DEPARTMENT OF COMPUTER SCIENCE

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : M.Phil. Computer Science

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JAMAL MOHAMED COLLEGE (AUTONOMOUS)
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TIRUCHIRAPPALLI – 620 020

M.Phil. COMPUTER SCIENCE

Sem	Course Code	Course Category	Course Title	Hrs/ Week	Credit	CIA Marks	ESE Marks	Total Marks
I	23MPCS1CC1	Core - I	Research Methodology	4*	4	25	75	100
	23MPCS1CC2	Core - II	Advanced Concepts in Computer Science	4*	4	25	75	100
	23MPCS1CC3	Core - III	Teaching and Learning Skills (common paper)	4*	4	25	75	100
	23MPCS1CC4	Core - IV (Elective)	Paper On Topic of Research (The syllabus will be prepared by the Guide and Examination will be conducted by the COE)	4*	4	25	75	100
			Total	**16**	**16**			**400**
II	23MPCS2PD		Dissertation ##	-	8	-	200	200
			Grand Total	**16**	**24**			**600**

(Evaluation of the Dissertation shall be made jointly by the Research Supervisor and the External Examiner.

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC1	CORE- I	4	4	25	75	100

Course Title	RESEARCH METHODOLOGY

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction to Research: Meaning of Research – Objectives of Research – Motivation in Research – Types of Research – Research Approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific Method – Importance of knowing how research is done – Research Process – Criteria of Good Research – Defining the Research Problem – Selecting the Problem – Necessity – Techniques involved in defining a problem – Research Design – Meaning – *Need* – Features of Good Design.	12
II	Thesis Writing: Literature Survey – Writing Reviews and Journal Articles – Publication of Papers – Planning a Thesis – General Format – Page and Chapter Format – *Footnotes* – Tables and Figures – References and Appendices.	12
III	Reliability: Definition of Reliability – Failure-Data Analysis - Hazard Models – Constant Hazard – Linearly-Increasing Hazard – The Weibull Model – * System Reliability * – Series Configuration – Parallel Configuration – Mixed Configuration – Applications to Specific Hazard Models – Related Problems.	12
IV	Sampling Theory and Testing of Hypotheses: *Types of Samples* – Parameter and Statistic – Tests of Significance – Procedure for Testing Hypothesis – Applications of t-test – t-test for Single Mean – Paired t-test for difference of means – F-test for equality of two Population variances – Analysis of Variance – Assumptions – Technique of Analysis of Variance – One Way Classification Model –Two Way Classification Model.	12
V	Research Tools: Introduction – SPSS – MATLAB – LaTeX – NS/2 – * Weka *	12
VI	**Current Trends (For CIA only) –** Mixed-Methods Research, Replication Studies, Open Science, Big Data Analytics, Qualitative Data Analysis, Mixed- Reality Research, Community-Based Research	

* ……..* Self Study

Text Book(s):

UNIT I Chapters: 1, 2 and 3

1. C.R. Kothari, Research Methodology Methods and Techniques, Wiley Eastern limited, 2nd Edition, 2004.
2. Janathan Anderson, Berry H. Durston, Millicent Poole, Thesis and Assignment Writing, Wiley Eastern Limited, 2092.

UNIT II

3. L.S. Srinath, Reliability Engineering, Affiliated East-West Press Pvt. Ltd., New Delhi, Fourth Edition, Reprint 2009. Chapters: 2, 3, 4.1 to 4.4, 6.1 to 6.5

UNIT III

4. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand &Sons, New Delhi, 11th Edition, 2002. Chapters: 14.1 to 14.6, 16.3.1, 16.3.3

UNIT IV

5. S.P. Gupta, Statistical Methods, Sultan Chand & Sons Publishers, New Delhi, Fortieth Revised Edition, 2011. Volume II, Chapter 5

UNIT IV

6. Web site References

Reference Book (s):
1. Hunt / Lipsman / Rosenberg, A Guide to MATLAB: For beginners and experienced users, 3rd edition, CambridgeUniversity Press, 2014.
Web Resource(s):
1. . https://www.researchgate.net/publication/342467021_Research_Methodology_Tutorial-_Dr_Abhijit_Mitra_presents_- 2. https://www.tutorialspoint.com/market/course/fundamentals-of-research-methodology/index.jsp

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Practice mixture levels of Research insights like good design, approaches, significance, scientific methods, process, and its importance.	**K3, K4**
CO2	Classify and summarize the relevant literature survey, write journal review articles, and publish a good quality paper followed by planning thesis content.	**K4**
CO3	State the reliability, data analysis and applications to specific hazard models.	**K4**
CO4	Express the significance of samples, procedure for different testing hypotheses.	**K4, K5**
CO5	Demonstrate diverse kinds of advanced computing related research tools towards societal developments.	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	2	3	1	2	3	2	2.3
CO2	2	3	3	2	1	3	2	2	3	1	2.2
CO3	3	3	2	2	2	3	3	1	2	3	2.4
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	3	1	2	2	1	3	2	2	3	2.2
										Mean Overall Score	2.28
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. M. Mohamed Surputheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC2	CORE - II	4	4	25	75	100

