PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Phil COMPUTER SCIENCE

(Students admitted during 2021 – 2022 Onwards)

(Under CBCS with Outcome Based Education (OBE) Pattern)

SYLLABUS

H.H. THE RAJAH'S COLLEGE
PUDUKKOTTAI – 622 001.

(Government Autonomous Co-educational Institution,
Affiliated to Bharathidasan University, Trichy)

Semester	Title of the Course	Marks				Credits
		Hours	IA	UE	Total	
Semester - I						
Course – I	Research Methodology	3	25	75	100	4
Course – II	Advanced Topics in Computer Science	3	25	75	100	4
Course – III	Teaching and Learning skills (Common Paper)	3	25	75	100	4
Course – IV	Paper on Topic of Research (The syllabus will be prepared by the Guide and the examination will be conducted by the COE)	3	25	75	100	4
Semester – II						
Dissertation	Dissertation and Viva-Voce Viva Voce 50 marks Dissertation 150 marks	---	----	---	200	8

For each Course other than the Dissertation
Continuous Internal Assessment   - 25 Marks
End Semester Examination   -75 Marks
Total   **-100 Marks**

Part – A Answer all the Questions 10 X 2 = 20 Marks	Part – B Internal Choice Type 5 X 5 = 25 Marks	Part – C Answer any 3 Questions 3 X 10 = 30 Marks
Question 1,2 – 1 Unit 3,4 – II Unit 5,6 – III Unit 7,8 – IV Unit 9,10 – V Unit	11a (or) 11b – 1 Unit 12a (or) 12b – II Unit 13a (or) 13b – III Unit 14a (or) 14b – IV Unit 15a (or) 15b – V Unit	16 – I Unit 17 – II Unit 18 – III Unit 19 – IV Unit 20 – V Unit

The following components shall be adopted for continuous internal evaluation / assessment.

I	Best 2 tests out of 3	10 Marks
II	Attendance	05 Marks
III	Seminar	05 Marks
IV	Assignment	05 Marks
	Total	25 Marks

PROGRAMME OUTCOMES:

PO1: After successful completion of Master of Philosophy in Computer Science, the students will be able to demonstrate basic knowledge in Computer Science.

PO2: The scholars will be able to use research tools used by researchers in their chosen area of specialization.

PO3: Scholars pursuing this course will show ability in the critical evaluation of research techniques and methodologies.

PO4: The scholars will acquire basic knowledge of research and skills to solve problems, analyse data and interpret the results.

PO5: The students will be able to communicate effectively and demonstrate professional and ethical responsibilities.

COURSE I – RESEARCH METHODOLOGY

Objectives :

1. Thesis Writing Formats
2. Analysis & Designing of Algorithms
3. Understanding of NFA & DFA
4. Analysis using Probability & Statistics
5. Understanding of Logics

UNIT- I

Thesis Writing: Thesis Writing: Research types – objectives and approaches – Literature collection, Web browsing – Software tools – Writing review and journal articles – manuscript publication.

Planning a thesis – general format – page and chapter format – footnotes – tables and figures – references and appendices.

Unit II

Analysis of algorithm: The role of algorithm in computing – Insertion sort – Analyzing and designing algorithms – growth of functions – Divide and Conquer: The Maximum Subarray Problem –Strassen's algorithm for Matrix multiplication – The substitution method and recursion tree methods of solving recurrences - Introduction to NPcompleteness.

Unit III

Formal Languages and Finite Automata: Context free grammars – Derivation trees – Simplification of context free Grammars – Chomsky normal form – Greiback normal form – The pumping lemma for context free languages. Finite state systems – Basic definitions – Non deterministic finite automata – Finite automata with epsilon moves – Regular expressions – Applications of finite Automata.

Unit IV

Probability and Statistical Analysis: Probability – Fail time data analysis – Hazard models – Conditional probability – Baye's rule – System reliability – Stochastic process.

Unit V

Logic – Relations and Functions: Propositions – Precedence rules for operators – Laws of equivalence – Natural deduction system – Developing natural deduction system proofs.
Relation properties – Matrix and Graph – Graph Notations for relations – Partition and covering – Equivalence relation – Compatibility relations – Partial ordering – Functions – Components – Composition of function – Inverse functions – Binary and n-ary operations.

