M.Phil. in Computer Science (2 Semesters - 1 year)

Curriculum and Credit Distribution

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<tr>
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<th>Code</th>
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<td>Research Methodology</td>
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<td>15CSA702</td>
<td>Advanced Computing Techniques</td>
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<td>15AVP501</td>
<td>Amrita Values Programme</td>
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<tr>
<th>Semester II</th>
<th>Elective</th>
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| TOTAL CREDITS | 30 |

List of Electives

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<td>15CSA732</td>
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SYLLABUS

SEMESTER I

15CSA701 Research Methodology 3-1-0-4

Course Description: The research methodology module is intended to assist students in planning and carrying out research projects. The students are exposed to the principles, procedures and techniques of implementing a research project. The course starts with an introduction to research and carries through the various methodologies involved. It continues with finding out the literature using computer technology and ends with knowing the tools used for data analysis in various systematical way, and writing the report, paper using LaTeX s/w.

Course Learning Outcome
Define research and describe the research process and research methods; Understand and apply basic research methods including research design, data analysis, and interpretation.

Unit 1
Introduction - 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 processes - criteria of good research - defining research problem - selecting the problem - necessity of defining the problem - techniques involved in defining a problem - research design - meaning of research design - need for research design - features of good design - different research designs - basic principles of experimental design.

Unit 2
Resources for research - research skills - time management - role of supervisor and scholar - interaction with subject experts. Thesis Writing: The preliminary pages and the introduction - the literature review - methodology - the data analysis - the conclusions - the references (IEEE format).

Unit 3

Unit 4

Unit 5
LaTeX and Beamer: Writing scientific report - structure and components of research report - revision and refining' - writing project proposal - paper writing for international journals, submitting to editors - conference presentation - preparation of effective slides, pictures, graphs - citation styles.

Text Books

Reference Books
15CSA702 ADVANCED COMPUTING TECHNIQUES 3 – 1 – 0 – 4

Course Description
This paper gives insights into the fundamental and emerging technologies in Computer Science.

Course Learning Outcome
Creating awareness of the new research arenas and open problems.

Unit 1
Advanced Operating Systems: Virtual memory management, Synchronization and communication, Distributed Operating System.

Unit 2

Unit 3

Unit 4

Unit 5

* Subjected to change based on recent trends.
Text Books:

Recommended Reading

SEMESTER II

**15CSA796**  
**Dissertation**  
12 Cr

The dissertation is based on any minor area selected by the scholar. The progress of the research work will be evaluated by the research committee constituted by the department on a periodical basis. The scholars with satisfactory performance will be allowed to submit their thesis. It should be a comprehensive study on the selected topic, consisting approximately 150 to 200 pages. The final thesis will be evaluated by the research supervisor and an external examiner.

**15CSA797**  
**VIVA- VOCE**  
5 Cr

A Viva-Voce will be conducted within 2 months of submission of the dissertation. The external examiner will evaluate the findings and presentation of the scholar.
Objective
This course is for those who want to train as professional science communicators. Academic components provide a broad overview of the professional science communication landscape. The course includes print journalism, new media work, broadcast television or radio production and presentation.

Unit 1
Science Communication- an introduction - Professional scientific communication - History of science and technology communication theory, laws and ethics

Unit 2
Need for science communication - Importance and use of science communication, Sources of scientific information – books, scientific reports, scientific journals, magazines, feature syndicates, leaflets, tabloids, wall magazines, speeches, seminars, press releases, databases, encyclopedias on science, etc - Comparative study of science sections and supplements carried in Indian / foreign newspapers and science magazines.

Unit 3

Unit 4

Unit 5
Science Broadcasting- New Media and Science Communication- Internet- Blogs- Alternative Media and Science Communication

Text
- Anthony Wilson, “Handbook of Science Communication”, IOP
- Kahlor, LeeAnn, Communicating Science, Routledge Publishers

References
- Dubas O and Martel L, “Media Impact. A Research Study on Science Communication
Prerequisites
This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable.

Unit 1
Introduction to data analytics (DA), data preparation, data cleaning. Data types and measures of similarity, Data Preprocessing and numerosity reduction, Data Governance

Unit 2
Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests, Permutation & Randomization Test, Regression, ANOVA (Analysis of Variance)

Unit 3

Unit 4
Supervised Learning with Regression and Classification techniques -1: Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines.