Course Title	ADVANCED CONCEPTS IN COMPUTER SCIENCE

SYLLABUS		
Unit	**Contents**	**Hours**
I	Design and Analysis of Algorithm: Analyzing and Designing Algorithms – Heap Sort – Quick Sort – Hash Tables – Binary Search Trees – Red-Black Trees – Dynamic Programming – Greedy Algorithms – B-Trees – Graph Algorithms – Minimum Spanning Trees – *Single-Source Shortest Paths* – All-Pairs Shortest Paths.	12
II	Digital Logic Circuit Design: Design of Combinational Circuits: Analysis Procedure – Design Procedure – Design of Course Code Converters – Implementation of Boolean Functions using Multiplexers – Design of Sequential Circuits: Analysis Procedure – Design Procedure – Design of Counters – Design with State Equations – Sequential Logic Implementation – * Design of Serial Adder using Sequential Logic Procedure * – Design of Accumulator.	12
III	Parallel Processing: Parallel Computer Structures – Architectural Classification Schemes – Parallel Processing Applications – Pipelining: An Overlapped Parallelism – Instruction and Arithmetic Pipelines – Principles of Designing Pipelined Processors – SIMD Array Processors – SIMD Interconnection Networks – Associative Array Processing – Multiprocessors Architecture and Programming – Functional Structures – Interconnection Networks – * Multiprocessor Scheduling Strategies *.	12
IV	Genetic Algorithm: Introduction to Genetic Algorithm – Working principle of GA – Differences between Genetic Algorithm and Traditional Methods – Terminology used in Genetic Algorithm – Genetic Operators – Selection – Crossover – Mutation – Parameters of GA – Designing the Genetic Structures – * Applications of Genetic Algorithm for Simple Optimization Problem * – Travelling Sales Man Problem – Other Applications.	12
V	Human Computer Interaction: The Human: Introduction – Human Memory – Thinking – Emotion – The Computer: Positioning, Pointing, and drawing – The Interaction: Models of interaction – Frameworks and HCI – Ergonomics – Paradigms: Paradigms for interaction – HCI in the software process: Usability Engineering – Design rationale – * Design Rules: Standards * – Guidelines – Golden rules and heuristics – HCI Patterns – Implementation Support: Programming the application – Evaluation Techniques: Goals of evaluation – Evaluation through expert analysis – Universal Design: Universal design principles – Multi-modal interaction – User Support: Requirements of user support – Approaches to user support.	12
VI	**Current Trends (for CIA only):** Quantum Computing, Explainable AI, Blockchain, Natural Processing Language, Human-Computer Interaction	

* ……..* Self Study

Text Book(s):

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, PHI, Third Edition, 2010.
2. M. Morris Mano, Digital Logic and Computer Design, Pearson Education, 2008.
3. M. Morris Mano, Digital Design, Prentice Hall of India, 3rd Edition, 2002.
4. Stephen Brown, ZvonkoVranesic, Fundamentals of Digital Logic with Verilog Design, Tata McGraw Hill, 2004.

5. Kai Hwang and Faye A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill International Edition in Computer Science Series, 2085.
6. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison Wesley.
7. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall.
8. Z. Michalewicz, Genetic Algorithms + Data Structures = Evolution Programs, Springer-Verlag.
9. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Human–Computer Interaction, Pearson Education, Third Edition, 2008.

UNIT-V

Chapter-1 Section (1.1, 1.3-1.5), Chapter-2 (2.3), Chapter-3 Section (3.2-3.4), Chapter-4 (4.2)
Chapter-6 Section (6.3, 6.5), Chapter-7 Section (7.3-7.7), Chapter-8 Section (8.3),
Chapter-9 Section (9.2, 9.3), Chapter-10 Section (10.2, 10.3), Chapter-11 Section (11.2, 11.3)

Reference Book(s):

1. John M. Carroll, Human Computer Interaction in the new millennium, Pearson Education, 2007.

Web Resource(s):

1. https://www.geeksforgeeks.org/advanced-computer-subjects-tutorials/

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Analyze and design algorithms by way of proposing alternate solutions.	**K4**
CO2	Infer the design concepts of combinational and sequential logic implementation	**K4**
CO3	Identify and match the parallel computer structures and its applications.	**K3**
CO4	Illustrate the genetic structures and relate applications of GA for different problems.	**K2**
CO5	Employ the knowledge of HCI paradigms, design rules, patterns and implementation and evaluation techniques with respect to user support.	**K5 & K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	0	3	3	0	0	0	3	1.8
CO2	3	3	2	3	2	3	2	3	2	2	2.5
CO3	3	2	3	2	3	2	3	2	3	2	2.5
CO4	2	3	2	2	3	3	3	0	2	2	2.2
CO5	3	2	2	3	2	3	2	2	3	3	2.5
									Mean Overall Score		2.3
									Correlation		Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. D.I George Amalarethinam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC3	CORE - III	4	4	25	75	100

Course Title	TEACHING AND LEARNING SKILLS

SYLLABUS

Unit	Contents	Hours
I	E-Learning: Introduction – Why E-Learning – Types of E-Learning – Blended Learning – Standard Learning – Component of E-Learning – * Standards of E-Learning *.	12
II	Educational Psychology: Introduction – Social, Moral and Cognitive Development – Learning and Cognition – Motivation – * Research Methodology * – Application in Instructional Design and Technology – Application in Teaching – Careers in Educational Psychology.	12
III	Soft Skills: Attitude and Altitude – Lateral Thinking – Time is Money – Are Leaders Born or Made – Team Building – Inter-Personal Skills – Business Communication in English – Presentation Skills – Business Correspondence – Interviews – Group Dynamics – * Internet for Job Seekers *.	12
IV	Computer Practical Session: Preparation of E-Content – * Lesson Plan Preparation for Teaching *.	12
V	Teaching Practices in Computer Science Subjects: Programming Languages – Computer Networks – Computer Graphics – Simulation and Modeling – Data Structures and Algorithms – Parallel Processing – Multimedia Systems and Design – Computer Organization and Architecture – Principles of Compiler Design – Numerical and Statistical Methods – Optimization Techniques – *Operating Systems* – Artificial Intelligence and Expert Systems – Web Technology.	12
VI	**Current Trends (For CIA only):** Personalized Learning, Digital Learning, Collaborative Learning, Critical Thinking and Problem Solving, Social-Emotional Learning	

* ……..* Self Study

Text Book(s):

1. G. Ravindran, S.P.B.Elango and L. Arockiam , Success Through Soft Skills, Institute for Communication and Technology, Tiruchirappalli, 2nd Edition, 2008.
2. Jack Snowman and Robert Biehler, Psychology Applied to Teaching. HMH, 8th Edition, 2097.
3. Web site references: www.kontis.net, en.wikipedia.org.