Text Books:

1. Kothari C. R. Research Methodology – methods and techniques, 2nd Edition, Wishwa Prakashjan New Delhi 1999
2. For Research Tools in Computer Science: Official Websites of tools concerned.
3. Cormen, Leiserson, Rivest and Stein, "Introduction to Algorithms", Third Edition, PHI LEARNING PVT. LTD-NEW DELHI, ISBN: 9788120340077, 8120340078, 3rd Edition, 2009.
4. John E. Hopcroft, Jeffery D. Ullman, 'Introduction to Automata Theory Language and Computation', narosa Publishing House, 1979

5. L.S. Srinath, 'Reliability Engineering', Third Edition, Affliated East, West press pvt. Ltd, New Delhi, 2005 6. David Gries, 'The Science of Programming' Narosa Publishing House, 1981.

Reference Books:

1. Anderson, Durston and Poole, 'Thesis and Assignment writing', Wiley Eastern Ltd. ND 1970

2. Misra R.P. Research Methodology – A Hand Book, Concept publishing Company, New Delhi 1988

3. Ellis Horowitz and Sartaj Sahni, 'Fundamentals of Computer algorithms', Galgotia Publications, New Delhi 2000 4. E. Balagurusamy, 'Reliability Enginering', Tata McGraw Hill Publishing Ltd., New Delhi 2003 5. Leon S. Levy, 'Discrete structures of Computer Science', Wiley Eastern Ltd., 1980

COURSE OUTCOMES :

CO1: Understanding of what scholarly writing is and development of the skills to write the same.

CO2: Learn to use tools related to research in Computer Science.

CO3: Learn to analyze the algorithms and compute their computing time.

CO4: Understanding of the basic concepts of NP-Complete and NP-Hard and problems of Computability.

CO5: Understand the formal language, context free grammar and the applications of finite automata.

Mapping Course Outcomes with Programme Outcomes:

CO / PO	PO1	PO2	PO3	PO4	PO5
CO1	9	9	9	9	3
CO2	9	9	3	3	3
CO3	3	9	9	3	3
CO4	9	3	9	9	3
CO5	3	3	3	1	3
Weightage	33	33	33	25	12
Weightage Percentage of Course Contribution of PO's	33.33	35.48	42.31	46.30	13.33

LOW: 1; **MEDIUM: 3**; **STRONG: 9**;

COURSE II–ADVANCED TOPICS IN COMPUTER SCIENCE

Objectives :

- To understand the basic ideas of Data Science and to analyze big data sets.
- To understand the Cloud Computing as an emerging area of public and scientific use and to learn to apply Cloud Computing in the current social and research contexts.
- To learn and apply the ideas of Virtualizationand its various uses.
- To appreciate IoT as a fast growing paradigm on Research in Computer Science and to use the same for research.
- To understand the basics of Machine Learning and its application in related areas such as Data Mining, ANN etc.
- To understand the use of Cryptography as a tool of security in the areas of Database, Program and Computer Networks.

Unit I :

Data Science Big Data and Data Science Hype – Datafication - The Current Landscape - Thought Experiment. Statistical Inference, Exploratory Data Analysis, and the Data Science Process: Statistical Thinking in the Age of Big Data - Exploratory Data Analysis – The Data Science Process.

Big Data : Understanding Big Data: Concepts and Terminology - Big Data Characteristics - Source of Big Data – Big Data Types (Formats) – Big Data Classification – Big Data processing technologies/tools/platforms.Types of Analytics: Analytics- Data Analytics – Big Data Analytics – Health Big Data Analytics – Importance of Analytics – Types: Predictive – Descriptive – Diagnosis – Prescriptive.

UNIT II :

Cloud Architecture And Model : Technologies for Network-Based UNIT System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public VS Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Virtualization: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III :

Internet of Things : IoTarchitecture M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model – IoT reference architecture.

Unit IV :

Machine Learning : Types of learning, hypothesis space and inductive bias, evaluation, cross-validation. Linear regression, Decision trees, over fitting- Instance based learning, Feature reduction, Collaborative filtering based recommendation - Probability and Bayes learning - Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM - Neural network: Perceptron, multilayer network, back-propagation, introduction to deep neural network - Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning - Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model - Concept learning – general to specific ordering – Decision tree learning – ANN.

