft Computing **COURSE No:** PHCSA1E0
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT I

Introduction to Soft Computing, Features of Soft computing, Applications, techniques in soft computing, Concepts of Neural Computing, Applications of NN. Linear Separability , XOR problem, Stability- Plasticity Dillema, Multi feed forward networks, pattern recognition, pattern classification, pattern clustering.

Unit II

Learning in Neural networks- Supervised, Unsupervised, Competitive learning and re-inforced learning, various learning rules, back propagation, Simulated Annealing, Associative Memories, Hopfield network's, Boltzman's machine, ART, ART2, Competitive learning Networks, Recurrent Networks, Kohnen networks ,SOM Associative Memories, RBF

Unit III

Fuzzy Sets, comparison with classical sets,Operations on Fuzzy Sets: Compliment, Intersections, Unions, fuzzy membership, propostions, connectives, quantifiers, functions, inference, Fuzzy rule based systems , defuzzification, applications of fuzzysystems.

Unit IV

Introduction to Genetic Algorithms (GA), Fundamentals of GA, History of GA, Difference between Genetic Algorithm and traditional methods, Basic Concepts(biological background, creation of offsprings), working principle, encoding- Binary, Octal, Hexadecimal, Fitness Function, Reproduction,Selection

Unit V

Introduction, tasks in NLP, issues/ challenges, Stages in NLP- Phonology, Morphology, Syntactic Analysis, Semantics, Pragmatic and Discourse Analysis. PoS Tagging, Ambiguity, WSD, evaluation techniques, Application areas of NLP.

REFERENCES

1. Yegnanarayan ,Introduction to neural networks, PHI
2. Klir G.J. & Yuan B., Fuzzy Sets & Fuzzy Logic, PHI.
3. S.Rajeskaran, G.A.Vijayalakshmi PAI, Neural Networks, Fuzzy Logic And Genetic Algorithm - PHI
4. Haykin, Neural networks: a comprehensive foundation, Pearson.
5. Mitchell M., An Introduction to Genetic Algorithms, Prentice-Hall, 1998.
6. K.H.Lee.. First Course on Fuzzy Theory and Applications, Springer-Verlag.
7. S. N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley-India, 2008.
8. "Introduction to Neural Networks using MATLAB 6.0 ", Tata McGraw-Hill, New Delhi, 2006.
9. SPEECH and LANGUAGE PROCESSING,An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition Second Edition by Daniel Jurafsky and James H. Martin-PHI

5

COURSE TITLE: Information Assurance **COURSE No:** ~~PE106~~ PHCSAIE0067
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT-I
Information security: Introduction to information & network security, CIA triad, challenges to information security, OSI security architecture,-Security Attacks , security mechanisms and security services, Security model, Entity Authentication.
Malicious software,Viruses and countermeasures, generations of antiviruses.

UNIT-II
Cyber Security: Introduction, Evolution of cyber crime, classifications of cybercrimes, categories of cybercrimes, types of cybercriminals, planning of attacks, cyberstalking, Internet bots, Information warfare, advanced persistent threat (APT)

UNIT-III
Computer Systems Security: Introduction, Cryptography, Authentication, Enterprise Identity and Access management, Audit and Logging, Host Hardening, Software Security, Data Security.
The organizational implication- Insider threats, security & privacy implications, web threats to organizations, protecting privacy in organizations.DLP, IDS.

UNIT-IV
Ethics, Privacy and Digital Rights: Introduction, Ethics, and the Law, Information Security and Internet, Brief History of the Internet And Jurisdiction, Trademarks on the Internet, Copyright Law and the Internet, Online Obscenity and Liability

UNIT-V
Security Risk Management: Introduction to Information Security, Risk management concepts and practices, Risk Assessment Process and methodology, Principles of Security Baselines, Security controls to manage IA risks, Access Control Risk Management, Network Risk Management, Database and Applications Risk Management, Risk Analysis, Mitigation and Reporting

REFERENCES:

1. Cyber Security, Nina Godbole, Sunit Belapure, Wiley India
2. Network Security Essentials,William Stallings, Pearson
3. Data Communications and Networking, Behrouz A Forouzan, McGrawHill
4. Information Security,Richard E.Smith ,Jones &Bartlett Learning
5. Information Systems Security ,Nina Godbole ,Wiley India
6. Introduction to Computer Networks and Cybersecurity 1st Edition
by Chwan-Hwa (John) Wu (Author), J. David Irwin

COURSE TITLE: Advanced Software Engineering **COURSE No:** PHCSR\E00
Duration of Exam: 3 Hours **Lectures: 4 hours per week**
MAX MARKS-100

UNIT I
Formal Methods: Basic concepts, mathematical preliminaries, Applying mathematical notations for formal specification, formal specification languages, using Z to represent an example software component, the ten commandments of formal methods, formal methods- the road ahead.**Cleanroom Software Engineering**: approach, functional specification, design and testing.

UNIT II
Component-Based Software Engineering: CBSE process, domain engineering, component-based development, classifying and retrieving components, and economics of CBSE.

Client/Server Software Engineering: Structure of client/server systems, software engineering for Client/Server systems, analysis modeling issues, design for Client/Server systems, testing issues.

UNIT III
Web Engineering: Attributes of web-based applications, the WebE process, a framework for WebE, formulating, analyzing web-based systems, design and testing for web-based applications, Management issues.

Reengineering: Business process reengineering, software reengineering, reverse reengineering, restructuring, forward reengineering, Economics of reengineering..

UNIT IV
Computer-Aided Software Engineering: Building blocks for CASE, taxonomy of CASE tools, integrated CASE environments, integration architecture, CASE repository, case Study of tools like TCS Robot.

UNIT V
Mobile Development Process: Model View Controller, Presentation Abstraction Control, UML based development, Use cases, Testing: Mobile infrastructure, validating use cases, Effect of dimensions of mobility on testing, Case study: IT Company, Requirements, Detailed design, Implementation.

REFERENCES

1) Roger S. Pressman, "Software Engineering a Practitioners Approach", McGraw-Hill, 8 th Edition, 2014.
2) Quality Software Management, Volume 1: Systems Thinking, 2011, Dorset House Publishing.
3) Metrics and Models in Software Quality Engineering 2 Edition, Pearson, 2003.
4) Capers Jones, "Applied Software Measurement",Tata McGraw Hill, 2008 3rd ed.
5) J.Bowan, "Formal Specification and Documentation using Z - A Case Study Approach", International Thomson Computer Press, 2003.
6) Marcus S. Fisher, "Software Verification and Validation: An Engineering and Scientific Approach", Springer, 2007 .
7) PankajJalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2005.