Reference Book(s):

1. Som Naidu, E-Learning: A Guide book of Principles, Procedures, and Practices, 2nd Revised Edition, CEMCA, 2006

Web Resource(s):

1. https://www.slideshare.net/HONEYBABU1/teaching-skills-108203088

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Outline the concepts of E-learning, types and standards of E-learning.	**K2**
CO2	Practice the motivation behind learning cognition and discover the careers in educational psychology.	**K3**
CO3	Synthesize the composite factors of soft skills towards attitude, team building and group dynamics.	**K4**
CO4	Prepare the E-Contents and lesson plan for teaching subjects.	**K3, K4**
CO5	Predict and sketch the teaching practices in programming languages, core subjects of computer science and mathematical methods.	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	2	2	3	3	2	2	1	2	3	1	2.1
CO2	3	2	3	2	1	3	2	0	2	1	1.9
CO3	3	3	3	1	2	3	2	2	2	2	2.3
CO4	3	2	3	2	3	2	3	1	2	1	2.2
CO5	2	3	2	3	2	1	2	2	2	3	2.2
Mean Overall Score											2.14
Correlation											Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A.R. Mohamed Shanavas

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV(ELECTIVE)	4	4	25	75	100

Course Title	WIRELESS SENSOR NETWORKS

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction and Overview of Wireless Sensor Networks – Applications of Wireless Sensor Networks – Basic Wireless Sensor Technology, Sensor Taxonomy, Wireless Network Environment, * Wireless Network Trends *.	12
II	Wireless Transmission Technology – Radio Technology primer, Available Wireless Technologies – Fundamentals of Medium Access Control (MAC) Protocols – MAC Protocols for WSNs: Schedule-Based Protocols and * Random- Access Based Protocols* – Case Study, IEEE 802.15 4LR WPAN, Standard Case Study.	12
III	Routing protocols for WSNs: Data Dissemination and Gathering – Routing Challenges and Design Issues: Network Scale and Time-Varying Characteristics – Resource Constraints – Routing Strategies in WSN – Energy Aware Routing, WSN Routing Techniques, Flooding and its Variants – Low-Energy Adaptive Clustering Hierarchy – Power-Efficient Gathering in Sensor Information Systems – *Directed Diffusion* – Geographical Routing.	12
IV	Transport Control Protocols for Wireless Sensors Network – * Traditional Transport Control Protocol *, Transport Protocol Design Issues, Examples of Existing Transport Control Protocol, Performance of TCP – Network Management for WSNs: Network Management Requirements – Network Management Design Issues – Issues Related to Network Management: Naming and Localization.	12
V	Operating Systems for WSNs: Operating System Design – Examples of Operating Systems – Tiny OS, Mate and MANTIS – Performance and Traffic Management: Performance Modeling – Performance Metrics – Basic Network Models – Simple Computation of System Life Span – * WSN Applications *.	12
VI	**Current Trends (For CIA only):** IoT, Edge Computing, Machine Learning, 5G Connectivity, Wireless sensor networks in Healthcare	

* ……..* Self Study

Text Book(s):

1. KazemSohraby, Daniel Minoli and TaiebZnati, Wireless Sensor Networks – Technology, Protocols and Applications, Wiley, 2007

Reference Book(s):

1. Dr Ian F. Akyildiz, Mehmet Can Vuran, Wireless Sensor Networks, Wiley Online Library, 2010

Web Resource(s):

1. https://www.tutorialspoint.com/what-are-wireless-sensor-networks

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Analyze an overview of Wireless Sensor Networks (WSNs), its applications and trends.	**K3**
CO2	Define Wireless transmission technology, MAC protocols and some standard case study.	**K2**
CO3	Illustrate Routing protocols, challenges, design issues and techniques.	**K3, K4**
CO4	List the TCPs for WSN, and design issues related to network management.	**K4**
CO5	Indicate the Operating Systems for WSNs and predict the performance & traffic management	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	2	2	3	2	3	3	2	2.4
CO2	3	3	2	2	2	3	3	2	3	2	2.5
CO3	3	2	3	3	1	3	2	2	3	3	2.5
CO4	3	2	3	2	3	2	1	3	2	1	2.2
CO5	3	2	1	2	3	1	2	3	2	2	2.1
Mean Overall Score											2.34
Correlation											Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. G. Ravi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV (ELECTIVE)	4	4	25	75	100

Course Title	GRID COMPUTING

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas,*Grid Applications*, Grid Infrastructures.	12
II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best practice Guidelines, Global Grid Forum (GCF), *Organization Developing Grid Computing Toolkits and Framework*, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.	12
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, * Grid Architecture * and relationship to other distributed technology.	12
IV	The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service- Oriented Architecture and Grid, *Semantic Grids*.	12
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, *XML messages and Enveloping*, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.	12
VI	**Current Trends (for CIA only):** Cloud/Grid Integration, Big Data Analytics, Containerization, Energy Efficiency, High Performance Computing	

* ……..* Self Study

Text Book(s):

1. Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.

Reference Book(s):

1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

Web Resource(s):

1. https://www.javatpoint.com/grid-computing
2. https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Acquire knowledge of Grid computing	**K1**
CO2	To provide knowledge on various grid computing organizations	**K2**
CO3	To understand concepts of virtualization	**K2, K3**
CO4	Acquire the concepts of SOA	**K3**
CO5	To gain knowledge on grid and web service architecture	**K3, K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	1	1	3	3	2	2	2	3	2.3
CO2	3	2	2	3	2	2	2	3	2	1	2.2
CO3	2	2	3	3	2	2	3	2	2	2	2.3
CO4	2	3	3	2	3	3	2	1	2	2	2.3
CO5	2	2	3	3	2	3	1	2	2	3	2.3
									Mean Overall Score		2.28
									Correlation		Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. D.I George Amalarethinam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV (ELECTIVE)	4	4	25	75	100