Supervised Learning with Regression and Classification techniques -2: Ensemble Methods: Random Forest, Neural Networks, Deep learning

Unit 5
Unsupervised Learning and Challenges for Big Data Analytics : Clustering, Associative Rule Mining, Challenges for big data analytics.

Prescriptive analytics: Creating data for analytics through designed experiments, Creating data for analytics through Active learning, Creating data for analytics through Reinforcement learning. (R, Weka or any tool)

References
Unit 1
Necessity and importance of Human and Visual Communication, Communication as expression, skill and process, Understanding Communication: SMRC-Model

Unit 2
Communication as a process- Message, Meaning, Connotation, Denotation Culture/Codes etc ., Levels of communication: Technical, Semantic, and Pragmatic. The semiotic landscape: language and visual communication, narrative representation

Unit 3

Unit 4
Principles of Visual and other Sensory Perceptions - Color psychology and theory (some aspects) Definition, Optical / Visual Illusions Etc Various stages of design process- problem identification, search for solution refinement, analysis, decision making, and implementation.

Unit 5
Basics of Graphic Design - Definition, Elements of GD, Design process-research, a source of concept, the process of developing ideas-verbal, visual, combination & thematic, visual thinking, associative techniques, materials, tools (precision instruments etc.) design execution, and presentation.

References
Unit 1
Artificial Intelligence – a Brief Review – Pitfalls of Traditional AI – Need for Computational Intelligence – Importance of Tolerance of Imprecision and Uncertainty - Constituent Techniques – Overview of Artificial Neural Networks - Fuzzy Logic - Evolutionary Computation.

Unit 2

Unit 3
Neural Networks as Associative Memories - Hopfield Networks, Bidirectional Associative Memory. Topologically Organized Neural Networks – Competitive Learning, Kohonen Maps,

Unit 4

Unit 5
Evolutionary Computation - Overview of other Bio-inspired Algorithms - Swarm Intelligence Algorithms

Text books/ References:
15CSA731  CLOUD COMPUTING TECHNIQUES  3-0-2-4

Unit 1
Cloud Computing - Introduction, characteristics, benefits, challenges and risks, Web 2.0

Unit 2

Unit 3
Cloud Computing Architecture - Service Models - Deployment Models - Infrastructure as a Service

Unit 4
Resource Virtualization - Server - Storage - Network - Platform as a Service - Cloud Platform and Management - Software as a Service - Case Study on Eucalyptus. Service Management in Cloud Computing

Unit 5

Text Books / References:


15CSA733  MOBILE AND WIRELESS TECHNOLOGIES  3-0-2-4

Objectives: The purpose of this course is to provide an introduction to modern digital mobile and wireless communication systems.

Unit 1
GSM - Mobile services, system architecture, Radio interface, protocols, Localization and calling, Handover, security - 27-31 GPRS, HSCDC
Unit 2
Wireless LAN: IEEE 802.11, system architecture - IEEE-802.11

Unit 3
protocol architecture, physical layers, medium access control layers, MAC management 802.11b, 802.11a, Hiper LAN

Unit 4
Bluetooth, Adhoc network, sensor network-Mobile IP, DHCP

Unit 5

Textbook:
1. Mobile Communications by Jochen Schiller, Pearson Education 2nd Edition
2. Wireless communications & Networks by William stallings.

15CSA736 SYSTEM AND NETWORK SECURITY 3-0-2-4

Objectives: System and Network Security a study of the security principles and practices of computer and network systems. The students will be able to understand what the foundational theory is behind computer security, what the common threats are, and how to deal with attackers.

Unit 1

Unit 2
Unit 3

Unit 4

Unit 5

TEXTBOOK:

Data Management, Geographic Information System, Biological and Genomic Databases, Spatial Databases, Multimedia Databases, Distributed Databases.

Unit 3

Unit 4

Unit 5

* Subjected to change based on recent trends.

**Text Books:**

**Recommended Reading**
Amrita Vishwa Vidyapeetham

Faculty of Science

Board of Studies (BOS) in Computer Science and IT

Minutes of the meeting of members of the Board of Studies in Computer Science and IT held at 10:30 a.m. on Thursday 1st February 2018.