Unit V :

Security problems in Computing Cryptography – program security – Database security – Security in Networks

Recommended Text books:
 1. "Doing Data Science: Straight Talk from the Frontline", by Rachel Schutt and Cathy O'Neil, O'Reilly Media publications, 2013.
2. Big Data Fundamentals: Concepts, Drivers & Techniques", by Paul Buhler, Wajid Khattak, Thomas Erl, Prentice Hall Publications, January 2016,ISBN: 9780134291185
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
4. Gautam Shroff, Enterprise Cloud Computing, Cambridge University Press,2011
5. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
6. Machine Learning. Tom M. Mitchell. First Edition, McGraw- Hill, 1997.
7. Charles P. Pfleeger & Shani Lawrence Pfeeger, "Security in Computing", Pearson Education, ISBN: 9789352866533, 9352866533, Fifth Edition, 2018.

COURSE OUTCOMES :

CO1 : Understanding of basic ideas of Data Science and capacity to analyze big data sets.

CO2: Understanding the Cloud Computing as an emerging area of public and scientific use and applications of Cloud Computing in the current social and research contexts.

CO3: Knowledge of Virtualization and its various uses for practical applications.

CO4 : Appreciation of IoT as a fast growing paradigm of Computer Science and it suses in research.

CO5: Understanding of the basics of Machine Learning and its application in related areas such as Data Mining, ANN etc.

Mapping Course Outcomes with Programme Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	9	9	3	3	9
CO2	3	9	3	3	9
CO3	3	3	3	3	9
CO4	9	3	3	3	9
CO5	9	9	3	3	9
Weightage	33	33	12	12	45
Weightage Percentage of Course Contribution of PO's	33.33	35.48	15.38	22.22	50.00

LOW: 1; **MEDIUM: 3**; **STRONG: 9**;

COURSE – III : TEACHING AND LEARNING SKILS

Objective :

1. Acquaint different parts of computer system and their functions
2. Understand the operations and use of computers and common accessories.
3. Develop skills of ICT and apply them in teaching learning context and Research.
4. Appreciate the role of ICT in teaching, learning and Research.
5. Acquire the knowledge of communication sill with special reference to its elements, types , development and styles.
6. Understand the terms communication Technology and Computer mediated teaching and develop multimedia / e-content in their respective subject.
7. Understand the communication process through the web
8. Acquire the knowledge of Instructional Technology and tis Applications.
9. Develop different teaching skills for putting the content across to targeted audience.

Unit I :

Computer Application Skills : Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations - ICT for Professional Development : Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II :

Communications Skills Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III :

Pedagogy Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV :
E- Learning, Technology Integration and Academic Resources in India :
Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V :
Skills of Teaching and Technology based assessment Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi

2. Brandon Hall , E-learning, A research note by Namahn, found in: www.namahn.com/resources/ .../note-e-learning.pdf, Retrieved on 05/08/2011

3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.

5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. Innovations in Education & Teaching International, 43(1), 15-27.

6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.

7. Learning Management system : https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016

8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.

9. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.

10. Pandey, S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.

11. Ram Babu, A abd Dandapani, S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.

12. Singh, V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.

13. Sharma, R.A., (2006) Fundamentals of Educational Technology, Surya Publications, Meerut

14. Vanaja, M and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

COURSE OUTCOMES :

CO1:   Develop skills of ICT and apply them in Teaching Learning context and Research.

CO2:   Be able to use ICT for their professional development.

CO: Leverage OERs for their teaching and research.

CO: Appreciate the role of ICT in teaching, learning and Research.

CO: Develop communication skills with special reference to Listening, Speaking, Reading and Writing.

Mapping Course Outcomes with Programme Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	9	9	9	9	9
CO2	9	9	9	3	3
CO3	9	3	9	3	9
CO4	3	3	3	1	3
CO5	3	3	3	1	9
Weightage	33	27	33	17	33
Weightage Percentage of Course Contribution of PO's	33.33	29.03	42.31	31.48	36.67

LOW: 1; **MEDIUM: 3**; **STRONG: 9**;

Program Articulation Matrix

Sl.No.	Course Code	Title of the Course	PO1	PO2	PO3	PO4	PO5	Total
1		Research Methodology	33	33	33	25	12	136
2		Advanced Topics In Computer Science	33	33	12	12	45	135
3		Teaching and Learning Skills	33	27	33	17	33	143
Total			99	93	78	54	90	414

CO – PO WEIGHTAGE MATRIX

Sl.No.	Course Code	Title of the Course	PO1	PO2	PO3	PO4	PO5	Average
1		Research Methodology	33.33	35.48	42.31	46.30	13.33	34.15
2		Advanced Topics In Computer Science	33.33	35.48	15.38	22.22	50.00	31.28
3		Teaching and Learning Skills	33.33	29.03	42.31	31.48	36.67	34.56
Total			100.00	100.00	100.00	100.00	100.00	100.00