Course Title	DATA MINING

SYLLABUS		
Unit	**Contents**	**Hours**
I	Data Mining Functionalities – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Database or Data Warehouse System – Major Issues in Data Mining – Data Preprocessing – Descriptive Data Summarization – *Data Cleaning* – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.	12
II	Mining Frequent Patterns, Associations, and Correlations – Efficient and Scalable Frequent Itemset Mining Methods – Mining Various Kinds of Association Rules – From Association Mining to Correlation Analysis – Constraint–*Based Association Mining*.	12
III	Classification and Prediction – Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Rule-Based Classification – Classification by Back propagation – Associative Classification – Lazy Learners – Prediction – *Accuracy and Error Measures* – Evaluating the Accuracy of a Classifier or Predictor – Model Selection.	12
IV	Cluster Analysis – Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – *Partitioning Methods* – Hierarchical Methods – Density-Based Methods –Grid – Based Methods – Model-Based Clustering – Clustering High-Dimensional Data – Constraint – Based Cluster – Outlier Analysis.	12
V	Mining Data Streams – Social Network Analysis – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – * Applications and Trends in Data Mining *.	12
VI	**Current Trends (for CIA only):** Streaming Data Mining, Big Data Mining, Multi Model Data Mining, Graph Mining	

* ……..* Self Study

Text Book(s):

1. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, Second Edition, 2006.

Reference Book(s):

1. Margaret H. Dunham, Data Mining, Introductory and Advanced Topics, Prentice Hall, 2002.
2. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining Practical Machine Learning Tools and Techniques, Morgan Kaufmann Publishers, Third Edition, 2011
3. G.K. Gupta, Introduction to Data Mining with Case Studies, Prentice Hall of India, 2008

Web Resource(s):

1. https://www.educba.com/data-science/data-science-tutorials/data-mining-tutorial/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.	**K4**
CO2	Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems,make predictions of outcomes.	**K4**
CO3	Select and apply proper data mining algorithms to build analytical applications.	**K3, K4**
CO4	Cluster the high dimensional data for better organization of the data	**K5**
CO5	Comprehend the roles that data mining plays in various fields and manipulate different data miningtechniques	**K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	2	3	1	1	2	2	2.1
CO2	3	2	2	3	2	1	2	3	2	2	2.2
CO3	3	3	2	2	2	3	3	2	2	3	2.5
CO4	3	3	2	2	3	2	3	2	1	3	2.4
CO5	3	2	2	3	2	3	2	2	3	3	2.5
										Mean Overall Score	2.34
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. T. Abdul Razak

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	SOFTWARE METRICS

SYLLABUS

Unit	Contents	Hours
I	Measurement in Software Engineering - The scope of software Metrics- The basics of measurement- The representational theory of measurement and models - Scales- Classification of software measures – Empirical investigation - *Planning formal experiments.*	12
II	Software metrics data collection - Storing and extracting. Analyzing the results of experiments - *Simple analysis technique* - Advanced methods – Statistical tests- Measuring internal product attributes- Reuse - Complexity.	12
III	Overview - Benefits of Software Measurement - Challenges in Software Measurement- Basic Object-Oriented Concepts - Properties of Metrics - Traditional and Object Oriented Metrics - Traditional Metrics Applied to OO Systems- Object Oriented Metrics - Chidamber and Kemerer's Metrics Suite - * MOOD (Metrics for Object Oriented Design) Lorenz and Kidd's suite of design metrics*.	12
IV	Cognitive Complexity Metrics - Cognitive Complexity Metrics for Procedure Oriented System - Cognitive Complexity Metrics for Object Oriented System. Class Complexity (CC) - Weighted Class Complexity (WCC) – Extended Weighted Class Complexity (EWCC) - Class Complexity due to Inheritance (CCI) - * Cognitive Code Complexity (CCC)* - Weighted Composite Complexity Measure (CwP).	12
V	Overview- Defining the Metric: AWCC - Calibration of Cognitive Weights for Attributes - Experimentation and Case Study - Analytical Evaluation of AWCC Comparison of AWCC with Existing Metrics. Defining the Metric:CWCBO - Calibration of Cognitive Weights for Couplings – Experimentation and Case Study - * Analytical Evaluation of CWCBO *- Comparison of CWCBO with CBO.	12
VI	**Current Trends (For CIA only):** Code Quality Metrics, Agile Metrics, Cloud Metrics, Data Analytics Metrics	

* ……..* Self Study

Text Book(s):

1. Norman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics: A Rigorous and Practical Approach", PWS Publishing Company, USA, 3rd Edition, 2014.
2. Metrics and Models in Software Quality Engineering Second Edition Stephan H.Kan. 2007

Reference Book(s):

1. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Pearson Education, 2nd Edition, 2007.

Web Resource(s):

1. https://www.javatpoint.com/software-engineering-software-metrics

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Impart knowledge on software measurement principles and practices	**K1**
CO2	Understand the scope of software measures	**K2**
CO3	Get exposure in software data collection	**K3**
CO4	Assess the various traditional metrics	**K5**
CO5	Discuss the Object-Oriented Concepts	**K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	2	3	1	2	3	2	2.3
CO2	2	3	3	2	1	3	2	2	3	1	2.2
CO3	3	3	2	3	2	3	2	1	2	2	2.4
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	3	2	2	2	3	3	2	2	3	2.5
										Mean Overall Score	2.34
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. O.A Mohamed Jafar

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	DIGITAL IMAGE PROCESSING

SYLLABUS

Unit	Contents	Hours
I	Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals – RGB, HSI models, Image sampling, Quantization, dither, Two- dimensional mathematical preliminaries, 2D transforms – *DFT, DCT, KLT, SVD*.	12
II	Histogram equalization and specification techniques, *Noise distributions*, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image enhancement.	12
III	Image Restoration – degradation model, unconstrained restoration – Lagrange multiplier and constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.	12
IV	Edge detection, Edge linking via Hough transforms – * Thresholding * – Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	12
V	Need for data compression, Huffman, Run Length Encoding, Shift Course Codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, * MPEG *	12
VI	**Current Trends (for CIA only):** Deep Learning, Generative Adversarial Networks (GANs), Real-time Processing, Image Fusion, Super Resolution, 3D Imaging, Mobile Image Processing	