Venue : CIR Seminar Hall, Kochi Campus.

Members Present:

1. Dr. Maya L Pai, ASAS Kochi (Chairperson, BOS)
2. Mr. Jayakrishnan K, (External Expert)
3. Dr. Srinath S, SJCE, Mysore (External Expert)
4. Dr. S GokulDev, ASAS, Mysore
5. Mr. Prasannakumar C V, ASAS, Kochi
6. Mrs. Ani R, ASAS, Amritapuri
7. Dr. Shoba Rani, ASAS, Mysore
8. Mr. Mahesh A S, ASAS Kochi
9. Mr. Sreekumar, ASAS, Kochi
10. Mrs. Nima S Nair, ASAS, Kochi
11. Ms. Leena V, ASAS, Kochi
12. Mrs. Nitha L, ASAS, Kochi
13. Mrs. Soumya Krishnan, ASAS, Kochi
14. Mrs. Deepa G, ASAS Kochi
The meeting started at 10:30 a.m. with prayer. Dr. Maya L Pai who chaired the meeting, welcomed the members.

Meeting considered the revision of curriculum and detailed syllabi of various programmes under Computer Science & IT and the revisions made are given below. The revised curriculum and syllabi will be effective from 2018 admissions onwards.

**Int. BCA - MCA/ BCA**

1. The board suggested to restructure the existing fractal curriculum and syllabi.
2. Two new core courses namely “Computational Thinking And Problem Solving” and “Computer Essentials” be introduced in the first semester.
3. Computational Thinking And Problem Solving : Number Conversion be included in Unit 1.
4. Computational Thinking and Problem Solving Lab : Scratch be included in Unit 4.
5. Computer Essentials: Lab component for Web Browsing, Emails, Searching be included in Unit 4.
9. Computer Organization: Computer Arithmetic - Introduction - Multiplication Algorithm - Booth’s Algorithm be moved from Unit 1 to Unit 5.
11. Data Structures and Algorithm: Back Substitution method be added in Unit 1. Selection Sort be added in Unit 2. Priority Queue be moved from Unit 4 to Unit 3.
12. Data Structures and Algorithms Lab: Selection sort be included.
13. Computer Networks: MAC Address be added in Unit 2. IPv4, IPv6, Gateway, Subnetting be added in Unit 3.
15. Web Technologies Lab: Wireshark can be included.
16. Advanced Java and J2EE: JSON programming can be added in Unit 2. The topics inside Unit 2 and 3 are interchanged. In Unit 5, Introduction to Spring and Hibernation be added.
17. Advanced Java and Java and J2EE Lab: JSON be included in Lab question 8.
20. Cryptography and Cyber Security: SSL be added in Unit 2, Phishing to Unit 5.
21. The Board suggested that only students who opted for exit option must undertake a six credit project. The existing elective course and one credit seminar be removed from the exit option. This will be applicable for 2016 and 2017 batches also.

**UG ELECTIVES**

22. Introduction to Distributed Computing: title be changed to ‘Client- Server Computing’.
25. SOA: be replaced with Web Services and Cloud in semester 8.

**PG Electives**

30. Intelligent System: be removed.
31. Distributed Computing: be removed and replaced by Advanced Operating Systems and Distributed Computing.
32. Introduction to Intelligent Systems and Machine Learning be added.
33. Deep Learning for Natural Language Processing be added.
34. Cloud Computing be removed.

**PG Lab Courses**

35. Angular and Node JS Lab, Network and Grid Simulation Lab, Bio Informatics Lab be added.

**M.Phil. Computer Science- Part Time**

36. It is decided in the BOS meeting, CS & IT M.Phil. Computer Science course can be offered as part-time from 2018-19 academic year onwards. M.Phil. Computer Science Full Time Syllabi and curriculum are same for part-time, provided it is spanned for 4 semesters.

The board also reviewed the courses offered to B.Com (Finance and IT), B.Com (Taxation and Finance), BBA (Logistics Management), BBM, M.Com (Finance and Systems). All the courses can be offered without any modifications.

**Other Suggestions /Decisions**

1. Since M.Sc. Computer Science (Systems and Network Administrations) will not be offered from 2018 admissions, no revisions or modification have been made in the curriculum and syllabi of this program.