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Text Book(s):

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Book(s):

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006
2. Rafael C. Gonzalez, Richard E. Woods and Steven Eddins, Digital Image Processing Using MATLAB, Pearson Education Inc., 2004.
3. D.E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 2090
4. William K. Pratt, Digital Image Processing, John Wiley, New York, 2002
5. Milan Sonka et al., Image Processing, Analysis and Machine Vision, Brookes / Cole, Vikas Publishing House, 2nd Edition, 2099
6. Jeyaraman and Esakki Raja, Digital Image Processing, Tata McGraw Hill, 2009

Web Resource(s):

1. https://www.tutorialspoint.com/dip/index.htm
2. https://www.javatpoint.com/digital-image-processing-tutorial
3. https://www.olympus-lifescience.com/en/microscope-resource/primer/digitalimaging/javaindex/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recognize the fundamental concepts of a digital image processing system.	**K1**
CO2	Explain the different image enhancement and image restoration techniques	**K2**
CO3	Apply and review the 2D image transforms	**K3, K4**
CO4	Analyze the basic algorithms used for image segmentation and image compression with morphological techniques.	**K4**
CO5	Design and Synthesize Color image processing and its real world applications.	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	3	3	2	2	1	1	2.2
CO2	3	3	2	2	2	3	3	3	2	1	2.4
CO3	3	3	2	2	2	3	2	3	3	3	2.6
CO4	3	2	3	2	3	3	2	3	2	1	2.4
CO5	2	1	3	3	3	2	3	2	3	3	2.5
Mean Overall Score											2.42
Correlation											Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A.R. Mohamed Shanavas

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	NETWORK SECURITY

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction: Security Trends – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security – Classification Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – * Steganography *.	12
II	Block Ciphers and the Data Encryption Standard: Block Cipher Principles – The Data Encryption Standard – Advanced Encryption Standard: Evaluation Criteria for AES – The AES Cipher – More on Symmetric Ciphers: Multiple Encryption and Triple DES – *Stream Ciphers and RC4* – Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems – The RSA Algorithm.	12
III	Key Management: Key Management – Diffie-Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Message Authentication and Hash Functions: Authentication Requirements – Authentication Functions – Message Authentication Course Codes – Hash Functions – Security of Hash Functions and MACs – Hash and MAC Algorithms: Secure Hash Algorithm – HMAC – *CMAC*.	12
IV	Digital Signatures and Authentication Protocols: Digital Signatures – Authentication Protocols – Digital signature Standard – Authentication Applications: Kerberos – X.509 Authentication Service – Public-Key Infrastructure – *Firewalls: Firewall Design Principles* – Trusted Systems.	12
V	Electronic Mail Security: Pretty Good Privacy – IP Security: IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Payload – Combining Security Associations – Key Management – Web Security: Secure Socket Layer and Transport Layer Security – *Secure Electronic Transaction.*	12
VI	**Current Trends (For CIA only):** Zero Trust Architecture, Cloud Security, Artificial Intelligence and Machine Learning, Endpoint Security, Identity and Access Management (IAM), Cybersecurity Workforce Development, Internet of Things (IoT) Security	

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Text Book(s):

1. William Stallings, Cryptography and Network Security Principles and Practices, Prentice-Hall of India, New Delhi, Fourth Edition, 2007.

UNIT I: Chapter-1 Section (1.1-1.6) Chapter-2 Section (2.1-2.3, 2.5)

UNIT II: Chapter-1 Section (3.1, 3.2) Chapter-5 Section (5.1, 5.2) Chapter-6 Section (6.1, 6.3) Chapter-9 Section (9.1, 9.2)

UNIT III: Chapter-10 Section (10.1-10.4) Chapter-11 Section (11.1-11.5) Chapter-12 Section (12.1, 12.3, 12.4)

UNIT IV: Chapter-13 Section (13.1-13.3) Chapter-14 Section (14.1-14.3) Chapter-20 Section (20.1- 20.2)

UNIT V: Chapter-15 Section (15.1) Chapter-16 Section (16.1-16.6) Chapter-17 Section (17.2, 17.3)

Reference Book(s):

1. William Stallings, Network Security Essentials: Applications and Standards, Pearson Education, Delhi, 2004.

Web Resource(s):
1. https://www.tutorialspoint.com/network_security/index.htm 2. https://www.javatpoint.com/computer-network-security

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recognize the concepts of security architecture, attacks, services and encryption techniques	**K1, K2**
CO2	Analyze the principle of block cipher and public-key cryptosystems	**K4**
CO3	Apply key management and hash functions	**K3**
CO4	Explain various standards for digital signatures	**K4**
CO5	Evaluate and develop security mechanism for real life applications	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	3	3	1	1	1	2	2.1
CO2	3	2	2	3	2	2	3	3	2	2	2.4
CO3	3	2	3	2	3	2	1	2	3	1	2.2
CO4	3	3	1	1	2	3	3	2	1	1	2.0
CO5	3	2	1	3	1	3	2	1	3	3	2.2
									Mean Overall Score		2.18
									Correlation		Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. G. Ravi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	NETWORK MANAGEMENT

SYLLABUS		
Unit	**Contents**	**Hours**
I	Data Communication and Network Management Overview: Analogy of Telephone Network Management – Data and Telecommunication Network- Distributed Computing Environments – TCP/IP- Based Networks – Communication Protocols and Standards – Case Histories – Challenges of Information Technology Managers- Network Management: Goals, Organization and Functions – Network and System Management – Network Management System Platform – Current Status and Future of Network Management – Fundamental of Computer Network Technology: Network Topology, LAN, Network Node components – *WAN* – Transmission Technology- Integrated Services: ISDN, Frame Relay, and Broadband.	12
II	SNMP, Broadband and TMN Management – Basic Foundations: Network Management Standards, Network Management Model – Organization Model – Information Model – Communication model – Encoding Structure – Macros – Functional Model – SNMPv1 Network Management: Organization and Information Models – Management Network – The History of SNMP Management – Internet Organizations and Standards – The SNMP Model – *The Organization Model* – System Overview – The Information Model – SNMPv1 Network Management: Communication Model and Functional Models.	12
III	SNMP Management: Major Changes in SNMPv2 – SNMPv2 System – Architecture – SNMPv2 Structure of Management Information – The SNMPv2 Management Information Base – SNMPv2 Protocol – Compatibility with SNMPv1 – SNMPv3 – SNMPv3 Documentation – SNMPv3 Documentation Architecture- Architecture – SNMPv3 Applications – SNMPv3 Management Information Base – Security – SNMPv3 User – Based Security Model – Access Control- SNMP Management: RMON – Remote Monitoring – RMON SMI and MIBRMON1 – RMON2 – ATM Remote Monitoring –* Case Study*.	12
IV	Broadband Networks and services – ATM Technology – ATM Network Management- Broadband Access networks and Technologies – *HFC Technology* – Data over Cable Reference Architecture – HFC Management – DSL Technologies – ADSL technology – ADSL Management.	12
V	Network Management Tools and Systems: System Utilities for Management- Network Statistics Measurement Systems- MIB Engineering – NMS Design – Network Management Systems – Network Management Applications: Configuration Management – Fault Management – Performance Management – Event correlation Techniques – Security Management – *Accounting Management* – Report Management – Policy Based Management.	12
VI	**Current Trends (for CIA only) :** Network Automation, Software-Defined Networking (SDN), Network Virtualization, Cloud-based Network Management, Intent-Based Networking (IBN), Network Analytics, Network Security Management	

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Text Book(s):
1. Mani Subramanian, Network Management: Principles and Practice, Pearson Education, 2010
Reference Book(s):

1. William Stallings, SNMP, SNMPv2, SNMPv3, and RMON 1 and 2, Addison-Wesley, 2099
Web Resource(s):
1. https://www.tutorialspoint.com/what-is-network-management

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Identify the insights of Data communication and Network management and classify the computer network technologies.	**K2, K3**
CO2	Define the foundations of Network management standards and its models.	**K1**
CO3	Practice SNMP management such as structure, architecture, compatibility, applications and remote monitoring.	**K3**
CO4	Examine Broadband access networks and its technologies.	**K4, K5**
CO5	Apply the Network management tools and systems and list the management applications.	**K3, K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	3	2	3	1	2	3	2	2.3
CO2	2	3	3	2	1	3	2	2	3	1	2.2
CO3	3	3	2	2	2	3	3	1	2	3	2.4
CO4	2	3	2	2	3	3	3	1	2	2	2.3
CO5	3	3	1	2	2	1	3	2	2	3	2.2
										Mean Overall Score	2.28
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. M. Mohamed Surputheen

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	CLOUD COMPUTING

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction to Cloud Computing: Roots of Cloud Computing – Layers and Types of Cloud – Features of a Cloud – Infrastructure Management – Cloud Services – Challenges and Risks. Migrating into a Cloud: Introduction – Broad Approaches – *Seven Steps Model*. Integration as Service-Integration Methodologies – SaaS	12
II	Infrastructure as a Service: Virtual Machines – Layered Architecture - Life Cycle – VM Provisioning Process – Provisioning and Migration Services. Management of Virtual Machines Infrastructure – Scheduling Techniques - Cluster as a service – *RVWS Design* – Logical Design. Cloud Storage – Data Security in cloud Storage – Technologies.	12
III	Platform and Software as a Service: Integration of Public and Private Cloud – Techniques and tools – framework architecture – resource provisioning services – Hybrid Cloud. Cloud based solutions for business Applications – Dynamic ICT services – Importance of quality and Security in clouds – Dynamic Data center – case studies. Workflow Engine in the cloud – Architecture – Utilization. Scientific Applications for Cloud – Issues – Classification – SAGA – * Map Reduce Implementation*.	12
IV	Monitoring and Management: An Architecture for federated Cloud Computing – Usecase –Principles – Model – Security Considerations. SLA Management – Traditional Approaches to SLO – Types of SLA – Lifecycle of SLA – Automated Policy. Performance Prediction of HPC – * Grid and Cloud * – HPC Performance related issues.	12
V	Applications: Best Practices in Architecting cloud applications in the AWS cloud – Massively multiplayer online Game hosting on cloud Resources – *Building content delivery Networks using clouds* – Resource cloud Mashups.	12
VI	**Current Trends (for CIA only):** Serverless Computing, Hybrid Cloud, Multi- Cloud, Edge Computing	

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Text Book(s):

1. RajkumarBuyya, James Broberg, and Andrzej Goscinski, Cloud Computing Principles and Paradigms, John Wiley and Sons, Inc, 2011.

UNIT I Chapter 1: Section 1.2 – 1.8 Chapter 2: Section 2.1 – 2.3 Chapter 3: Section 3.1, 3.7, 3.9, 3.8

UNIT II Chapter 5 : Section 5.4,5.5,6.2,6.3 Chapter 6 : Section 6.2,6.3 Chapter 7 : Section 7.3,7.4 Chapter 8: Section 8.2, 8.3

UNIT III Chapter 9: Section 9.1, 9.2 Chapter 10: Section 10.4 Chapter 11: Section 11.5, 11.4 Chapter 12: Section 12.5 Chapter 13: Section 13.1-13.3

UNIT IV Chapter 15: Section 15.1-15.5 Chapter 16: Section 16.2-16.3, 16.6 Chapter 17: Section 17.1, 17.3, 17.4

UNIT V Chapter 18: Section 18.1-18.6 Chapter 20: Section 20.1-20.6 Chapter 21: Section 21.1-21.3

Reference Book(s):

1. George Reese, Cloud Application Architectures, O'Reilly Media, Inc, First Edition, 2009.

2. Michael Miller, Cloud Computing: Web based Applications That Change the Way You Work and Collaborate Online, QUE Publishing, 2009.
Web Resource(s):
1. https://www.tutorialspoint.com/cloud_computing/index.htm

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recognize the knowledge on concepts of cloud computing	**K1**
CO2	Acquire and apply the knowledge of virtual machines	**K3**
CO3	To learn public, private and hybrid cloud deployment models	**K1**
CO4	To acquire knowledge about SLA management	**K3**
CO5	Understand the application access of cloud	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	2	3	2	2	1	3	2.2
CO2	3	2	2	3	2	3	2	2	1	1	2.1
CO3	3	1	3	2	3	1	2	1	3	2	2.1
CO4	3	3	2	3	2	2	3	1	2	2	2.3
CO5	3	2	3	3	1	3	3	2	2	1	2.3
										Mean Overall Score	2.2
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. D.I George Amalarethinam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	MOBILE COMPUTING

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction – Mobile Computing Architecture – Internet – The Ubiquitous Network – Three –Tier Architecture – Design Considerations – Mobile Computing through Internet – Making Existing Applications Mobile Enabled – Mobile Computing through Telephony – *Multiple Access Procedures* – Developing an IVR Application – Voice XML – TAPI.	12
II	Emerging Technologies – Bluetooth – Radio Frequency Identification (RFID) – Wireless Broadband (WiMAX) – Mobile IP – Internet Protocol Version 6 – Java Card – Global System for Mobile Communications (GSM) – GSM Architecture – Entities – Call Routing in GSM – PLNM Interfaces – GSM Address and Identifiers – Network Aspects – *Frequency Allocation* – Authentication and Security – Short Message Service (SMS) – Mobile Computing over SMS – Value Added Services through SMS – Accessing the SMS Bearer.	12
III	General Pocket Radio Service (GPRS) – GPRS and Packet Data Network – GPRS Network Architecture – Operations – Data Services – Applications – Limitations – Wireless Application Protocol (WAP) – MMS – GPRS Applications – CDMA and 3G – Spread-Spectrum Technology – IS-95 – CDMA versus GSM – Wireless Data – *3G Networks* – Applications.	12
IV	Wireless LAN – Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility – Deploying Wireless LAN – Mobile Ad Hoc Networks and Sensor Networks – Wireless LAN Security – WiFi versus 3G – Internet Networks and Interworking – Call Processing – Intelligence in Networks – SS*7 Signaling – IN Conceptual Model (INCM) – Soft switch Programmable Networks – Technologies and Interfaces for IN – Client Programming – Mobile Phones – PDA –*Design Constraints*.	12
V	Palm OS – Architecture – Application Development – Communication in Palm OS – Multimedia – Voice over Internet Protocol and Convergence – H.323 Framework – Session Initiation Protocol (SIP) – Real Time Protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP Multimedia Subsystem – Mobile VoIP – Security Issues in Mobile Computing – Information Security – Security Techniques and Algorithms – Security Protocols – *Public Key Infrastructure* – Security Models – Security Frameworks for Mobile Environment.	12
VI	**Current Trends (for CIA only):** 5G Wireless Networks, IoT, Mobile Payments, Augmented Reality, Artificial Intelligence and Machine Learning, Mobile Health	

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Text Book(s):

1. Asoke K Talukder, Roopa R Yavagal, Mobile Computing – Technology, Applications and Service Creation, Tata McGraw-Hill Publishing Company Ltd., Eleventh Reprint, 2009.

Reference Book(s):

1. Tomasz Imielinski, Henry F. Korth, Mobile Computing, Kluwer Academic Publishers, 2006
2. Raj Kamal, Mobile Computing, Oxford University Press, 2008.

3. Uwe Hansmann, LotharMerk, Martin S. Nicklous, Thomas Stober, Principles of Mobile Computing, Springer International Edition, 2008

4. GargKumkum,Mobile Computing: Theory and Practice, Pearson Education India, 2010.

Web Resource(s):

1. https://www.smashingmagazine.com/category/tutorials/
2. https://github.com/topics/mobile-computing

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Acquire Knowledge on various communication technology	**K1**
CO2	Explain the GSM, GPRS, and Bluetooth software model for mobile computing	**K2**
CO3	Recognize the Knowledge of 3G wireless standards	**K2**
CO4	Analyze security issues of mobile computing systems	**K3, K4**
CO5	Build data communicating methods and networking protocols for mobile environment	**K6**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	2	3	3	1	1	2	2.0
CO2	3	2	2	3	1	2	0	2	2	1	1.8
CO3	3	2	3	2	3	2	3	2	3	2	2.5
CO4	3	3	2	1	2	2	3	0	3	3	2.2
CO5	3	2	0	2	3	3	2	0	3	3	2.1
										Mean Overall Score	2.12
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. G. Ravi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	BIG DATA ANALYTICS

SYLLABUS		
Unit	**Contents**	**Hours**
I	Big Data – Characteristics of big Data – Domain specific examples of big data – Analytics flow for big data – Big data stack – Analytics – Analytics Types – Big data storage – *Mapping analytics flow of big data stack*.	12
II	Brief history of Hadoop - Hadoop core: Hadoop Distributed File System (HDFS) & Map Reduce (MR) & Hadoop Eco- systems: Hbase - Hive & R, Impala - Pig and Pig Latin – Sqoop – ZooKeeper – Avro - HDFS: Design of HDFS – concepts – * **Hadoop file system*.** Introducing Apache Hadoop: HDFS features - MR - MR features – Storage options on Hadoop – File formats and Compression formats – Introducing Apache Spark: History – What is Apache Spark? – MR issues – Spark's stack. Hadoop plus Spark: Hadoop features – Spark features – *Installing Hadoop plus Spark clusters*.	12
III	Map Reduce Patterns: Numerial summarization (count, max-min) – Top-N – Filter – Binning – Sorting – Joins. Hadoop and MR: MR programming model – Hadoop YARN – *Hadoop MR Example: Find top N-words with map reduce*.	12
IV	Data Management (Data Models): Key Value Pair Data Bases (DB) - Document Store DBs – Column Store DBs – Graph Based DBs – Comparison of NOSQL databases. Data Visualization: Frameworks & Libraries: Lightning – Pygal – Seaborn – Visualization examples: Line chart - Scattor plot – *Bar chart* – Map chart – KDE	12
V	Frameworks: Spark MLlib – H2O – Clustering: k-means – Classification & Regression: Naïve Bayes (NB) – Decision Tree (DT) – *Random Forest (RF) – Support Vector Machines (SVM)*.	12
VI	**Current Trends (for CIA only):** AI and Machine Learning, Real time Analytics, Natural Language Processing, Graph Analytics	

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Text Book(s):

1. ArshdeepBahga& Vijay Madisetti, "Big Data Analytics: A Hands-on Approach", 2020, ISBN: 978-1-949978-00- 1, Book Website: www.hands-on-books-series.com (For Unit - I, III, IV & V)
2. Tom White "Hadoop: The Definitive Guide", Second Edition, O'reilly Media, 2011, ISBN: 978-1-449-38973-4. (For Unit–II)
3. VenkatAnkem, "Big Data Analytics", Packt Publishing, 2016, ISBN 978-1-78588-469-6 (For Unit–II).

Reference Book(s):

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman , "Bigdata for Dummies", John Wiley & Sons Inc, 2013. ISBN 978-1-118-64396-9 (ebk). www.it-ebooks.info.
2. Lakshmi Prasad Y, "Big Data Analytics – Made Easy", Notion Press, 1stEdition , 2016, ISBN 978-1-946390- 72.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
4. Zaharia M et al., Apache Spark: A Unified Engine for Big Data Processing, Communications of ACM, Vol.59, No.11 pp. 56 -65 DOI:10.1145/2934664.

5. Shasank Tiwari, “Professional NOSQL”, 2011, John Wiley & Sons, Inc.,
6. Bill Franks, “ Taming the Big data tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”,JohnWiley& Sons Inc., 2012.
7. Seema Acharya, SubhasiniChellappan, “Big Data and Analytics”, O’Reilly Media, 2013 Edition.
8. Boris Iublinsky, Kevin T. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015, ISBN: 978- 8126551071.

Web Resource(s):

1. https://www.guru99.com/bigdata-tutorial.html
2. http://www.javapoint.com/what-is-big-data

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recognize the characteristics of Big data, concepts of Analytics and its types.	**K2**
CO2	State the History of Hadoop and Spark, Infer the Hadoop Core (HDFS) & its Eco-systems.	**K4**
CO3	Apply the Map Reduce (MR) patterns and prepare the MR programming Model	**K3**
CO4	Adapt different kinds of Data models; show the Data Visualization frameworks via examples.	**K6**
CO5	Experiment classification, clustering and regression-based algorithms via Spark Mllib framework.	**K3**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	3	3	1	1	2	3	2.3
CO2	2	3	3	2	2	3	2	3	2	2	2.4
CO3	3	3	3	2	2	3	3	2	2	3	2.6
CO4	3	3	3	2	2	2	3	1	3	2	2.4
CO5	3	2	3	3	2	2	3	3	2	3	2.6
										Mean Overall Score	2.46
										Correlation	Medium

Mean Overall Score = Sum of Mean Score of COs / Total Number of COs

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. D.I George Amalarethinam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23MPCS1CC4	CORE – IV	4	4	25	75	100

Course Title	INTERNET OF THINGS

SYLLABUS		
Unit	**Contents**	**Hours**
I	Introduction - Putting the Internet of Things forward to the Next Level - Internet of Things Strategic Research and Innovation Agenda: Internet of Things Vision - Internet of Things Strategic Research and Innovation Directions - *IoT Smart X Applications.*	12
II	Internet of Things and Related Future Internet Technologies - Network and Communications - Processes - Data Management - Security, Privacy and Trust - Device Level Energy Issues - *IoT Related Standardization* - IoT Protocols Convergence.	12
III	Scalable Integration Framework for Heterogeneous Smart Objects, Applications and Services : IPV6 Potential - IoT6 - IPV6 vs.IoT - Adapting IPV6 to IoT Requirements - *IoT6 Architecture* - Discovery - IoT6 Integration with the Cloud and EPICS - Enabling Heterogeneous Integration - IoT6 Smart Office Use Case - Scalability Perceptive.	12
IV	Insights on Federated Cloud Service Management and the IoT: Federated Cloud Service Management - Federated Management Service Life Cycle - Self Management Life Cycle - Self Organising Cloud Architecture - *Horizontal Platform.*	12
V	Internet of Things Applications: OpenIoT - iCORE – Compose – SmartSantander – Fitman – *OSMOSE.*	12
VI	**Current Trends (for CIA only):** Edge Computing, 5G Wireless Networks, Block Chain Technology, Smart Cities, Industrial IoT	

* ……..* Self Study

Text Book(s):

Reference Book(s):

1. OvidiuVermesan, Peter Friess, "Internet of Things - From Research Innovation to Market Deployment", River Publishers, 2014
2. Adrian McEwen, HakimCassimally, "Designing the Internet of Things, John Wiley and Sons Ltd, 2014

Web Resource(s):

1. https://www.iotforall.com/
2. https://developer.ibm.com/technologies/iot/tutorials/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Able to understand vision of Internet of Thing and its characteristics	**K2**
CO2	To learn IoT related future Internet technologies	**K2**
CO3	Compare different protocols used in IoT	**K4**
CO4	Apply Federated cloud service management in IoT	**K3**
CO5	Evaluate and adapt the application areas of IoT	**K5, K6**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	1	3	3	2	2	1	3	2.3
CO2	3	3	2	3	2	3	2	3	2	2	2.5
CO3	3	2	3	2	3	2	3	2	3	2	2.5
CO4	2	3	2	2	3	3	3	2	2	2	2.4
CO5	3	2	1	3	1	3	2	1	3	3	2.2
Mean Overall Score											2.38
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. D.I. George Amalarethinam